

# Protecting Salmon and Steelhead

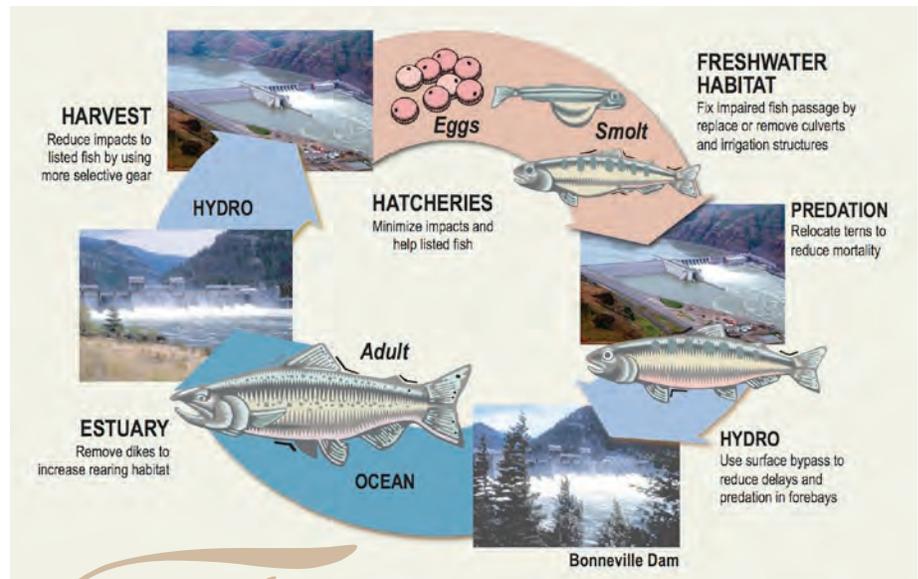
## Endangered Species Act Federal Columbia River Power System 2008 Progress Report Summary

December 2009

In May 2008, NOAA Fisheries issued a new Biological Opinion (BiOp) on the operation of the dams that make up the Federal Columbia River Power System. This opinion considered a Biological Assessment and a suite of actions proposed by the Bonneville Power Administration, the Bureau of Reclamation, and the U.S. Army Corps of Engineers (the Action Agencies) to protect salmon and steelhead across their life cycle. It also provided NOAA Fisheries with scientific analysis under the Endangered Species Act (ESA) and an extensive list of Reasonable and Prudent Alternative (RPA) actions to avoid jeopardy to the fish.

Based on the BiOp, the Action Agencies committed to implementing actions to improve the survival of salmon and steelhead listed under the ESA, including the use of spill and surface passage structures at dams, management of water releases from storage reservoirs, expanded control of predators that prey on young salmon, restoration of tributary and estuary habitat, and

*continued on page 2*



### All-H Problems: All-H Solutions

*Samples from the 2008 FCRPS BiOp*

Throughout the Columbia River basin, tribal, state, local, and federal parties are working in partnership to protect and restore stocks of salmon and steelhead. Thirteen stocks of these fish are listed as threatened or endangered under the Endangered Species Act (ESA). Many parties in the region are working together to protect and enhance important habitats, improve hatchery and harvest practices, and enhance river conditions for migrating fish. Federal agencies alone are spending more than \$400 million each year on this effort.

The goal is to provide healthier places for ESA-listed salmon and steelhead to spawn and grow, and a safer migration path to and from the ocean – improving fish survival, abundance, and productivity. Recovering species that have such complex life cycles—that spawn and rear in freshwater rivers but spend most of their lives in the ocean—requires a comprehensive approach.

The federal agencies that manage the system of dams in the basin include the U.S. Army Corps of Engineers, Bureau of Reclamation, and Bonneville Power Administration (BPA), collectively known as the Action Agencies. They consult with NOAA Fisheries on dam operation, including activities that improve conditions for fish. Operating the dams for flood control, power production, irrigation, navigation, and other uses affects the flow of the river and water conditions. In addition, the mainstem dams are in the path of salmon

*continued on page 3*

implementation of hatchery reforms. The Action Agencies also entered into the Columbia Basin Fish Accords with two states and five tribes to promote regional partnerships and “on-the-ground” implementation. The Action Agencies are responsible for providing annual progress reports detailing the implementation and progress of the RPA.

In September 2009, the BiOp was enhanced through a Memorandum of Agreement with the State of Washington and an Adaptive Management Implementation Plan (AMIP, at <http://www.salmonrecovery.gov/BiologicalOpinions/FCRPS/2008BiOp.aspx>) prepared by the Obama Administration after considering the views of the court and the parties and conducting a scientific review. The AMIP includes accelerated actions, additional research related to fish status and climate change, and precautionary use of biological triggers and contingency plans in case there is an unexpected, significant fish decline. These new ESA provisions are being implemented now but were not in place for 2008.

To review the FCRPS BiOp in its entirety, go to [https://pcts.nmfs.noaa.gov/pls/pcts-pub/pcts\\_upload.summary\\_list\\_biop?p\\_id=27149](https://pcts.nmfs.noaa.gov/pls/pcts-pub/pcts_upload.summary_list_biop?p_id=27149).

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*This report is produced by the “Action Agencies”—the U.S. Army Corps of Engineers Northwestern Division, Bureau of Reclamation Pacific Northwest Region, and Bonneville Power Administration.*

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and steelhead as they migrate many miles to the ocean to mature and return upriver to spawn in inland streams and tributaries.

This report summarizes the significant actions implemented by the Action Agencies in 2008 to protect ESA-listed salmon and steelhead affected by the operation of the Federal Columbia River Power System (FCRPS).<sup>1</sup> It describes the status of RPA actions being implemented across the fish life cycle for that calendar year. The actions described in this annual report are focused on achieving biological performance standards, achieving programmatic performance targets, and addressing factors that limit certain life

stages for specific evolutionarily significant units (ESUs) or distinct population segments (DPSs) of salmon and steelhead. Adaptive management is the process the agencies use to make annual adjustments to actions based on new scientific information, to meet biological performance objectives effectively and efficiently.

The region as a whole is making noticeable progress in fish conservation. Over the past decade, fish survival through the federal dams has improved significantly. Fisheries that were closed for a decade or more have been reopened as fish numbers have increased. Step by step, regional efforts are improving the quality of salmon habitat and increasing knowledge about salmon and

steelhead life cycles and requirements. The agencies remain committed to continued collaboration and coordination with other regional parties working toward the common goal of sustainable Pacific salmon and steelhead populations. The full FCRPS 2008 Annual Progress Report, which includes the *Reasonable and Prudent Alternative (RPA) Summary Table: Actions and Accomplishments, Detailed Description of RPA Action Implementation, and Project Tables for RPA Action Implementation*, is available online at [www.salmonrecovery.gov](http://www.salmonrecovery.gov). Previous FCRPS progress reports and information on other salmon and steelhead protection efforts are available on websites listed at the end of this document.



Figure 1. Map of the Columbia River Basin Showing Action Areas, Dams, and Listed Species. The Columbia River and its tributaries form the dominant water system in the Pacific Northwest and are a heavily used regional resource.

<sup>1</sup> The FCRPS includes 14 major dams and power plants on the Columbia and Snake rivers. These dams and power plants are operated as a coordinated system (including with Canada) to meet multiple purposes as authorized by Congress.

# 2008 Fish Status and Environmental Conditions

## Adult Fish Returns and Trends

One way the Pacific Northwest tracks how well salmon and steelhead are doing is by comparing the numbers of fish that return each year to spawn. Many dams have fish counting stations where annual index tallies are made of the various species as they swim up the fish ladders. In 2008, more than 1.3 million adult and jack salmon and steelhead were counted as

they passed Bonneville Dam. (Jack salmon are young males that mature and return to spawning grounds earlier than others in their age class.) This number exceeds historical averages (i.e., for 2000 and earlier) and is slightly above the 10-year average (Figure 2).

As shown in Table 1, counts in 2008 of adult and jack summer Chinook, coho, and sockeye passing Bonneville Dam all exceeded the 10-year average, and spring

Chinook, fall Chinook, and steelhead counts were below the 10-year average. In a typical year, about 80 percent of all returning adult salmon are of hatchery origin, though the actual percentage varies by species.

### Adult Fish Survival

Survival rates of ESA-listed adult Chinook and steelhead through the FCRPS are at or slightly below adult passage performance standards, using the methodology in the 2008 FCRPS BiOp and updated harvest estimates (see Table 1). Five-year rolling average survival rates are within 1 to 2 percent below the BiOp goals for all Snake River (SR) ESUs and Upper Columbia River (UCR) ESUs that migrated in river as juveniles. This discrepancy is likely related to three factors: modifications to operations and structures at the dams to increase juvenile survival that in some instances may also increase adult passage times; predation on spring Chinook that fall back at Bonneville Dam; and additional unquantifiable levels of mortality from unreported or delayed mortality caused by fisheries and unaccounted levels of straying. Determining optimal spill levels for all life-cycle stages, modifying operations or structures with known adult passage problems, and managing sea lion predation should help improve adult survival rates in the future.

### Juvenile Fish Survival

Juvenile salmon and steelhead that migrate to the ocean through the Snake and Columbia rivers are either transported by barge or truck around the lower river dams or left "in river" to migrate past the dams. Total juvenile fish survival, also known as system survival, is a combination of in-river and transportation survival. The COMPASS model was used to estimate FCRPS system survival for the 2008 migration of Snake River spring Chinook and steelhead. The model estimated that 2008 system survival was 58.0 percent for Chinook and 67.1 percent for steelhead. Actual 2008 system survival results will be calculated when adult returns are completed.



Figure 2. Adult and Jack Salmon/Steelhead Returns at Bonneville Dam, 1938 to 2008 (Includes Hatchery and Natural-Origin Fish).

Table 1. Adult Salmon and Steelhead Returns at Bonneville Dam, 2008 and 10-Year Average.

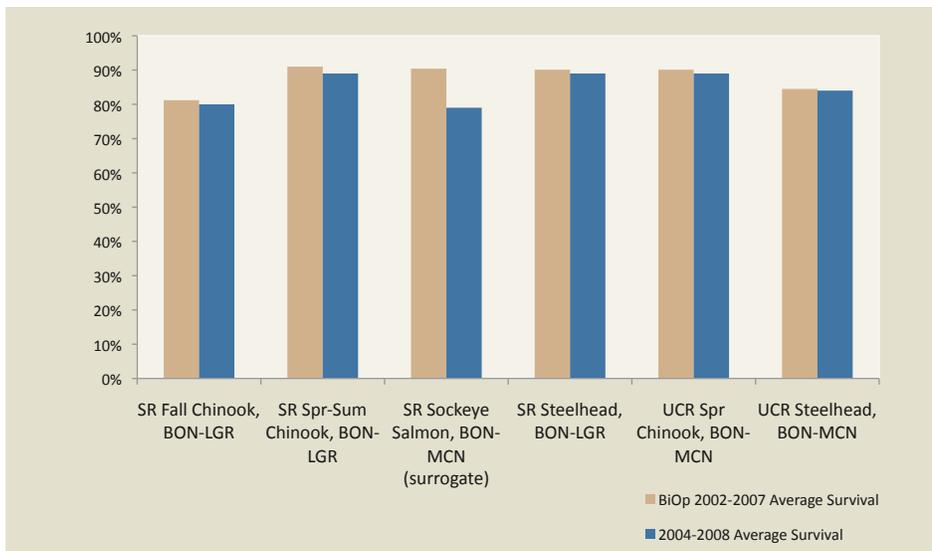
| Species                          | 2008      | 10-Year Average |
|----------------------------------|-----------|-----------------|
| Chinook – Total <sup>1</sup>     | 587,428   | 670,558         |
| Spring Chinook <sup>2</sup>      | 143,139   | 172,107         |
| Summer Chinook                   | 89,892    | 87,086          |
| Fall Chinook                     | 354,397   | 411,365         |
| Steelhead                        | 357,820   | 361,078         |
| Sockeye                          | 213,607   | 78,642          |
| Coho <sup>3</sup>                | 146,059   | 119,860         |
| Chum and Pinks                   | 135       | 192             |
| TOTALS of all species for period | 1,305,049 | 1,230,330       |

Period of 10-year average 1999–2008. All data from the U.S. Army Corps of Engineers' Fish Passage Report 2008, Table 18, except as noted below.

<sup>1</sup> Chinook data from monthly values in Fish Passage Report 2008, Table 19, except that values for 1994-2002 are from monthly values in Fish Passage Report 2002, Table 18. Values include jacks.

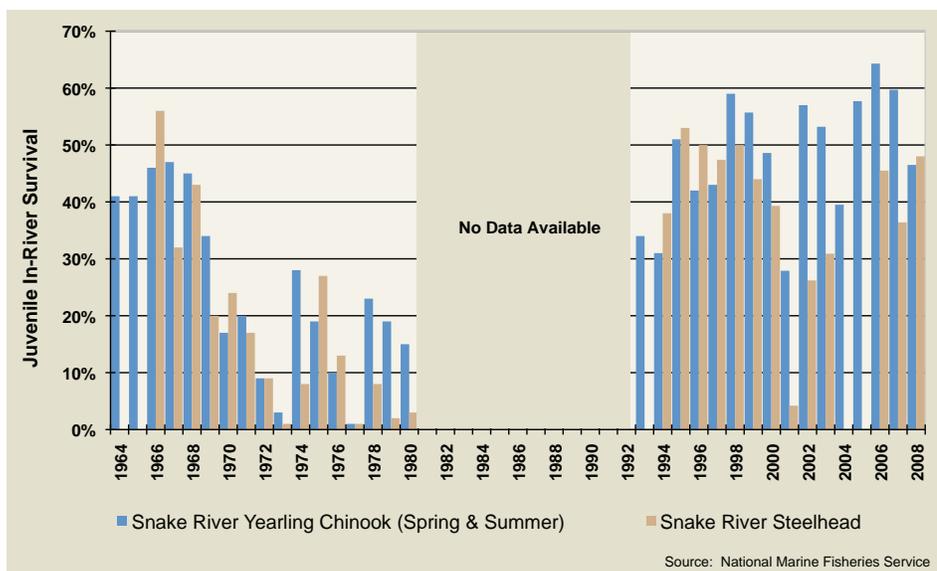
<sup>2</sup> Assumed Chinook run dates: spring = Jan 1–May 31, summer = June 1–July 31, fall = Aug 1–Dec 31.

<sup>3</sup> Includes jacks.



**Figure 3. 2008 FCRPS BiOp Adult Survival Standard and Summary of 5-Year Rolling Average Adult Survival of Adults that Migrated in River as Juveniles, Based on PIT Tag Conversion Rates of Snake River (SR) and Upper Columbia River (UCR) ESUs.**

(BON = Bonneville, MCN = McNary, LGR = Lower Granite) (Source: May 5, 2008, Biological Opinion and NOAA Fisheries – Portland, unpublished data [Bellerud]).



**Figure 4. In-River Survival Estimates (Hatchery and Wild Combined) for Snake River Chinook Salmon and Steelhead.**

(Steelhead estimates for 2004 and 2005 are unavailable due to lower PIT tag detection efficiency at Bonneville Dam. Survival estimates not available for 1981 through 1992.)

The percentage of fish that travel in river compared to the percentage transported has ranged from 45 to 90 percent, depending on a number of factors, such as projected river flow volumes, how much spill is provided, and how well fish are attracted to juvenile fish bypass systems. Approximately 98 percent of the transported juveniles survive to the point

of release below Bonneville Dam. Because additional “delayed mortality” may occur after the fish are released, research is being carried out under the BiOp to better understand any delayed effects of transport.

The BiOp also established an in-river survival performance metric for Snake River spring/summer Chinook and

steelhead; this metric is intended to provide important information for both the annual adaptive management process and the comprehensive evaluations in 2013 and 2016. The Action Agencies empirically measured in-river survival for 2008 (Lower Granite to Bonneville and McNary to Bonneville) and compared that with the survival estimates derived by running COMPASS (with prospective survival estimates for the actions that were implemented at the start of the 2008 migration season using 2008 river conditions, fish migration patterns, and dam and transport operations). Results indicate that the benefits from the RPA actions implemented to date are likely accruing as expected.

In-river survival estimates for Snake River spring Chinook, Snake River steelhead, and Columbia River spring Chinook were similar to expected survival targets based on the COMPASS model. The in-river survival of both Snake River Chinook and Upper Columbia spring Chinook was lower than predicted by the COMPASS model, although the associated 95 percent confidence intervals encompassed the model estimates. The measured in-river survival for Snake River steelhead in 2008 exceeded the COMPASS estimate. As with the Chinook salmon estimates, the confidence intervals for Snake River steelhead overlapped the COMPASS estimate. In-river survival estimates for Upper Columbia steelhead could not be generated in 2008, so a comparison with the COMPASS model was not possible. NOAA Fisheries’ 2008 in-river survival report<sup>2</sup> offers several potential explanations for the lower than expected survival between McNary Dam and Bonneville Dam in 2008 for both the Snake River and Upper Columbia Chinook salmon ESUs. One potential explanation is related to the installation of two top spillway weirs (TSWs) at John Day Dam. Although survival rates<sup>3</sup> were high over the new structures, it is possible that altered tailrace conditions made migrating fish in river more vulnerable to predators.

<sup>2</sup> Faulkner, J.R., S.G. Smith, W.D. Muir, D.M. Marsh, and J.G. Williams. 2009. *Survival Estimates for the Passage of Spring-Migrating Juvenile Salmonids through Snake and Columbia River Dams and Reservoirs, 2008.*

<sup>3</sup> Generally, juvenile dam survival estimates represent survival of the treatment group relative to the control group.

In 2009, additional avian predation prevention measures such as increased harassment to exclude birds from portions of the tailrace were employed as an adaptive management response.

## Water Year and Streamflow Summary

The Columbia Basin experienced average water conditions in 2008. Snake River flow volume was near average throughout April 2008 but increased to above average for most of May because of late-season thaw of larger-than-average snowpack. In addition, the large influx of cold meltwater made April and May water temperatures the coldest in the Snake River in recent years.

## Ocean and Climate Conditions

Columbia River Basin salmon and steelhead abundance is strongly correlated with periods of relatively warm or cold off-coast ocean conditions. In general, warmer conditions are less favorable for salmon and colder conditions are more favorable. Pronounced warm and cold cycles have occurred over most of the past century, lasting approximately 20 to 30 years each (Figure 6). This climate pattern is known as the Pacific Decadal Oscillation (PDO).

A cool PDO regime in place from about 1947 to 1976 was characterized by abundant salmon returns to the Columbia River basin. The PDO shifted to a warm phase in about 1977, which coincided with a significant decline in Columbia Basin salmon runs. Although it is not clear yet whether another longer term shift has taken place or what effects might be associated with climate change, ocean conditions have been variable since about 1999, with relatively brief cool and warm periods.<sup>4</sup>

The NOAA Fisheries Northwest Fisheries Science Center (NWFSC) oversees the Ocean Ecosystem Indicators Project to track specific climatic and biological indicators believed to influence the growth and survival of juvenile salmon once they reach the ocean. The NWFSC forecasts coho and Chinook salmon returns based on a survey of several indicators. Ocean

<sup>4</sup> For more information, see the Pacific Northwest Climate Impacts Group website at <http://cse.washington.edu/cig/>.

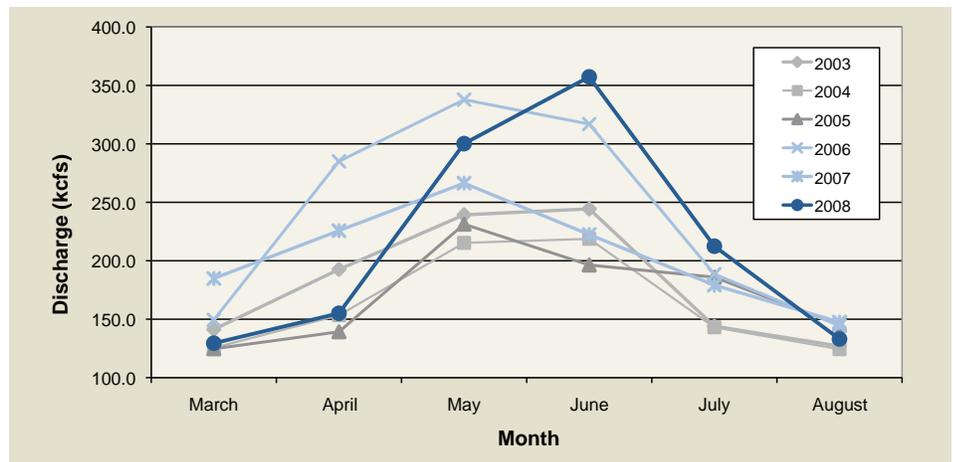


Figure 5. Mean Daily Flow by Month at McNary Dam, 2003-2008.

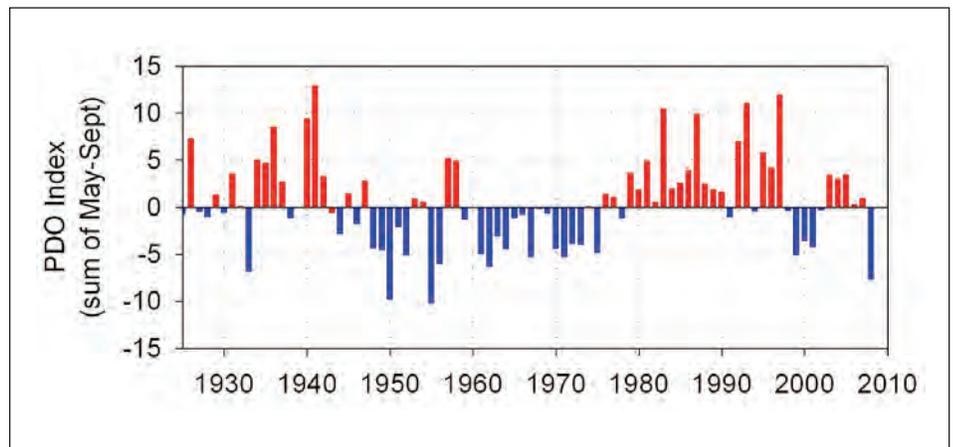


Figure 6. Pacific Decadal Oscillation from 1925 to 2008, Showing Its 20- to-30-Year Cycle and Highly Favorable Conditions in 2008.

|   | Juvenile Migration Year |        |        |        | Forecast of adult returns |              |
|---|-------------------------|--------|--------|--------|---------------------------|--------------|
|   | 2005                    | 2006   | 2007   | 2008   | Coho 2009                 | Chinook 2010 |
| <b>Large-scale ocean and atmospheric indicators</b> |                         |        |        |        |                           |              |
| PDO   | Red                     | Red    | Yellow | Green  | Green                     | Green        |
| MEI   | Red                     | Yellow | Green  | Green  | Green                     | Green        |
| <b>Local and regional physical indicators</b>       |                         |        |        |        |                           |              |
| Sea surface temperature                             | Red                     | Yellow | Red    | Green  | Green                     | Green        |
| Coastal upwelling                                   | Red                     | Yellow | Green  | Green  | Green                     | Green        |
| Physical spring transition                          | Red                     | Green  | Yellow | Green  | Green                     | Green        |
| Deep water temp. & salinity                         | Red                     | Yellow | Green  | Green  | Green                     | Green        |
| <b>Local biological indicators</b>                  |                         |        |        |        |                           |              |
| Copepod biodiversity                                | Red                     | Red    | Yellow | Green  | Green                     | Green        |
| Northern copepod anomalies                          | Red                     | Yellow | Green  | Green  | Green                     | Green        |
| Biological spring transition                        | Red                     | Red    | Green  | Green  | Green                     | Green        |
| Spring Chinook-June                                 | Red                     | Yellow | Green  | Green  | --                        | Green        |
| Coho--September                                     | Red                     | Yellow | Red    | Yellow | Yellow                    | --           |

Key:   
■ good conditions for salmon ● good returns expected   
■ intermediate conditions for salmon -- no data   
■ poor conditions for salmon ● poor returns expected

Figure 7. Ocean Ecosystem Indicators of the Northern California Current.

Colored squares indicate positive (green), neutral (yellow), or negative (red) conditions for salmon entering the ocean each year. In the two columns to the far right, colored dots indicate the forecast of adult returns based on ocean conditions in 2008.

ecosystem indicators during juvenile migration year 2008 were the best overall since 1999-2000. As a result, the NWFSC forecasts that spring Chinook runs in 2010 and 2011 should rival the high returns seen in 2001 and 2002, while returns of coho in 2009 should be somewhat lower.<sup>5</sup>

### New Climate Change Information

The 2008 BiOp summarized a number of studies, including the Independent Scientific Advisory Board's (ISAB) review

of the literature relevant to climate change impacts on Columbia River basin salmon and steelhead (*Climate Change Impacts on Columbia River Basin Fish and Wildlife*, Independent Scientific Advisory Board, 2007). There was no additional significant new information on climate change in 2008. Under the RPA, the Action Agencies provided funding and collaborative support to the Washington Department of Ecology in 2008 to contract with the University

of Washington Climate Impact Group to develop climate change streamflow scenarios. The Action Agencies are developing additional data sets, such as climate change water supply forecasts and flood control elevations, that will be used in conjunction with the streamflow scenarios developed by the University of Washington to adequately model climate change impacts to the hydrosystem.

## Implementation Overview

The Action Agencies have established implementation strategies and actions using the "All-H" approach—hydropower, habitat, hatchery, and harvest, plus predator management—to work toward salmon and steelhead recovery in the Columbia River basin. Work performed is summarized below. Detailed descriptions can be found in the RPA action implementation portion of this Annual Progress Report.

### Hydropower

Under the hydropower strategy, the Action Agencies implemented juvenile and adult dam passage modifications, operation improvements for spill and transport of juvenile fish, water management operations, and operational and maintenance activities aimed at improving juvenile passage survival and adult returns. These actions are focused on achieving higher juvenile dam survival performance standards, as well as the system survival and in-river survival performance metrics.

### Improvements for Fish at the Dams

Most salmon and steelhead in the Columbia River basin encounter one or more hydroelectric dams as they migrate to and from the ocean. Fish passage systems provide various routes to help salmon and steelhead get past the dams. Over the past several decades, juvenile fish survival past the dams has improved dramatically.

Juvenile fish migrate past the dams by several routes: through the turbines, through juvenile bypass systems, through spillways, or by collection and transport in barges or trucks. Turbine passage is often considered to be the least desirable juvenile bypass route. As a result, bypass systems, spill, and other passage improvements are used to divert the vast majority of migrating fish past the turbines. Depending on location, time of year, and species, about 76 to 99 percent of the juvenile fish use these non-turbine routes. Juvenile dam survival estimates of 86 to 99 percent<sup>6</sup> have been demonstrated through bypass systems and during spill periods at Snake and Columbia River dams, with survival rates at most of the dams in the upper 90 percent range. The BiOp includes requirements to achieve dam survival performance standards (through all passage routes) of 96 percent for spring migrating fish and 93 percent for summer migrating fish. These standards may have been met at some dams and for some seasons, but significant improvements are also under way. In 2008, the agencies continued to make improvements to fish passage; key accomplishments are noted below.

### Spill and Surface Passage

Fish passage through the spill is widely recognized as one important way to get juvenile fish through the dams. Water is

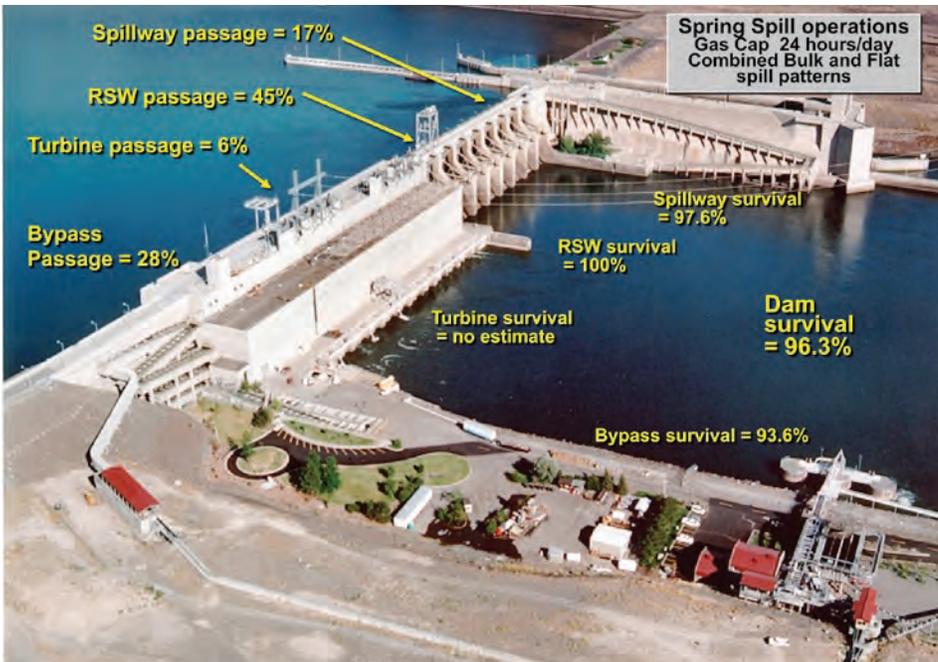
"spilled" through spillway openings rather than being routed through turbines to generate power or being used for other purposes. The Action Agencies' hydro operations include spring and summer spill to help juvenile salmon and steelhead pass the lower Columbia and Snake River dams. In 2008, consistent with the court-ordered 2008 Fish Operations Plan, spill levels from 2007 were repeated with only those modifications necessary to accommodate new structures and perform essential research.

Surface passage facilities are increasingly being used in addition to normal spillways to provide more natural river passage conditions, improve juvenile fish survival, reduce fish delay in the forebay, improve water quality, and potentially spill less water. Most juvenile salmon tend to stay in the upper 10 to 20 feet of the water column as they migrate downstream to the ocean. When approaching the dams, juvenile fish need to dive to depths of 50 to 60 feet to find passage routes such as a spillway opening or a screen that will guide them to a juvenile bypass channel. Spillway weirs and the Bonneville corner collector use new technologies to provide more surface-oriented, less stressful passage routes for juvenile fish.

In 2008, two top spillway weirs were installed and tested at John Day Dam, and a removable spillway weir (RSW)

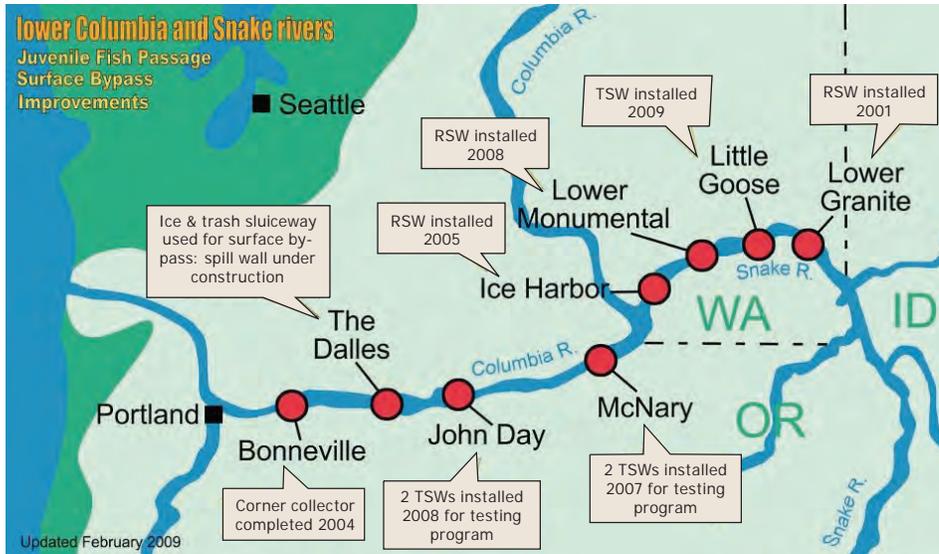
<sup>5</sup> See the Northwest Fisheries Science Center's Ocean Ecosystems Indicators website at <http://www.nwfsc.noaa.gov/research/divisions/fed/oeip/a-ecinhome.cfm>.

<sup>6</sup> Generally, juvenile dam survival estimates represent survival of the treatment group relative to the control group.



**Figure 8. Lower Monumental Dam — Route-Specific Passage and Survival Estimates for Yearling Chinook Salmon When Spring Spillage Operations Are Gas Cap Spill with a Bulk Spill Pattern All Day.**

(Source: *Passage Behaviour and Survival for Radio-Tagged Yearling Chinook Salmon and Juvenile Steelhead at Lower Monumental and Ice Harbor Dams, 2008 [Preliminary Results]*, Hockersmith et al. 2008).



**Figure 9. Lower Columbia and Snake River Juvenile Fish Passage Surface Bypass Improvements.**

was installed and tested at Lower Monumental Dam. These projects were key milestones in the Action Agencies' commitment to install surface passage and achieve performance standards at all Snake River and Columbia River dams. The John Day facilities reduced salmon and steelhead passage through turbines

by 50 percent or more and increased fish survival through the dam. Dam passage survival estimates for yearling Chinook and steelhead were 95.5 percent and 98.4 percent, respectively, while the dam survival estimate for subyearling Chinook was 86.2 percent. The Lower Monumental RSW was very effective for passage and

appeared to meet or exceed performance standards. Dam passage survival estimates were 96.9 percent for yearling Chinook (bulk spill pattern), 99.8 percent for steelhead (all spill patterns), and 94.1 percent for subyearling Chinook (bulk spill pattern). Relative survival estimates of fish passing over the RSW were nearly 100 percent for both yearling Chinook and steelhead and 97 percent for subyearling Chinook.

### Juvenile Bypass Systems

Juvenile fish bypass systems are in operation at seven of the eight lower Columbia and Snake River dams. Most systems guide fish away from turbines by means of submerged screens installed in front of the turbine intakes. As fish follow currents down toward the turbines, the screens guide the fish back up to channels in the dam. The fish are then either routed to the river below the dam (bypassed) or loaded into barges or trucks for transport past the remaining dams.

In 2008, at Bonneville Second Powerhouse, modifications to the juvenile bypass system were completed to improve fish guidance efficiency. A Little Goose bypass outfall relocation to improve fish survival was initiated in 2008 and is expected to be completed in 2009-2010.

### Fish Transportation and Barging

Juvenile fish transportation is an ongoing program that collects fish from facilities at some of the Snake and Columbia River dams, transports them by barge or truck, and releases them below Bonneville Dam. Juvenile fish are collected at Lower Granite, Little Goose, and Lower Monumental dams on the Snake River and occasionally at McNary Dam on the lower Columbia.

The timing and conditions for fish transportation are determined based on annual research comparing adult returns to the spawning grounds of transported fish versus fish that migrated in river. In general, fish survive better migrating in river in early April but survive better with transport in lower water conditions during mid- to late May. Also, steelhead generally experience higher survival through transportation than do Chinook salmon

during the spring migration. The Action Agencies shift to transportation in the Snake River when river flows are low.

In 2008, transportation began on a staggered basis in the Snake River collector projects beginning in May and at McNary Dam beginning in late July. Approximately 14.46 million of the migrating juvenile salmon and steelhead were collected at transport locations in 2008. Approximately 36 percent of collected fish were returned to the river. As a result, about 52.5 percent of the total number of juveniles migrated in river, with the remainder being transported (Figure 10).

Based on passive integrated transponder (PIT) tag data and preliminary results, NOAA Fisheries estimated that 54.3 percent of wild Snake River yearling Chinook and 45.3 percent of hatchery Snake River yearling Chinook were transported in 2008, while 50.5 percent of wild Snake River steelhead and 46.6 percent of hatchery Snake River steelhead were transported that year. Of the fish transported, almost 99 percent were transported by barge and just over 1 percent were trucked.

### Water Management and Flow Operations

In addition to fish passage at the dams, operators control storage reservoirs to enhance fish survival. They augment river flows with water released from upstream

dams to help juvenile migration and adult spawning, and to cool water temperatures.

Water management actions recognize that available storage—water that actually can be managed—is limited relative to total annual runoff in the Columbia River Basin. Specific operating rules, including earmarking amounts of water for fish flows, are used at individual reservoirs to provide salmon flows, protect resident fish, control floods, and serve other authorized purposes.

In 2008, the Action Agencies developed an annual Water Management Plan that incorporates the operating rules from the BiOp. Both the storage projects and the run-of-river mainstem lower Columbia River and Snake River projects were operated under the plan to aid juvenile fish passage. (Storage projects are the Libby, Hungry Horse, Albeni Falls, Grand Coulee, and Dworshak projects, while the run-of-river projects are Bonneville, The Dalles, John Day, McNary, Ice Harbor, Lower Monumental, Little Goose, and Lower Granite.)

The Action Agencies coordinated with Canada and entered into an agreement on operation of treaty storage for non-power uses for the period December 15, 2007, through July 31, 2008. Under this agreement, 1 million acre-feet (MAF) of flow augmentation water was stored in Mica Reservoir during January and early February 2008. All flow augmentation storage was released by June 30, 2008,

under this agreement. The Action Agencies stored 52 thousand acre-feet (kaf) into non-treaty storage in September 2008, bringing the U.S. account to 73 percent of full on September 30, 2008.

In 2008 the Bureau of Reclamation provided 487 kaf of flow augmentation water from the upper Snake River above Brownlee Reservoir in accordance with the National Marine Fisheries Service's 2005 Upper Snake BiOp. For more information see the December 12, 2008, Annual Progress Report for Reclamation's 2008 Salmon Flow Augmentation Program.<sup>7</sup>

### Water Quality

The Action Agencies monitor water quality to measure temperature and dissolved gas in the river. When providing spill for fish passage, dam operators direct some water through the spillways instead sending all of it through the turbines. At large dams, spilled water plunges to the river below the dam with enough force to supersaturate atmospheric gases in the water. These gases can build up to levels that are dangerous to salmon and other aquatic life. To address this, the agencies monitor total dissolved gas (TDG) levels in the river and adjust patterns and quantities of spill to stay within acceptable levels. In 2008, there were 93 gauge-day exceedances of state TDG standards associated with voluntary spill for fish. There were 422 gauge-day instances in which TDG levels were higher than state

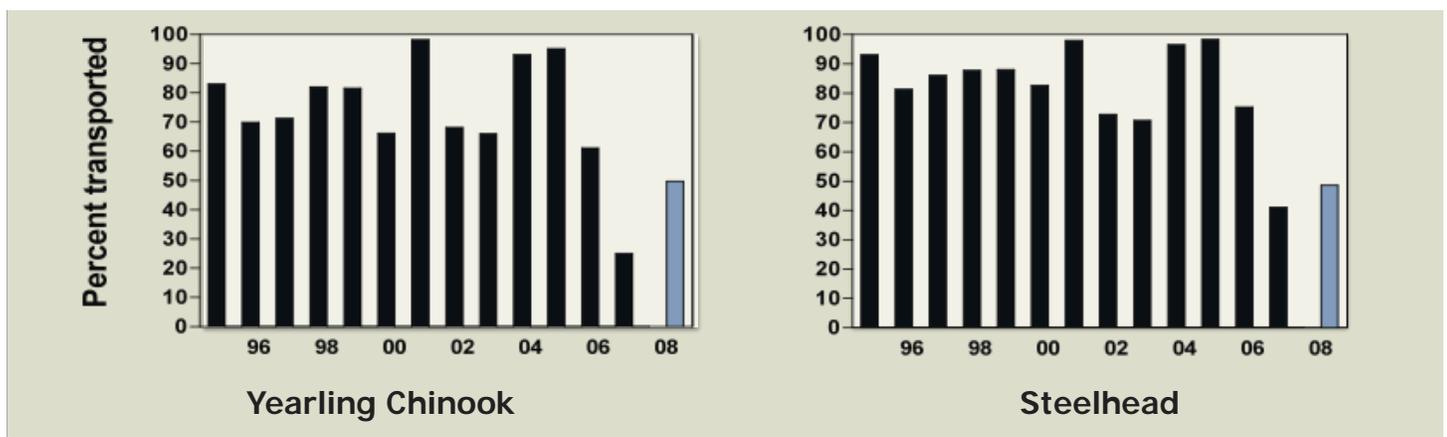


Figure 10: Percentage of Fish Transported to Below Bonneville Dam.

<sup>7</sup> Annual Progress Report: Bureau of Reclamation 2008 Salmon Flow Augmentation Program and Other Activities Associated with the National Marine Fisheries Service 2005 Biological Opinion and Incidental Take Statement for Operation and Maintenance of Bureau of Reclamation Projects in the Snake River Basin above Brownlee Reservoir, December 12, 2008, United States Department of Interior, Bureau of Reclamation, Pacific Northwest Region, Snake River Area.

standards as a result of (1) high river flows that forced involuntary spill, (2) turbine unit outage, or (3) high TDG levels upstream.

To help cool the lower Snake River in the summer, cold water is released from Dworshak Dam on the Clearwater River from early July through mid-September. The benefit of these cold-water releases was apparent as the agencies monitored temperatures in the Snake River, at Lower Granite Dam: temperatures there were consistent with state standards for the entire season. For a more thorough discussion of how the system was operated in 2008, see the annual "TDG and Temperature Report" links at <http://www.nwd-wc.usace.army.mil/TMT/wqwebpage/mainpage.htm>.

## Kelt Management

Several actions taken in 2008 were designed to enable development of a Kelt Management Plan for Snake River steelhead in 2009. Preliminary plans were developed for kelt collection activities at the juvenile fish facility and potential reconditioning efforts at the Dworshak Fish Hatchery in 2009. Federal, tribal, and University of Idaho representatives met and identified Lower Granite as the primary collection point for this work. The objective of this unique program is to increase survival and productivity of mature steelhead, such as by holding them and allowing them to spawn again the following year.

With funding from BPA, the Columbia River Inter-Tribal Fish Commission (CRITFC) began work on a Kelt Master Plan for Snake River fish, to provide more detail on the reconditioning aspect of the broader Kelt Management Plan at various locations. Implementing the master plan will include a three-step science and technical review process undertaken by the Northwest Power and Conservation Council.

## Predator Management

Four main predators consume large numbers of juvenile salmon and are a major cause of mortality of ESA-listed fish in the Columbia River system. Caspian terns and double-crested cormorants,

which eat large numbers of migrating fish, have enjoyed population increases over the last two decades in the Columbia River estuary and are also present in the mid-Columbia region. Among fish, northern pikeminnow are voracious consumers of juvenile salmon and steelhead. California sea lions are known to consume substantial numbers of adult Chinook salmon and steelhead below Bonneville Dam.

Federal and state agencies are cooperating in efforts to reduce predation on listed species. Programs to redistribute Caspian terns in the estuary, deter and block sea lions from Bonneville Dam fish ladders, and reduce the northern pikeminnow population through a sport-reward program have been successful in reducing the loss of adult and juvenile salmon to predation. In 2008, the Action Agencies continued efforts to control specific predators and improve survival of juvenile fish.

### Caspian Terns and Double-Crested Cormorants

Caspian terns and double-crested cormorants consume large numbers of juvenile salmon and steelhead. Together, the terns and cormorants consumed an estimated 15.9 million juvenile salmon in the estuary in 2008. The federal agencies have been addressing growing populations of Caspian terns and double-crested cormorants nesting in the estuary as well as Caspian terns and double-crested cormorants in the Mid-Columbia River that prey on juvenile salmon.



*Caspian terns nesting on East Sand Island consumed approximately 6.7 million young salmon in 2008, compared to the estimated 15 million they consumed in 1999.*

Recent efforts to redistribute Caspian terns from Rice Island, in the Columbia River estuary, to East Sand Island, nearer to the ocean, were successful in reducing predation rates. As intended, the

relocation shifted the terns' diets away from juvenile salmon toward a more diverse diet of predominantly marine fish species. (At Rice Island, juvenile salmon made up 75 to 90 percent of the terns' diet.)

In 2008, the East Sand Island tern colony consumed approximately 6.7 million juvenile salmon ([http://www.birdresearchnw.org/CEDocuments/Downloads\\_GetFile.aspx?id=349567&fd=0](http://www.birdresearchnw.org/CEDocuments/Downloads_GetFile.aspx?id=349567&fd=0)). In comparison, in 1999, the colony consumed about 15 million salmon when located at Rice Island. Approximately 10,700 pairs of Caspian terns nested on East Sand Island in 2008, which is an increase from the estimated 9,900 pairs that nested on the island in 2007. Plans are under way to relocate two-thirds of the Caspian terns to alternate nesting sites in Oregon and California (see [http://www.nwp.usace.army.mil/pm/e/en\\_plan\\_avian.asp](http://www.nwp.usace.army.mil/pm/e/en_plan_avian.asp)).

In the early spring of 2008, the U.S. Army Corps of Engineers began carrying out the Caspian Tern Management Plan with the construction of two islands for tern relocation—one in Fern Ridge Reservoir, near Eugene, Oregon, and the other in Crump Lake in southern Oregon. Although terns were slow to respond to the newly created island at Fern Ridge Reservoir, the opposite was true of the island constructed at Crump Lake. Construction of alternate habitat continued after the 2008 breeding season with the first of three islands in Oregon's Summer Lake State Wildlife Area, which was completed in December. Another island in Summer Lake will be constructed before the 2009 breeding season. At all of the islands constructed or enhanced through the tern management plan, social attraction, tern decoys, and tern colony sounds will be used in the spring of 2009 to attract terns.

The agencies also are considering management actions to address a greatly increased population of double-crested cormorants in the Columbia River estuary. The cormorant nesting population on East Sand Island increased from around 100 pairs in 1989 to about 13,771 breeding pairs in 2007. The number of juvenile fish consumed by cormorants averaged 6.8 million fish for 2003-2007, with 2.9 to

10 million juveniles being consumed per year. Estimates of cormorant consumption of salmon for 2008 are still being developed.

In 2008, the Action Agencies continued a study of potential management techniques for reducing losses of juvenile salmon to cormorant predation in the Columbia River estuary. This study sought to determine whether habitat enhancement and social attraction techniques can be used to induce double-crested cormorants to nest in an area outside the Columbia River estuary where they have not previously nested. In 2008, the agencies continued employing habitat enhancement (such as placement of old tires filled with nesting material) and social attraction techniques on a floating platform in Fern Ridge Reservoir in an effort to attract cormorants away from the estuary.

### Northern Pikeminnow

Northern pikeminnow are voracious consumers of juvenile salmon. Since 1990 BPA has funded the Northern Pikeminnow Management Program (NPMP) to reduce the numbers of larger pikeminnow and improve survival of juvenile salmon. In 2008, the BPA reward for the catch of this predator was sustained at a higher tiered monetary level initiated in 2005. This reward structure helps sustain the higher catches and resulted in the highest harvest rate of pikeminnow since program inception.



*Northern Pikeminnow, a Voracious Consumer of Juvenile Salmon*

In 2008, the pikeminnow program continued implementation of its base reward program, which relies on private-sector fishing efforts to provide the majority of the catch of northern pikeminnow. In addition, program managers reinstated a dam-angling program component for the first time since 2001. This program provided two fishing crews that focused on the forebay

and tailrace sections of the Bonneville and The Dalles dams—areas not accessible to the general fishing public. Also in 2008, evaluation crews were able to tag 70 percent more pikeminnow than in 2007, to better evaluate the benefits of predator management. The Northern Pikeminnow Management Program has removed more than 3.3 million pikeminnow from the Columbia River since 1990. Evaluation indicates that, as a result, pikeminnow predation on juvenile salmon has declined 38 percent since that time, saving 4 to 6 million juvenile salmon annually that would otherwise have been eaten by this predator.

### California Sea Lions at Bonneville Dam

In recent years, California sea lions, which are protected under the Marine Mammal Protection Act (MMPA), have been observed swimming more than 140 miles up the Columbia River to Bonneville Dam to prey on adult Chinook salmon, steelhead, and sturgeon. Generally arriving from mid- to late February and leaving by the first week in June, these male sea lions eat to gain weight in preparation for the summer mating season.

Corps biologists began gathering data on sea lion presence and predation at the dam in 2001, when six California sea lions were documented. In 2002—the first full season of monitoring—30 sea

lions were counted. In 2004, 101 sea lions were counted, and in 2005 the number was estimated at 87 or more. From 2006 to 2008 the number increased from 72 to 84. Not all of these were at the dam at the same time; usually about 30 were present on any one day. The amount of fish eaten by sea lions has increased every year. In 2002 the expanded catch estimate was 1,010 adult salmon and steelhead that passed Bonneville Dam from January 1 through May 31. In 2008 the expanded catch estimate was 4,466 adult salmon and steelhead (Figure 11). For more information, see [http://www.nwd-wc.usace.army.mil/tmt/documents/fish/2008\\_Pinniped\\_Report.pdf](http://www.nwd-wc.usace.army.mil/tmt/documents/fish/2008_Pinniped_Report.pdf).

The Corps implemented and evaluated a variety of sea lion deterrents, from physical barriers to non-lethal harassment, in 2008. Sea lion exclusion devices were installed at Bonneville Dam's 12 primary fishway entrances to prevent sea lions from entering the fishways. Corps biologists also coordinated with U.S. Department of Agriculture personnel and boat-based crews from the Oregon Department of Fish and Wildlife (ODFW), Washington Department of Fish and Wildlife (WDFW), and CRITFC on all sea lion harassment activities at Bonneville Dam. In addition, the Action Agencies supported CRITFC in conducting monitoring and non-lethal harassment efforts to deter marine mammal predation downstream of the dam.



*A California sea lion catches a steelhead at Bonneville Dam.*

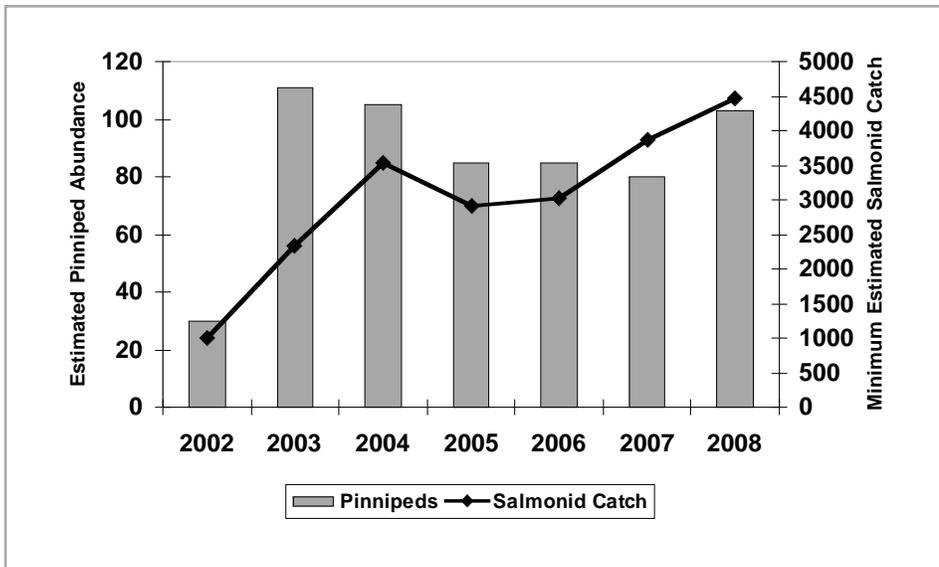


Figure 11. Estimated Minimum Number of Adult Salmonids Consumed by Pinnipeds and Estimated Total Number of Pinnipeds Seen at Bonneville Dam January 1–May 31, from 2002 to 2008.

In 2005, regular observations did not start until March 18. Pinnipeds observed included California sea lions, Steller sea lions, and harbor seals.

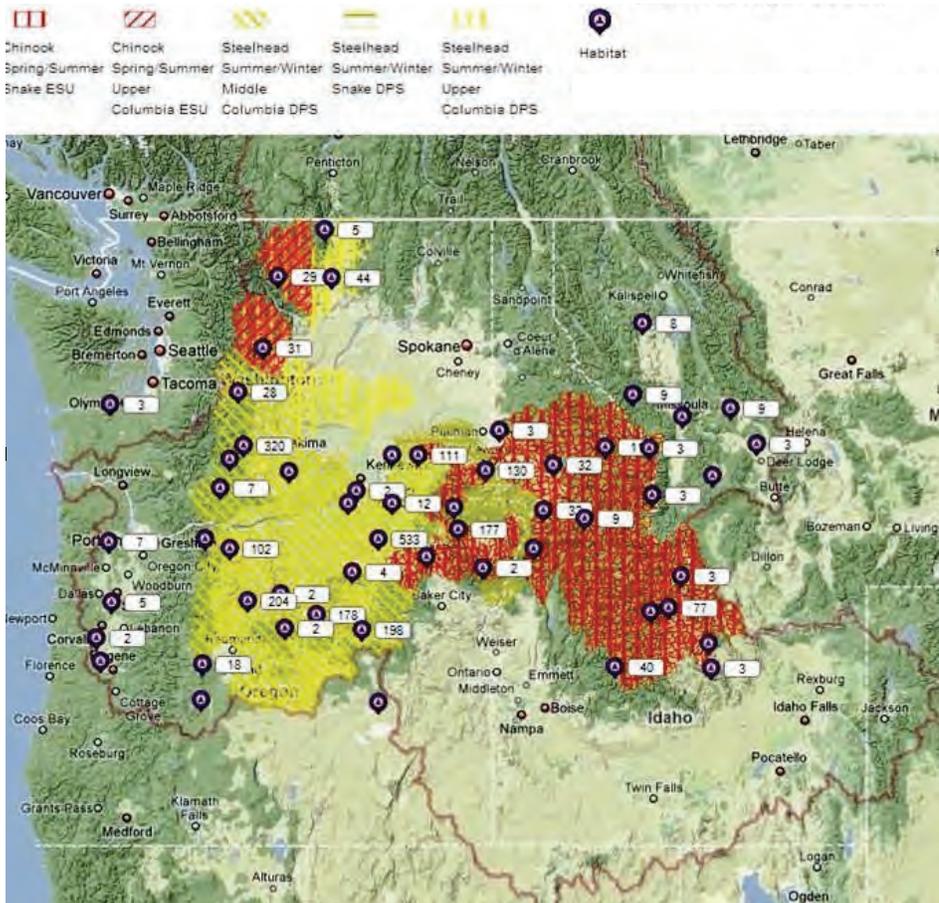


Figure 12. Action Agency Funded Tributary Habitat Projects, 2005 - 2008.

In 2008, under the MMPA nuisance sea lion removal authority, the states trapped 11 California sea lions. Six were sent to aquariums, four were processed (measured, weighed, and marked with a three-digit brand) and released, and one died under anesthesia before it could be sent to an aquarium. In May 2008, four California sea lions and two Steller sea lions died on traps, halting trapping operations for the 2008 season.

## Habitat Protection and Improvement Actions

Columbia River estuary and tributary habitat is important to salmon in their complex life cycle. Each year, the Action Agencies spend tens of millions of dollars under the RPA and the Columbia Basin Fish Accords to implement actions that improve the quantity and quality of habitat used by salmon in the estuary and tributaries. In coordination and partnership with other federal, state, and local parties, the Action Agencies are increasing the volume of water in streams, installing or retrofitting fish screens at water diversions to keep fish safely out of irrigation canals, reconnecting side channels and floodplains to add complex and diverse habitats, removing barriers to fish passage, and acquiring easements or other protective interests for riparian areas along tributaries.

## Tributary Habitat

In 2008, the Action Agencies began to expand an already significant tributary habitat program and took steps to target key factors known to limit the survival of specific salmon and steelhead populations. This effort improves on past BiOps. Not only does the expanded program use up-to-date biological information to target habitat actions to fish populations with the greatest biological need, but it also by uses local expert panels to identify and prioritize the most biologically appropriate actions for those populations. In addition to these population-focused efforts, the Action Agencies maintained or expanded their current overall level of effort for other anadromous fish populations. Specific projects have already been identified for implementation through 2009.

Specific tributary habitat projects for 2010-2012 are now being identified using recovery plan information and the BiOp's "expert panel" process, which is driven by local experts who identify tributary habitat projects and assess their biological benefits. Expert panel members include representatives from NOAA Fisheries, tribal and state fish and wildlife agencies, the U.S. Forest Service, local watershed groups, conservation districts, and recovery boards. The expert panels will be convened in 2009 and subsequently on a 3-year cycle for the duration of the BiOp, to review accomplishments and associated biological benefits during the last 3-year cycle, incorporate new scientific information (including climate change data), and identify actions and estimate associated biological benefits for the next 3-year cycle.

Projects to protect, improve, or restore critical fish habitat employ different approaches targeted to the specific limiting factors found in the individual watershed. The following sections summarize Action Agency accomplishments from 2005 to 2008 and provide examples of the work completed in 2008.

### Increasing Water Quantity and Quality through Water Transactions

Fish survival can suffer from the combined effect of naturally low summer flows and water withdrawals for human uses. One of the most effective and immediate steps the Action Agencies may take to improve fish habitat is to lease or purchase water rights or install water efficiency improvements to increase the amount of water in streams. This in turn provides immediate improvements to salmon and steelhead survival by reducing thermal stress and providing higher quality habitat for spawning and juvenile rearing. Since 2005, the Action Agencies acquired instream water to conserve or protect almost 200,000 acre-feet and 1,000 cubic feet per second (cfs) of water.

## Tributary Habitat Accomplishments

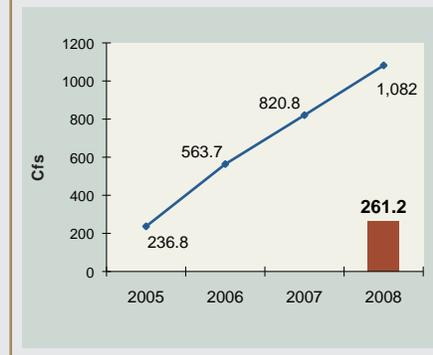
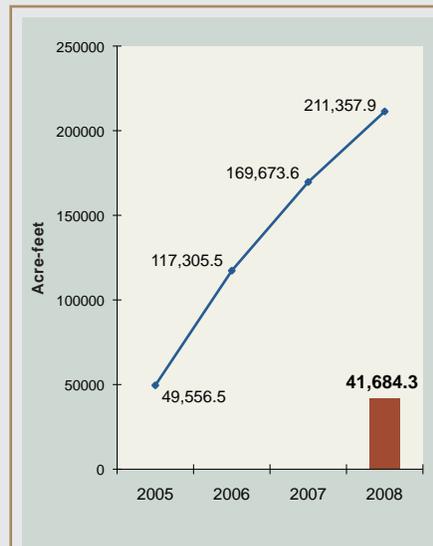


Figure 13. Water Protected, 2005 – 2008, in Acre-feet and Cfs.

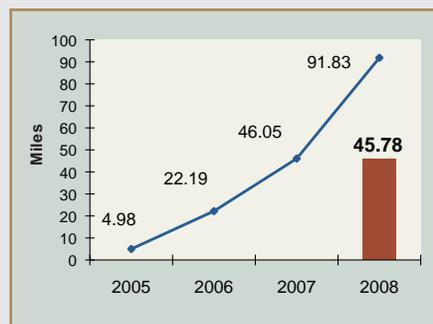


Figure 14. Miles of Improved Stream Complexity.

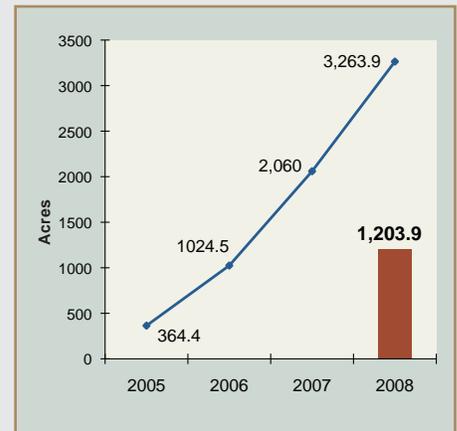


Figure 15. Acres Improved, 2005 – 2008.

Improvement measures included creating, connecting, or realigning channels; conducting controlled burns; planting; practicing no-till farming; removing mine tailings and invasive plant species; enhancing floodplains; or restoring wetlands.

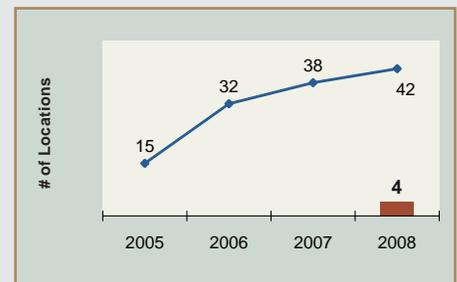


Figure 16. Number of Locations Where Entrapment Was Addressed, 2005 - 2008.

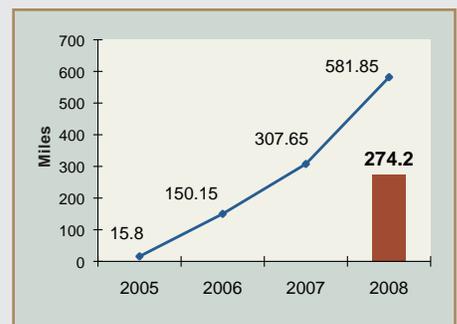


Figure 17. Improved Access to Habitat, 2005 - 2008.

— Cumulative annual results  
 ■ 2008 amount

Source: See Habitat Metrics by Fiscal Year report available at <http://www.efw.bpa.gov/IntegratedFWP/reportcenter.aspx> (limited to subbasins with anadromous fish).

An example of this approach took place in the Pahsimeroi River basin in central Idaho. Historically, central Idaho's Pahsimeroi River, a tributary of the Salmon River, coiled through a basin with abundant spawning and rearing habitat for summer Chinook salmon, steelhead, and westslope cutthroat trout. But for more than a century, parts of the Pahsimeroi and its tributaries have run dry in late summer and early fall because of water diversions for irrigated agriculture.

In 2008, BPA funded the Idaho Department of Water Resources (IDWR) to complete 20-year agreements that reopened 10 miles of high-quality, spring-fed creek habitat previously impassable to fish. Agreements with four landowners restored stream flows through a series of complex arrangements. As part of the project, the landowners also are switching from flood irrigation to more efficient sprinkler systems. The project restores nearly 30 cfs—more than 13,000 gallons per minute—of clean, cold water from April 1 to October 31, a flow-limited period for fish. State biologists report that adult salmon are already returning to this newly available habitat.

### Improving Habitat Complexity

Salmon evolved in streams that meandered, created multiple channels, and flooded seasonally. The complex habitats these processes created provided important rearing areas for juvenile salmon and steelhead, as well as cool-water refuges during the heat of summer. Human development has changed the nature of most of the Columbia River basin's river systems, depriving salmon of some of these habitat attributes.

An important component of the Action Agencies' habitat program involves funding actions and providing technical assistance to improve channel complexity by reconnecting side channels and, where feasible, increasing floodplain function to improve instream habitat conditions. The Action Agencies have improved 100 miles of stream since 2005, with 46 miles completed in 2008.

One example of this type of work involved the construction of approximately 200 feet of meandering channel habitat in the Chewuch River where the river channel had been cleared after extensive flooding in the middle of

the 20th century. Although the clearing effectively reduced flood threats, it also disconnected off-channel rearing habitat and floodplains that are important for fish. Through a contract with BPA, the Methow Salmon Recovery Foundation removed fill material to allow more water to flow from the Chewuch River into a disconnected side channel and constructed controls at an irrigation diversion point to provide continuous streamflow into the new side channel. This project provides more complex and diverse rearing habitat for Upper Columbia spring/summer Chinook and steelhead.

### Improving and Protecting Riparian Areas to Improve Water Quality

Riparian habitat—the streamside environment—makes a major contribution to water quality and long-term salmon survival. Although actions to improve and restore degraded riparian habitat can take years to yield results, they are nonetheless an essential salmon improvement strategy element. Because these actions can help moderate stream temperatures, they are an important hedge against the longer term effects of climate change, which are expected to cause stream temperatures to increase seasonally throughout the Columbia River Basin.

Riparian habitat can be protected through land purchases or conservation easements, which aim to reduce adverse land use impacts. In many instances, plantings or natural revegetation can reestablish a viable riparian zone by providing shade and other benefits for the stream. Since 2005, the Action Agencies have improved more than 3,000 acres (see Figure 15) and protected more than 37,000 acres. In 2008, BPA funded projects to improve and protect more than 1,100 acres of riparian vegetation, lease or purchase more than 9,800 acres of riparian habitat, secure more than 15,000 acre-feet of water, install 34 miles of riparian fencing, and improve or relocate more than 11 miles of roads affecting riparian areas. These projects are expected to provide habitat benefits that will help keep water cool and clean for ESA-listed populations.



*Adult salmon responded by returning to the Pahsimeroi River and its tributaries where water was leased from farmers and ranchers in 2008.*

For example, in 2008, BPA funds were used to extend land leases in the Tucannon watershed under the Conservation Reserve Enhancement Program (a voluntary agricultural land retirement program), ensuring continued protection of more than 350 acres of riparian habitat. As the riparian vegetation from these projects matures over time, it will help shade and cool the stream water and provide opportunities for recruitment of the large woody debris needed for complex habitat.

### **Reducing Fish Entrapment at Irrigation Diversions**

The Action Agencies have been funding projects to replace, improve, and install fish screens at irrigation diversions to prevent fish from becoming trapped, or entrained, in irrigation ditches. The fish screens, which are designed according to state and federal criteria, keep fish in the streams—out of irrigated fields—and thus provide immediate improvements to juvenile fish survival. Fish screen projects also helped consolidate irrigation diversions and replace instream diversions with groundwater wells, so that water can be diverted for irrigation but the need for an associated fish screen is reduced or eliminated entirely. Since 2005, the Action Agencies have addressed fish entrapment at 42 locations, four of those in 2008.



*Wenatchee River (Before).  
The leaky fish screen at the pump station did not meet current criteria for protecting salmon and steelhead that use the side channel habitat.*

In 2008, one of these projects involved the installation of an improved fish screen at a pump station that for many years has diverted water for irrigation from a side channel of the Wenatchee River in Washington State. A fish screen was in place at the pump site to prevent fish that use the side channel habitat (for rearing and to evade predators) from being drawn into the pump. But the screen no longer functioned as intended. Washington Department of Fish and Wildlife worked with the landowner to upgrade the screen to meet current criteria. Reclamation designed a vertical flat-plate screen for the pump station that was constructed and installed in 2008. The screen was specifically designed to have as little impact as possible on the side channel's depth and velocity, which are attractive to fish. A mechanical brush sweeps across the length of the screen to prevent accumulation of debris and maintain optimum screen function.

### **Improving Access to Spawning and Rearing Habitat**

Human development has restricted access to significant portions of the historical range of Columbia River basin salmon

and steelhead in many Columbia River tributaries. Many of these blockages can be fixed with negligible economic impact, providing a big biological boost to fish. Since 2005, the Action Agencies have improved access to more than 580 miles of instream habitat for anadromous fish (see Figure 17).

In 2008, the Action Agencies funded projects that opened up more than 260 miles of fish habitat. One such project took place in Idaho's Clearwater National Forest on the North Fork Spruce Creek, a tributary of the Lochsa River. A bridge with abutments that limited fish passage into good-quality habitat was replaced with a wider span bridge that allows a more free-flowing and natural stream channel. This project, funded by BPA and the U.S. Forest Service, was implemented through contracts with the Nez Perce Tribe and provided access to 3 miles of habitat for all life stages of fish.

### **Estuary Habitat Actions**

Fish from throughout the Columbia River basin use the Columbia River estuary for varying amounts of time during all months of the year. The estuary's diverse



*Wenatchee River (After).  
The design of the new fish screen maintains beneficial velocity and depth characteristics that attract juvenile fish into the rearing habitat in other parts of the side channel.*

habitats provide food and refuge for juvenile salmon for rearing and migrating as they make their critical transition from fresh water to salt water. Adult salmon returning to the Columbia River also must pass through the estuary.

In 2008 the Action Agencies expanded funding to implement on-the-ground projects to address biological priorities and key factors that limit fish survival in the estuary. Project types include the protection of remaining high-quality, off-channel habitats, reduction of invasive plants, and protection and restoration of riparian and wetland areas. In 2008, the Action Agencies completed eight on-the-ground habitat projects in the estuary, with another three projects in the planning and development phase.

One of the estuary habitat projects implemented by the Action Agencies in 2008 is the Willow Grove Acquisition and Restoration Project, which permanently protects 304 acres of intertidal wetland habitat adjacent to the Columbia River just downstream of Longview, Washington. The Willow Grove property has been altered by past land uses but represents an example of critical intertidal wetlands within this reach of the Columbia River. The wetlands provide important rearing habitat for juvenile salmon, particularly in this portion of the river where much of the historical floodplain and off-channel areas have been altered by industrial and commercial development.

Long-term management of the site includes implementing a management plan, to maintain and restore important habitat, and conducting regular monitoring as part of an adaptive management program. Future actions may include vegetation enhancement, control of invasive species, placement of large wood material, and enhancing fish access to the wetland complex from the mainstem Columbia River. This acquisition and restoration project provides benefits to multiple species of anadromous salmon, including Chinook, chum, coho, and steelhead.

In 2008 the Action Agencies also initiated implementation of a new Pile Structure Program. In collaboration with the Lower Columbia River Estuary Partnership (LCREP) and others, the Action Agencies



*North Fork Spruce Creek Bridge Passage Barrier (Before).  
Bridge abutments narrow the stream channel and restrict access to upstream habitat.*



*North Fork Spruce Creek Bridge (After Replacement).  
The new 60-foot-long bridge has abutments placed well outside the active stream channel.*

completed a final draft program plan for the new program and established a technical subcommittee under the Estuary Partnership's Science Work Group. Efforts to implement the Pile Structure Program included gathering pile

structure site condition data, designing a scientific approach, and preparing the final draft of the Pile Structure Program Plan.



*Willow Grove Acquisition and Restoration on the Columbia River, near Longview, Washington (facing east from Willow Grove Road, toward the northwest portion of the site).*

Pilings and pile dike were identified as one of many threats to juvenile salmon in NOAA Fisheries' *Columbia River Estuary ESA Recovery Plan Module for Salmon and Steelhead*. The module states that extensive use of pile structures has resulted in the following limiting factors: impaired sediment accretion and erosion processes; reduced flow circulation through shallow-water habitats; creation of favorable conditions for predators of salmon and steelhead, such as pikeminnow and cormorants; reductions in physical access to low-velocity juvenile salmon habitats that are important for refuge and feeding; and, in those cases where pile structures have been treated with harmful wood preservatives such as creosote, the release of toxic contaminants, including polycyclic aromatic hydrocarbons (PAHs), into the water column and sediment.

Table 2 summarizes the estuary habitat metrics accomplished in 2008 with Action Agency funding assistance.

**Table 2. Summary of Estuary Habitat Metrics, 2008.**

| Action  | Metric         |
|---|----------------|
| Improve and Restore Streams/Channels  | 6 linear miles |
| Restore Floodplain  | 60 acres       |
| Plant/Maintain Native Vegetation  | 285 acres      |
| Remove Invasive Plant Species   | 303 acres      |
| Restore Riparian Areas  | 57 acres       |
| Install Fence in Riparian Area  | 5 miles        |
| Land Acquisition<br><i>(Future restoration actions will be implemented on land acquisitions.)</i> | 380 acres      |

Projects for future implementation are now being identified using emerging tools such as the Ecosystem Classification System. The Ecosystem Classification System, which is being developed specifically for the estuary, will help local experts, planners, and project managers strategically identify and select restoration and protection projects that provide the highest benefits for the 13 listed ESUs in the Columbia River.

## Hatchery Management Actions

The Action Agencies continue to fund an extensive existing hatchery program as offsite mitigation for the federal dams, including conservation hatcheries for listed fish, while preparing for scientifically based hatchery reforms throughout the Columbia River basin. In 2008, the Action Agencies developed criteria for future hatchery funding decisions that require hatchery programs to operate in accordance with ESA requirements and, to the maximum extent practicable, operate in accordance with best management practices (BMPs) applicable to the individual program defined in program-specific ESA consultations. BPA funded the Hatchery Scientific Review Group (HSRG) process in 2008 to enable the HSRG to complete its comprehensive review and analysis of all Columbia Basin hatchery programs and prepare its final report with recommendations for hatchery reform.

The Action Agencies' strategy is to ensure that FCRPS mitigation hatchery programs are not impeding recovery of salmon ESUs or steelhead DPSs by reforming hatchery operations to reduce the genetic and ecological effects on ESA-listed salmon and steelhead.

BPA and Lower Snake River Compensation Program (LSRCP) staff initiated planning for specific hatchery reform actions to transition the Tucannon River and Touchet River steelhead hatchery programs from Lyons Ferry Hatchery broodstock to local broodstock. The Winthrop National Fish Hatchery initiated a pilot program to evaluate longer-term rearing of juvenile steelhead that would be required to transition to a locally adapted steelhead broodstock in the Methow River—a key initiative aimed at addressing one of the factors limiting the productivity of this Upper Columbia steelhead population.

The Action Agencies also continued to fund safety-net programs to reduce the extinction risk of at-risk populations of ESA-listed Snake River sockeye salmon and Snake River spring/summer Chinook. One of those programs, the Snake River Sockeye Salmon Captive Broodstock Program, preserves this critically imperiled



**Figure 18. Anadromous Fish Hatcheries Funded by the Action Agencies, Including Anadromous/Resident Fish Safety-Net Hatcheries.**

species. The program has produced hundreds of thousands of progeny from remnants of the wild stock. The progeny are raised in carefully managed hatcheries and released into their natural habitats to spawn or migrate downstream. Since 1999, 1,005 adults from the program have returned to Redfish Lake. The year 2008 was a particularly good return year, with 650 adult sockeye salmon returning to the Stanley Basin. This is the largest recorded annual return since 1956.

On September 2, 2008, a new state-of-the-art fish hatchery building was dedicated at the Idaho Department of Fish and Game's (IDFG) Eagle Fish Hatchery. This is one of three related efforts to increase sockeye salmon smolt

production to 150,000 sockeye salmon smolts—an initial step toward a goal of producing 500,000 to 1 million sockeye salmon smolts. The expanded hatchery capacity will accommodate additional sockeye salmon broodstock holding, adult spawning, egg incubation, and juvenile rearing.

On May 2, 2008, the Action Agencies signed a fish accord with Idaho that commits the agencies to providing funding for a new sockeye salmon fish hatchery (property acquisition and construction). Throughout 2008, BPA worked with IDFG to identify and begin the acquisition process for property meeting the criteria for a facility that will ensure propagation of up to 1 million sockeye salmon smolts.

The Action Agencies continued to fund hatchery conservation programs for Upper Columbia, Mid-Columbia, and Snake River steelhead to preserve and rebuild genetic resources and assist in promoting recovery of these ESUs. During 2008, BPA technical staff reviewed proposals and assisted with development of two new projects—one to recondition Upper Columbia River steelhead kelts and increase spawner abundance of this endangered DPS, and another project aimed at reintroducing Columbia River chum salmon in lower Columbia River tributaries below Bonneville Dam and increasing the abundance of this threatened ESU.

## Harvest

The overall harvest objective for all ESUs is to improve adult life-stage survival. Harvest of ESA-listed fish species in the Columbia River basin is managed primarily through state and federal agencies—other than the Action Agencies—and tribes. However, the Action Agencies have supported the identification and implementation of approaches or conservation measures to reduce the effects of harvest on ESA-listed species. In 2008, the Action Agencies funded the initial evaluation of several types of live-capture fishing gear that can be used to selectively harvest marked hatchery fish while allowing ESA-listed wild fish to escape unharmed.

## Research, Monitoring, and Evaluation

The Action Agencies implement an extensive research, monitoring, and evaluation (RME) program that focuses on maximizing performance of management actions. The RME program is implemented through the Northwest Power and Conservation Council's Fish and Wildlife Program, the Corps' Anadromous Fish Evaluation Program, and Reclamation's technical assistance activities, and it is coordinated with RME activities of other regional agencies. The Action Agencies work closely with the Pacific Northwest Aquatic Monitoring Partnership (PNAMP) – a forum for coordinating state, federal, and tribal aquatic habitat and ESA-listed salmon and steelhead monitoring programs to collaboratively advance a regionally coordinated approach to fish and habitat monitoring, action effectiveness research, and data management.

In 2008, programmatic performance was tracked through project implementation and compliance monitoring, while biological and environmental performance was tracked and evaluated through status monitoring, action effectiveness research, and critical uncertainty research. Performance standards were monitored to ensure accountability and adherence to proposed actions.



*Adult Salmon Staging Prior to Spawning.*

The Action Agencies implemented RME projects within nine strategic areas:

- Fish population status monitoring
- Hydro RME
- Tributary habitat RME
- Estuary and ocean RME
- Harvest RME
- Hatchery RME
- Predation and invasive species management RME
- Coordination and data management
- Project implementation and compliance monitoring

### Fish Population Status Monitoring

For fish population status monitoring, the Action Agencies continued to monitor the status of ESA-listed fish and enhance the existing status monitoring performed by regional fish management agencies. Fish population status monitoring was a key component of intensively monitored watersheds (IMW) in the Wenatchee, Methow, Entiat, Okanogan, Lemhi, South Fork Salmon, Yakima, and John Day subbasins. Supplemental fish population status information was also obtained through multiple hatchery and habitat

effectiveness research and monitoring projects throughout the Columbia Basin. The Action Agencies continued extensive status monitoring of adult and juvenile migration through the hydrosystem and provided ongoing support for a regional PIT tag information system. More than 90 percent of Action Agency funded hatchery fish were marked to enable tracking of hatchery-origin fish on the spawning grounds.

### Hydro RME

Hydro RME studies were conducted on the juvenile fish transportation program, turbine survival, water temperature, and juvenile and adult dam passage survival and passage efficiency. The Action Agencies expanded coverage in detecting PIT-tagged fish and improved the ability to evaluate new and alternative fish passage operations and technologies.

### Tributary Habitat RME

Tributary habitat RME studies were conducted to identify habitat conditions and limiting factors in pilot IMW areas, and to quantify the relationships between habitat conditions and fish productivity. This information is being used to develop

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and parameterize models used to plan and implement habitat actions and assess expected survival benefits of habitat actions.

### **Estuary and Ocean RME**

Estuary and ocean RME studies were conducted to evaluate fish performance and life history diversity relative to various habitat areas and key environmental attributes. The bathymetry and topography of the estuary continued to be mapped, and work was implemented to establish a habitat classification system and index of habitat connectivity. The effects of individual habitat actions were assessed and a methodology for estimating the cumulative effects of habitat projects was further developed. Critical uncertainty research was conducted on the importance of different tidal freshwater, estuary, plume, and nearshore ocean environments, and development of a hydrodynamic numerical model to evaluate contemporary and future habitat changes caused by climatic and anthropogenic effects and to describe the temporal and spatial features of the Columbia River estuary and plume that are important for salmon in relation to ocean conditions. Early ocean migration and survival studies continued to be implemented and refined.

### **Harvest RME**

Harvest RME investigations linked to FCRPS interests included feasibility studies for Zone 6 harvest PIT-tag recoveries to help refine upstream adult survival rates. Selective fishing methods and gear were evaluated. Support was continued for coded-wire tagging and recovery operations needed to assess the survival, straying, and harvest rates of specific hatchery fish stocks. Further work was advanced on genetic stock identification techniques.

### **Hatchery RME**

Hatchery RME studies were conducted to assess the effects that hatchery programs and implemented reform actions have on native populations. The relative reproductive success (RRS) of hatchery-origin fish compared to natural-origin fish continued to be assessed for several ESA-listed salmon and steelhead populations. Plans continued for expansion of the RRS work to other populations.

### **Predation and Invasive Species Management RME**

Predation RME studies were conducted to evaluate and monitor the Northern Pikeminnow Management Program, avian predation rates on juvenile salmon in the lower Columbia River, and predation rates

of California sea lions on adult salmon below Bonneville Dam. Management plans were further advanced for predator management, and studies on the effectiveness of predation management actions were implemented.

### **Coordination and Data Management, Project Implementation and Compliance Monitoring**

The Action Agencies continued to coordinate RME planning and implementation through the Corps' Anadromous Fish Enhancement Program and the project planning and review efforts of the Northwest Power and Conservation Council's (NPCC) Fish and Wildlife Program. Through the Action Agencies' participation and leadership in regional coordination forums, such as PNMAP and the Northwest Environmental Data Network, they continued their support for standardization and coordination of tagging and monitoring efforts and data management. Significant funding and staff support was provided for data system components that support the information management needs of all RME strategies.

# 2008 Accomplishments

| What are our goals and strategies?  | What are our key initiatives?   | What are our key accomplishments?  |
|---|---|--|
| <b>HYDROSYSTEM</b>  |   |  |
| <p>Increase the survival rates of fish passing through mainstem dams:</p> <ul style="list-style-type: none"> <li>• Configure dam facilities to improve juvenile and adult fish passage survival</li> <li>• Manage water to improve juvenile and adult fish survival</li> <li>• Operate and maintain fish passage facilities to improve fish survival</li> </ul> | <ul style="list-style-type: none"> <li>• Operate and maintain adult fish ladders and other fish facilities</li> <li>• Guide juvenile fish away from turbines</li> <li>• Improve passage routes through the dams for juvenile fish to achieve 96 percent dam survival for spring Chinook and steelhead and 93 percent dam survival for subyearling fall Chinook</li> <li>• Manage available water to improve conditions for migrating fish</li> <li>• Transport juvenile fish in barges or trucks past dams in a “spread-the-risk” approach</li> <li>• Track migrating fish with passive integrated transponder (PIT) detection systems</li> <li>• Implement kelt management and reconditioning to improve steelhead productivity</li> </ul>   | <ul style="list-style-type: none"> <li>• Water Management, Fish Passage, and Water Quality Plans completed and followed</li> <li>• 2008 testing at some dams shows where the performance standard (PS) may be met, partially met, or exceeded. The following actions were implemented to achieve PS: <ul style="list-style-type: none"> <li>- At Bonneville Dam, installed an improved behavioral guidance screen that increased the number of yearling Chinook passing through the corner collector (the route with the highest survival rate); implemented a new spill operation that substantially improved spillway survival for yearling and subyearling Chinook</li> <li>- At John Day Dam, operated and tested two new top spill weirs (TSW); turbine entrainment was reduced by 50 percent or more</li> <li>- At Ice Harbor Dam, concrete survival remained high for all three species. Relative survival estimates were equal or better than the BiOp performance standards under all operations.</li> <li>- At Lower Monumental Dam, installed and tested a new removable spillway weir (RSW) in 2008; survival via the RSW exceeded all other passage routes</li> <li>- Started construction of both an adjustable spillway weir at Little Goose Dam (installed early 2009) and a relocated outfall for juvenile bypass system at Little Goose Dam</li> <li>- Completed construction of flow deflectors on all 19 spillway bays at Chief Joseph</li> <li>- Replaced two of three gear shafts on the Ice Harbor fish ladder, which will improve hydraulic conditions for adult fish</li> </ul> </li> <li>• BPA funded CRITFC to prepare a Kelt Master Plan to help address reconditioning as part of the broader Kelt Management Plan</li> </ul> |
| <b>PREDATOR MANAGEMENT</b>  |   |  |
| <p>Reduce the number of juvenile fish consumed by predators:</p> <ul style="list-style-type: none"> <li>• Redistribute avian predators</li> <li>• Reduce fish predation</li> <li>• Manage sea lion predation</li> </ul>   | <ul style="list-style-type: none"> <li>• Provide alternative Caspian tern habitat in the Western Region to encourage redistribution (began in 2008, will complete around 2012)</li> <li>• Gradually reduce tern habitat in the Columbia River estuary, after alternative habitat is provided in other locations; reduce annual juvenile salmonid consumption by Caspian terns in the estuary to approximately 2.5 million fish</li> <li>• Provide incentives to reduce the number of large northern pikeminnow in the Columbia River</li> <li>• Address presence of sea lions below Bonneville Dam</li> <li>• Monitor predation by sea lions below Bonneville Dam</li> <li>• Initiate further baseline research and development of a future draft environmental impact statement to determine whether double-crested cormorant management is warranted</li> </ul> | <ul style="list-style-type: none"> <li>• Created 2.5 acres of alternative habitat for Caspian tern nesting at three locations in Oregon: Crump Lake, Fern Ridge, and Summer Lake</li> <li>• Continued baseline research and a feasibility study of potential management techniques to reduce cormorant predation on juvenile salmon in the Columbia River estuary</li> <li>• Began discussions with the U.S. Fish and Wildlife Service to develop an avian management plan for Corps-owned lands in the middle Columbia</li> <li>• Continued hazing of sea lions below Bonneville Dam and installed sea lion exclusion devices (SLEDs) at Bonneville Dam</li> <li>• Monitored sea lion abundance, predation, and distribution and the effectiveness of deterrent activities below Bonneville Dam</li> <li>• Removed more than 162,000 northern pikeminnow from the Columbia River in 2008; reduced their predation of juvenile salmon by about 38 percent since 1990</li> <li>• Increased northern pikeminnow tagging for evaluative purposes by more than 70 percent over previous years</li> </ul>   |

# 2008 Accomplishments

| What are our goals and strategies?   | What are our key initiatives?  | What are our key accomplishments?   |
|--|--|---|
| <b>HABITAT</b>   |  |   |
| <p>Improve tributary and/or estuary habitat used by salmon for spawning or rearing:</p> <ul style="list-style-type: none"> <li>• Protect and improve tributary habitat based on biological needs and prioritized actions</li> <li>• Improve juvenile and adult fish survival in estuary habitat</li> </ul> | <p><u>Tributary</u></p> <ul style="list-style-type: none"> <li>• Increase streamflow via water acquisitions</li> <li>• Address entrainment through screening</li> <li>• Provide fish passage and access</li> <li>• Improve mainstem and side-channel habitat conditions</li> <li>• Protect and enhance riparian conditions</li> </ul> <p><u>Estuary</u></p> <ul style="list-style-type: none"> <li>• Acquire, protect, and restore off-channel habitat</li> <li>• Restore tidal influence and improve hydrologic flushing</li> <li>• Restore floodplain reconnection by removing or breaching dikes or installing fish-friendly tide gates</li> <li>• Remove invasive plants and weeds; replant native vegetation</li> <li>• Protect and restore emergent wetland habitat and riparian forest habitat</li> <li>• Restore channel structure and function</li> <li>• Develop and implement a piling and pile dike removal program</li> </ul> | <p><u>Tributary</u></p> <ul style="list-style-type: none"> <li>• Secured 230 cubic feet per second (cfs) in additional streamflows throughout tributaries in the basin. The new transactions in 2008 totaled 37,937 acre-feet instream, with up to 92,482 acre-feet and 366 cfs instream in 2008 when combined with the flows from long-term transactions during 2003–2007.</li> <li>• Addressed fish entrainment in four locations</li> <li>• Improved or opened access to more than 260 miles of spawning and rearing habitat</li> <li>• Improved more than 170 acres of floodplain and wetland habitats, placed more than 300 instream structures, increased the complexity of almost 60 stream miles, and realigned, connected, or created about 44 acres of stream channels</li> <li>• Planted more than 600 acres of riparian vegetation, leased or purchased more than 9,500 acres of riparian habitat, and improved or relocated more than 35 miles of roads affecting riparian areas</li> </ul> <p><u>Estuary</u></p> <ul style="list-style-type: none"> <li>• Improved and restored 6 linear miles of stream/channels</li> <li>• Restored 60 acres of floodplain</li> <li>• Planted and maintained native vegetation for 285 acres</li> <li>• Removed invasive plant species from 303 acres</li> <li>• Restored 57 acres of riparian areas</li> <li>• Installed fencing for 5 miles</li> <li>• Funded acquisition of 380 acres of land for protection and/or restoration</li> </ul> |
| <b>HATCHERIES</b>  |  |   |
| <p>Use hatcheries to address the biological priorities of salmon:</p> <ul style="list-style-type: none"> <li>• Implement safety-net programs to avoid extinction</li> <li>• Reduce potentially harmful effects of artificial production</li> </ul>   | <ul style="list-style-type: none"> <li>• Intervene with artificial production techniques to avoid extinction of fish populations facing a high risk of extinction</li> <li>• Modify hatchery practices or facilities if needed</li> </ul>  | <ul style="list-style-type: none"> <li>• Funded safety-net hatchery programs that reduced the extinction risk of populations of Snake River sockeye, spring/summer Chinook, fall Chinook and steelhead, and Middle and Lower Columbia steelhead</li> <li>• Funded the final phase of draft Hatchery Genetic Management Plans. As these plans are reviewed and approved by NOAA Fisheries, they may be used to identify and prioritize facilities and practices for reform</li> </ul>  |

# 2008 Accomplishments

| What are our goals and strategies?   | What are our key initiatives?  | What are our key accomplishments?  |
|--|--|--|
| <b>RESEARCH, MONITORING AND EVALUATION</b>   |  |  |
| <p>Provide information needed to support planning and adaptive management and demonstrate accountability. The Action Agencies are undertaking RME through project implementation and compliance monitoring, status monitoring, action effectiveness research, and critical uncertainties research in nine strategic areas.</p> | <p>Implement RME in nine strategic areas:</p> <ul style="list-style-type: none"> <li>• Fish population status monitoring</li> <li>• Hydro RME</li> <li>• Tributary habitat RME</li> <li>• Estuary and ocean RME</li> <li>• Harvest RME</li> <li>• Hatchery RME</li> <li>• Predation and invasive species management RME</li> <li>• Coordination and data management</li> <li>• Project implementation and compliance monitoring</li> </ul> | <ul style="list-style-type: none"> <li>• Monitored status of selected fish populations related to FCRPS actions</li> <li>• Monitored and evaluated fish survival, migration characteristics, and river conditions within the FCRPS</li> <li>• Monitored and evaluated effects of configuration and operation of the FCRPS</li> <li>• Investigated critical uncertainties related to hydropower operations and investigated new technologies</li> <li>• Monitored and evaluated tributary habitat conditions and limiting factors and evaluated the effectiveness of tributary habitat actions</li> <li>• Monitored and evaluated estuary and nearshore ocean fish performance, migration characteristics, and environmental conditions</li> <li>• Monitored and evaluated the effects of habitat actions in the estuary</li> <li>• Investigated critical uncertainties related to the estuary and ocean</li> <li>• Implemented select harvest investigations linked to FCRPS interests</li> <li>• Monitored hatchery management effectiveness and investigated critical uncertainties related to hatcheries</li> <li>• Monitored and evaluated piscivorous, avian, and marine mammal predation and the effectiveness of management actions</li> <li>• Coordinated RME activities with other federal, state, and tribal agencies</li> <li>• Ensured that information is archived in appropriate data management systems</li> <li>• Monitored and evaluated implementation of Action Agency RPA actions</li> </ul> |

## Overview by Species

The following summaries primarily describe abundance and abundance trends at the species or ESU level. However, species-level status for the purposes of salmon recovery planning is determined based on a review of population-level status and includes consideration not just of abundance but also productivity, spatial structure, and diversity; these are known as the viable salmonid population (VSP) attributes or parameters. The following section includes a brief review of some of the population-level information in the 2008 FCRPS Biological Opinion, which contains a much more thorough review of the status of independent populations within each ESU. Figures 19 through 25 display natural spawners only (with the exception of sockeye populations, which are sustained through a captive broodstock program).<sup>8</sup> Population-level estimates of abundance and productivity have not been updated since the BiOp was issued.

### Snake River Fall Chinook Salmon

The Snake River fall Chinook salmon ESU was listed under the ESA as a threatened species in 1992. This ESU is composed of only one extant population, which spawns and rears in the mainstem Snake River and in the lower reaches of its major tributaries below Hells Canyon Dam. It is estimated that 85 percent of the ESU's historical spawning habitat was lost as a result of construction of the privately owned Hells Canyon dam complex, which blocks all fish passage.

The most recent 10-year average return of natural-origin fish (through 2007) is estimated to be 2,358 adults. The most recent 4-year average return is 2,521 adults. Estimates of natural-origin adult abundance are not yet available for 2008.

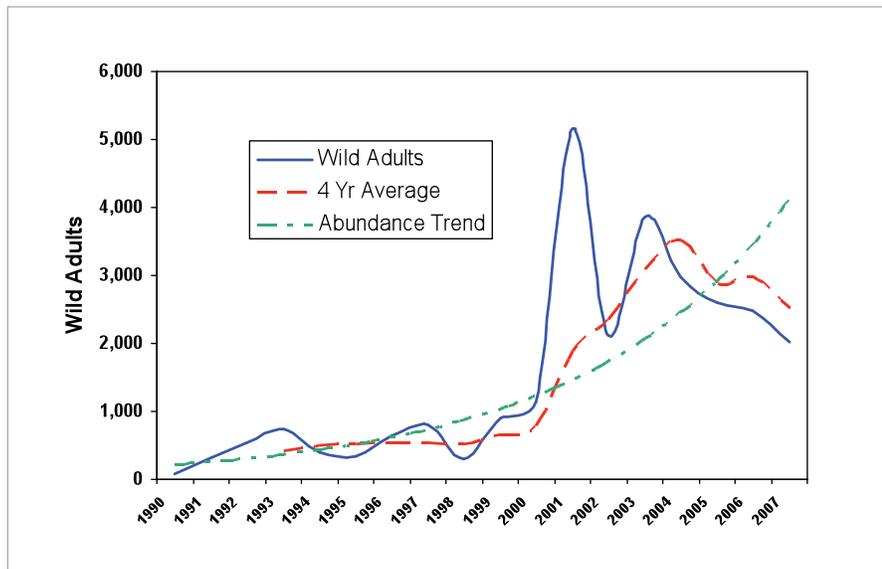


Figure 19. Returns of Naturally Produced Adult Snake River Fall Chinook Salmon.<sup>9</sup>

<sup>8</sup> A large percentage of each evolutionarily significant unit (ESU) is composed of hatchery fish, which are not displayed in the figures.

<sup>9</sup> Abundance charts in this report show ESU-level abundance from 1990 until the most recent available observation, consistent with the 2008 BiOp's "short-term" trend estimation period. Estimates are of naturally produced adult returns provided by NOAA Fisheries for all ESUs except Middle Columbia River steelhead.

Returns of natural-origin Snake River fall Chinook salmon have trended upward since 1990. The FCRPS Biological Opinion considered trends of natural-origin adults based on two time periods with differing management actions and climate: 1977-2004 and 1990-2004. Although abundance trends were positive for both periods, productivity measured as returns-per-spawner (R/S) were positive only for 1990-2004. These estimates represent average survivals during the periods in question and do not fully reflect survival improvements resulting from more recent hydrosystem and other management improvements,

### Snake River Spring/Summer Chinook

The Snake River spring/summer Chinook salmon ESU was listed under the ESA as a threatened species in 1992. The ESU is composed of 28 extant populations in five major population groups. The populations in this ESU spawn and rear in the tributaries of the Snake River between its confluence with the Columbia River and the Hells Canyon Dam.

The most recent 10-year average return of natural-origin Snake River spring/summer Chinook salmon was 18,156 adults. The most recent 4-year average return was 10,757 adults. An analysis of adult returns from 1990-2008 indicates that the ESU-level trend in abundance was positive during this period.

The FCRPS Biological Opinion considered population-level information based on adult returns from 1984-1986 through 2003-2005. Population-level abundance trends of natural-origin adults during this time period were generally positive. However, recruit-per-spawner productivity estimates were generally negative. These estimates represent average survivals during the periods in question and do not fully reflect survival improvements resulting from more recent hydrosystem and other management improvements.

Table 3 summarizes the tributary habitat metrics completed since 2005 with Action Agency support in areas used by Snake River spring/summer Chinook.

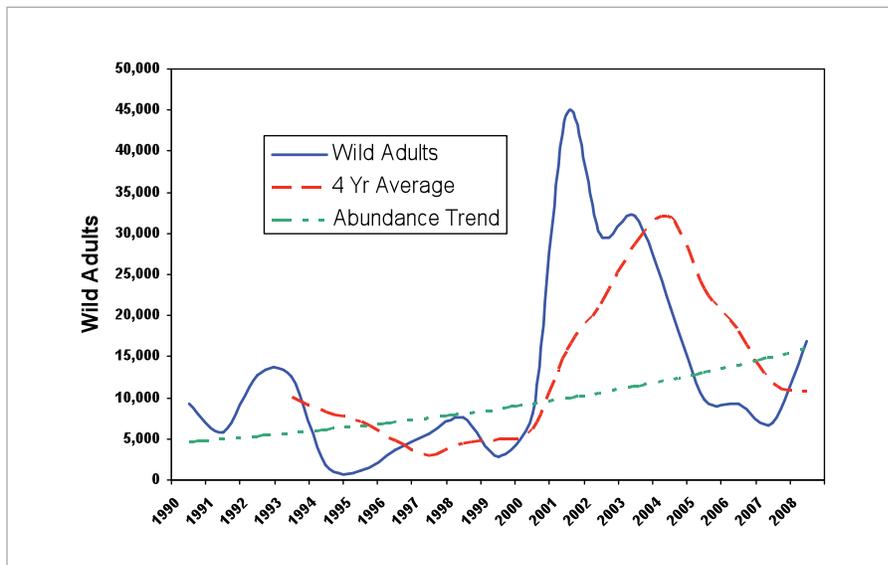
**Table 3. Snake River Spring-Summer Chinook Tributary Habitat Metrics, 2005-2008.**

| Metric  | 2008     | 2005-2008 |
|---|----------|-----------|
| Acre-feet/year of water protected             | 10,049.7 | 43,384    |
| Acres improved                                | 453.4    | 1,463.9   |
| Acres protected                               | 150.5    | 845.3     |
| Water flow protected (cfs)                    | 116      | 406.3     |
| Miles of enhanced or newly accessible habitat | 42.6     | 190.7     |
| Miles of improved stream complexity           | 2.78     | 9.11      |
| Miles protected                               | 7.73     | 32.09     |
| Screens installed or addressed                | 9        | 29        |

Source: See *Habitat Metrics by Fiscal Year report* available at <http://www.efw.bpa.gov/IntegratedFWP/reportcenter.aspx>. Metrics do not include upland areas.

### Snake River Sockeye Salmon ESU

The Snake River sockeye salmon ESU was listed under the ESA as endangered in 1991. The ESU includes all anadromous and residual sockeye in the Snake River basin, as well as the artificially propagated fish from the Redfish Lake Captive Broodstock Program. This species was thought by some to be functionally extinct at the time of its listing. It had suffered from significant long-term harvest pressures, a state-sponsored program to eradicate it from many of its natal lakes, private dams with little or no fish passage, the construction of the federal dams on the lower Snake River, and a major detrimental ocean/climate shift in the mid 1970s. An experimental captive broodstock program was initiated at the time of listing in an effort to forestall complete extinction in the near term. The program has achieved its original purpose and is now being expanded to help support recovery.



**Figure 20. Returns of Naturally Produced Adult Snake River Spring/Summer Chinook Salmon.**

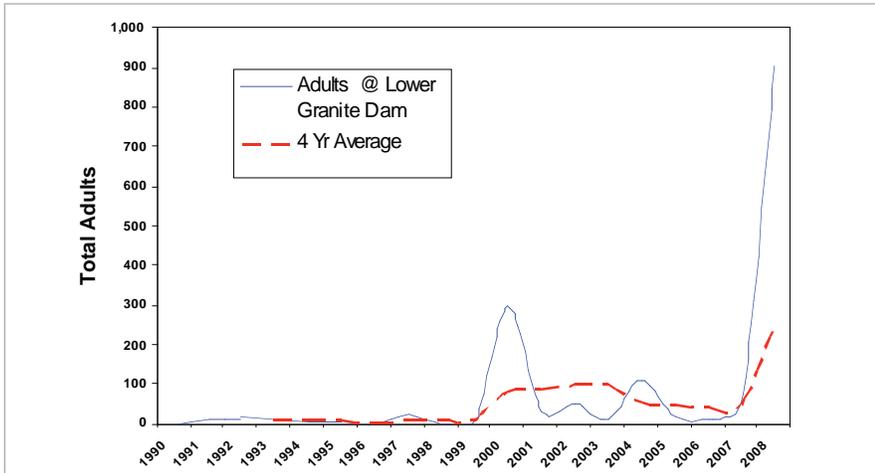
The average annual adult return from the captive broodstock program between 1991 and 1999 was 11 fish. The average return from 2004 to 2007 was 50 fish. The year 2008 saw an extraordinary return of 907 fish counted at Lower Granite Dam. This was the largest return since 1968. The Northwest Fisheries Science Center attributed the increased numbers to favorable ocean conditions and an increase in smolt releases from the captive broodstock program (*Factors Affecting Sockeye Salmon Returns to the Columbia River in 2008*, by NOAA-NWFSC, 2009).

### Snake River Steelhead DPS

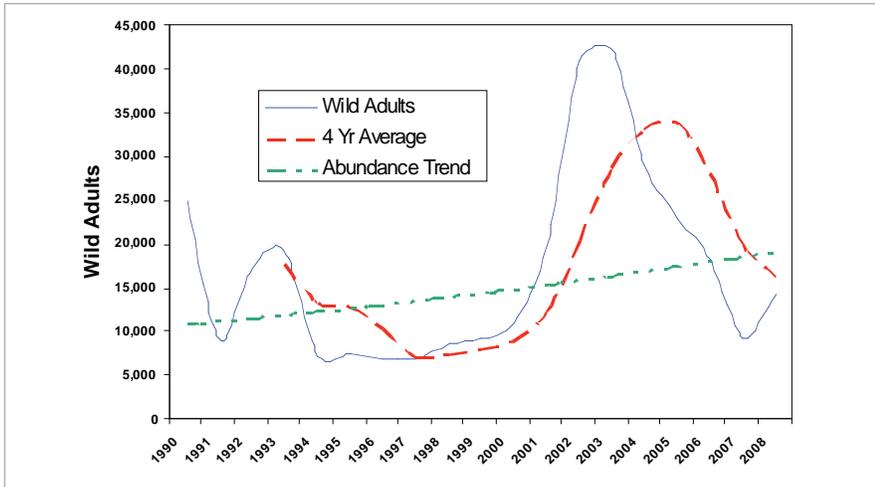
The Snake River steelhead distinct population segment (DPS) was listed as threatened in 1997. The DPS is composed of 24 individual populations in five major population groups. Inland steelhead of the Columbia River basin, and especially the Snake River DPS, are commonly referred to as either A-run or B-run. These designations are based on migration timing, age, and size at return. There is only marginal information regarding the status of most individual populations of Snake River steelhead, but it is believed that B-run steelhead spawn almost entirely in the Clearwater and Salmon rivers, while A-run steelhead occur throughout the Snake River basin.

The most recent 10-year average return of natural-origin Snake River steelhead was 21,834 adults (1999-2008). The most recent 4-year average return was 16,280 adults. An analysis of adult returns from 1990-2008 indicates that the DPS-level trend in abundance was positive during this period.

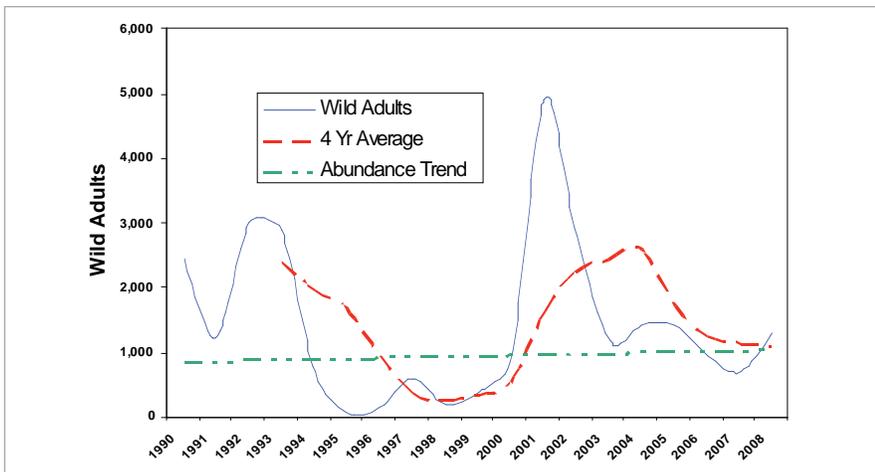
For most populations in this DPS, the 2008 FCRPS Biological Opinion applied "average" A-run and B-run population profiles, based on counts of returning adults at Lower Granite Dam. Based on these profiles, the BiOp concluded that most individual A-run populations in the DPS have trended upward since 1990, while B-run populations have not. Recruit-per-spawner productivity estimates have been positive for A-run populations generally over the 20-year period, but not for most B-run populations. These estimates represent average survivals during the periods in question and do not fully reflect survival improvements resulting from more recent hydrosystem and other management improvements.



**Figure 21. Returns of All Snake River Sockeye Salmon.**  
 Data from Columbia River DART (Data Access in Real Time): [http://www.cbr.washington.edu/dart/Snake\\_River\\_Steelhead\\_DPS](http://www.cbr.washington.edu/dart/Snake_River_Steelhead_DPS). Snake River sockeye salmon survival benefited in 2008 from hydro, habitat, predator control, hatchery, and harvest actions.



**Figure 22. Returns of Naturally Produced Adult Snake River Steelhead.**



**Figure 23. Returns of Naturally Produced Adult Upper Columbia River Spring Chinook Salmon.**

Table 4 summarizes the habitat measures completed since 2005 with Action Agency support in areas used by Snake River steelhead.

**Table 4. Snake River Steelhead Tributary Habitat Metrics, 2005-2008.**

| Metric  | 2008     | 2005-2008 |
|---|----------|-----------|
| Acre-feet/year of water protected             | 10,049.7 | 43,384    |
| Acres improved                                | 574.7    | 1,866.3   |
| Acres protected                               | 150.5    | 846.3     |
| Water flow protected (cfs)                    | 116      | 406.3     |
| Miles of enhanced or newly accessible habitat | 54.1     | 208.4     |
| Miles of improved stream complexity           | 4.18     | 39.01     |
| Miles protected                               | 7.73     | 32.19     |
| Screens installed or addressed                | 9        | 29        |

Source: See *Habitat Metrics by Fiscal Year* report available at <http://www.efw.bpa.gov/IntegratedFWP/reportcenter.aspx>. Metrics do not include upland areas.

**Upper Columbia River Spring Chinook Salmon**

The Upper Columbia spring Chinook salmon ESU was listed as endangered in 1999. The ESU consists of three extant populations in one major population group. These populations spawn and rear in the mainstem Columbia River and its tributaries between Rock Island Dam and Chief Joseph Dam (a barrier to upstream migration).

The most recent 10-year average return of natural-origin Upper Columbia River spring Chinook salmon was 1,612 adults (1999-2008). The most recent 4-year average return was 1,110 adults. An analysis of adult returns from 1990-2008 indicates that the ESU-level trend in abundance remained generally flat during this period.

The FCRPS Biological Opinion considered population-level information based on adult returns from 1984 through 2003. The BiOp concluded that 1990–2003 abundance trends for the Wenatchee River and Entiat River populations were generally stable, while the Methow River population saw a slight decline over that period. During the 1984-2003 base period analyzed in the BiOp, these populations failed to replace themselves. These estimates represented average survivals during the periods in question and do not fully reflect survival improvements resulting from more recent hydrosystem and other management improvements.

Table 5 summarizes the habitat measures completed since 2005 with Action Agency support in areas used by Upper Columbia River spring Chinook.

**Table 5. Upper Columbia River Spring Chinook Tributary Habitat Metrics, 2005-2008.**

| Metric  | 2008    | 2005-2008 |
|---|---------|-----------|
| Acre-feet/year of water protected             | 2,558.6 | 4,870.9   |
| Acres improved                                | 0.1     | 0.1       |
| Acres protected                               | 93      | 191.4     |
| Water flow protected (cfs)                    | 24.3    | 34.5      |
| Miles of enhanced or newly accessible habitat | 0       | 0.8       |
| Miles of improved stream complexity           | 0.1     | 0.1       |
| Miles protected                               | 0.47    | 2.22      |
| Screens installed or addressed                | 0       | 0         |

Source: See *Habitat Metrics by Fiscal Year* report available at <http://www.efw.bpa.gov/IntegratedFWP/reportcenter.aspx>. Metrics do not include upland areas.

**Upper Columbia River Steelhead**

The upper Columbia River steelhead DPS was listed as endangered in 1997 but was recently relisted as threatened. The DPS consists of four populations in one major population group. These populations spawn and rear in the rivers and tributaries draining the eastern slope of the Cascade Mountains upstream of Rock Island Dam.

The most recent 10-year average return of natural-origin Upper Columbia River steelhead was 2,669 adults (1998-2007). The most recent 4-year average return was 2,628 adults. An analysis of adult returns from 1990-2007 indicates that the ESU-level trend in abundance was positive during this period.

The FCRPS Biological Opinion considered population-level information based on adult returns from between 1985 or 1986 through 2004 or 2005, depending on the population. Hatchery returns have dominated natural spawning in all populations in this DPS. Historical broodstock protocols included the use of out-of-basin broodstock and extensive mixing of stocks from different populations within the DPS. This may be a major contributor to the poor productivity seen in these populations.

The BiOp concluded that short- and long-term abundance trends for all populations were positive. During the 20-year base period analyzed in the BiOp, these populations failed to replace themselves. The estimates represent average survivals during the periods in question and do not fully reflect survival improvements resulting from more recent hydrosystem and other management improvements.

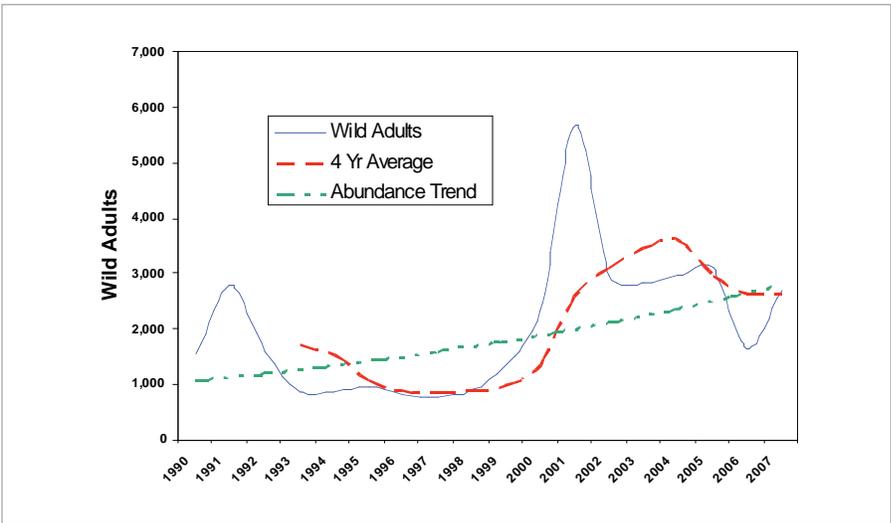


Figure 24. Returns of Naturally Produced Adult Upper Columbia River Steelhead.

Table 6 summarizes the habitat measures completed since 2005 with Action Agency support in areas used by Upper Columbia River steelhead.

**Table 6. Upper Columbia River Steelhead Tributary Habitat Metrics, 2005-2008.**

| Metric  | 2008    | 2005-2008 |
|---|---------|-----------|
| Acre-feet/year of water protected             | 3,251.6 | 6,263.9   |
| Acres improved                                | 22.6    | 23        |
| Acres protected                               | 193     | 291.4     |
| Water flow protected (cfs)                    | 49.3    | 84.5      |
| Miles of enhanced or newly accessible habitat | 0       | 0.8       |
| Miles of improved stream complexity           | 0.1     | 0.1       |
| Miles protected                               | 0.97    | 2.72      |
| Screens installed or addressed                | 0       | 0         |

Source: See *Habitat Metrics by Fiscal Year* report available at <http://www.efw.bpa.gov/IntegratedFWP/reportcenter.aspx>. Metrics do not include upland areas.

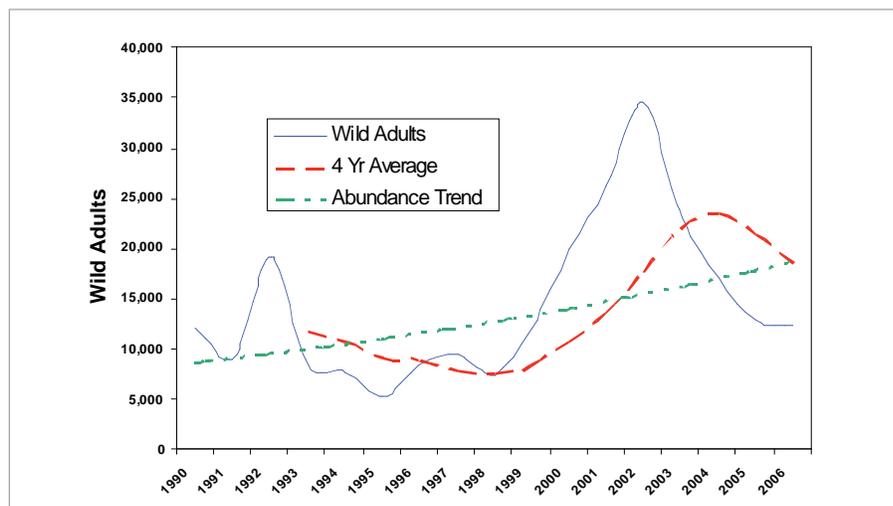
### Middle Columbia River Steelhead

The Middle Columbia River steelhead DPS was listed as threatened in 1999. The DPS is composed of 17 individual populations in four major population groups. These populations spawn in Oregon and Washington drainages upstream of the Hood River and Wind River systems up to and including the Yakima River basin. Almost all populations within this DPS are summer-run steelhead; the exceptions are the winter-run populations returning to the Klickitat and Fifteen Mile Creek watersheds.

The most recent 10-year average return of natural-origin Middle Columbia River steelhead was 17,201 adults (1996-2005). The most recent 4-year average return was 21,985 adults. An analysis of adult returns from 1990-2005 indicates that the ESU-level trend in abundance was positive during this period.

The 2008 FCRPS Biological Opinion considered population-level abundance estimates of natural-origin Middle Columbia River steelhead based on adult

returns through 2004 or 2005. Eleven of the 13 populations for which adequate information is available had a positive trend in abundance since 1990. Over the most recent 10 years, the average abundance of three populations has been more than the minimum level needed for recovery, as identified by the Interior Columbia Technical Recovery Team. However, over the 20 years considered in the BiOp (concluding with the adult returns for 2004 or 2005), only eight of those 13 populations had positive recruit-per-spawner productivity.



**Figure 25. Returns of Naturally Produced Adult Middle Columbia River Steelhead (DPS Composite).<sup>11</sup>**

Mid-Columbia steelhead survival benefited in 2008 from hydro, habitat, predator control, hatchery, and harvest actions.

Table 7 summarizes the habitat measures completed since 2005 with Action Agency support in areas used by Middle Columbia River steelhead.

**Table 7. Middle Columbia Steelhead Tributary Habitat Metrics, 2005-2008.**

| Metric  | 2008    | 2005-2008 |
|---|---------|-----------|
| Acre-feet/year of water protected             | 1,638.3 | 17,592.1  |
| Acres improved                                | 691.6   | 2,221.6   |
| Acres protected                               | 9,472.4 | 11,831.3  |
| Water flow protected (cfs)                    | 8.2     | 111       |
| Miles of enhanced or newly accessible habitat | 219.3   | 366.85    |
| Miles of improved stream complexity           | 41.5    | 51.04     |
| Miles protected                               | 169.13  | 464.39    |
| Screens installed or addressed                | 37      | 112       |

Source: See *Habitat Metrics by Fiscal Year* report available at <http://www.efw.bpa.gov/IntegratedFWP/reportcenter.aspx>. Metrics do not include upland areas.

### Lower Columbia and Willamette River ESUs

These ESUs are currently threatened by a broad array of habitat and other environmental factors. Because they largely do not migrate through the federal dams on the Columbia and lower Snake rivers, the proposed operation of the Columbia/Snake projects of the FCRPS has a limited impact on these populations and there is limited potential to improve their status with improvements to these dams. The Action Agencies will provide an update on the status of these ESUs as part of the Comprehensive Evaluations called for in 2013 and 2016.

<sup>11</sup> The DPS estimate is based on a composite of multiple data sources compiled by Fisher Fisheries.

# 2008 Adaptive Management Summary

The FCRPS BiOp is premised on adaptive management and accountability for results. The Action Agencies use the best available scientific information to achieve performance standards and make needed adjustments so that actions meet the BiOp goals. Based on 2008 research and implementation, the Action Agencies have developed questions and identified issues that affect BiOp implementation. This information will be used to inform future actions and the 2010-2012 Implementation Plan under development now.

## For hydropower mitigation,

the Action Agencies have observed the following:

- Dam modifications and spill/surface passage improvements appear to be on track to achieve the hydrosystem performance standards of 96 and 93 percent average dam survival for spring and summer migrating fish, respectively.
  - The Configuration and Operational Plan for Ice Harbor Dam was not finalized by the end of 2008. However, current improvements appear to be on track to achieve performance standards at the dam.
  - Unusually high debris loading at Bonneville Dam during the spring of 2008 that required the turbine intake screens to be removed, which may have led to reduced in-river survival of yearling Chinook, is not expected to reoccur with a frequency that would require adaptive changes to the operation. Reduced survival at John Day Dam in the summer of 2008 as a result of predation will be addressed by increasing hazing activities, increasing the coverage of avian deterrent wires, and installing a new spillway deflector, which will allow more flexibility in spill operations.
  - New installation and operation in 2008 of surface passage at Lower Monumental and McNary dams are already on track for achievement of hydro performance standards.
- Studies in 2008 confirmed that each dam presents unique circumstances and passage routes that must be considered to provide optimum passage and meet performance standards. Increased dam survival is not always associated with increased spill

volumes. The relationship between dam survival, spill passage efficiency, and passage delay at individual dams will continue to be a focus in future years.

- Surface passage structures often pass a greater number of fish with a lesser volume of water than do other passage routes. Surface passage allows migrants to pass at depths where juveniles naturally migrate and oftentimes reduces forebay delay. Snake River surface passage improvements are nearly complete, after which the focus in future years will shift toward the lower river dams, particularly McNary, John Day, and The Dalles.
- Optimizing project operations to provide good passage for juveniles while not impacting adult upstream passage is critical. In previous years, adult passage studies have shown increased fallback and lower escapement rates under higher spill levels.
- COMPASS modeling predictions/ performance metrics for in-river survival in 2008 were generally met. Although point estimates for in-river survival were somewhat lower than what the COMPASS model predicted, they fell within the expected confidence range. This difference may be explained by the unusual high debris issue at Bonneville Dam, as noted above.
- Adult return data continue to confirm that May transportation provides higher adult returns than in-river migration for steelhead, and somewhat higher returns for Chinook. Nevertheless, under adaptive management (as discussed with the Regional Implementation Oversight Group), the Action Agencies are continuing to spill during this time period and monitoring the adult return data to see whether this relationship changes based on improved in-river conditions.
  - However, a 2008 report by NOAA suggests that, from McNary Dam, transported and in-river migrants realize similar survival to the returning adult stage.
  - Preliminary results in a report by Kintama Research suggest that there are no significant differences in the survival of transported and in-river migrants during the estuarine and nearshore marine portions of the Chinook life cycle. Additional information will be collected to better access survival rate.

- Pursuant to court-ordered operations, spill was continued through August 31, 2008, regardless of the 300-fish trigger in the BiOp. However, that trigger would have resulted in spill through August 30 in 2008 in any case. The range of dates observed in recent years for this trigger has been August 1 to August 30.

**For habitat mitigation,** the Action Agencies have observed the following:

- The habitat program structure, which consists of biologically targeted projects, assessment of habitat quality improvements, use of expert panels, and independent scientific review, is under way and overall functioning well.
  - Projects were implemented that improved habitat quality in 2008, and many new projects are ramping up for future implementation.
  - Several estuary projects were successfully completed in 2008. A few are behind schedule but are scheduled for completion in 2009. Many new estuary projects are under development for completion in 2009-2010.
  - Timely environmental review for habitat projects, including ESA review, has emerged as a concern. The Action Agencies will be exploring a streamlined process for ESA compliance with state and federal agencies.
- Tangible habitat benefits are being achieved by specific projects. For example:
  - Year-round flow was returned to previously dry sections of a Pahsimeroi River tributary, and in September 2008, Idaho Department of Fish and Game biologists counted two Chinook "redds," or nests. Adding water to a dry section of stream added prime spawning ground and provided almost immediate fish benefits.
  - Fixes to passage barriers in the Methow River resulted in recolonization of upstream habitat by spawners of listed fish; however, significant straying of hatchery adult steelhead into the recolonized tributary study areas also occurred.
  - For tributary habitat, Intensively Monitored Watershed (IMW) monitoring is under way to confirm survival improvement benefits. This represents a cutting-edge approach to

research and monitoring and also has potential in monitoring climate change conditions.

- For estuary and ocean habitat, the Juvenile Salmonid Acoustic Tag (JSAT) and Pacific Ocean Survival Tracking (POST) projects are tracking juvenile salmon survival and location. Although exact results varied, preliminary results indicate that mortality is significantly higher in the estuarine and marine phases of the salmonid life cycle than in the freshwater phase.

**For predator management,** the Action Agencies have observed the following:

- Predation has emerged as a serious issue for the survival of both juvenile and adult salmon and steelhead. Future management actions must focus on controlling predation by native and non-native species.
- Predation by Caspian terns on juvenile fish continues to suggest that successfully relocating much of the tern nesting colony away from East Sand Island, where fish are most vulnerable to predation, will reduce mortality of juvenile salmonids. Diet studies have shown that steelhead smolts appear to be particularly vulnerable to predation, especially by Caspian terns.
- However, total avian predation on young fish has increased as a result of a nearly threefold expansion of a colony of double-crested cormorants on East Sand Island and predation by terns and cormorants from other colonies (Crescent Island, Rock Island, Foundation Island, etc.).
- Successful management of avian predation must be based on a broader framework, both in terms of the geographical area covered and the community of all potential avian predators present within that area.
- Predation by northern pikeminnow is being successfully controlled, with significant

survival benefits. Examination of predation by non-native species, such as shad, walleye, and bass, is under way. Management of non-native species predation may conflict with state management of exotic warm-water game species (walleye, largemouth and smallmouth bass, Northern pike, catfish, etc.) for sport fisheries.

- The amount of fish eaten by sea lions continued to increase in 2008, with an expanded catch estimate of 4,466 adult salmon and steelhead. Efforts by the states to remove sea lions is expected to help reduce growing marine mammal predation on returning adult fish.

**For hatchery mitigation,** the Action Agencies have observed the following:

- The majority of listed fish are still hatchery-based, and this balance between hatchery and wild fish is expected to continue for at least the next decade.
- The Snake River sockeye captive broodstock and conservation/supplementation program returned high numbers of adult fish in 2008. This indicates that we have potentially moved from handfuls of adult fish on the brink of extinction to a more stable base for this program, which will be expanded in future years under the BiOp.
- In contrast to the sockeye captive broodstock program, the captive broodstock program for spring Chinook in the Tucannon River continues to have disappointing results and has been unsuccessful in achieving its adult return goals.
- The Hatchery Scientific Review Group process under way in 2008 has developed useful guidelines for hatchery reforms, although each hatchery facility will have to be considered case by case.
- Studies of Hood River steelhead using DNA-based genetic parentage analysis showed that hatchery fish produced fewer

adult offspring per parent than wild fish (demonstrating low relative reproductive success, or RRS) but that supplementation hatchery fish from local, wild broodstock produced larger numbers of offspring than traditional hatchery fish from non-local, multi-generation hatchery broodstock.

- Repeat-spawning wild-born female steelhead were seen to double their reproductive success by spawning a second time. This suggests that kelt reconditioning may represent a valuable resource for buffering local populations and reducing the risk of local extinction or loss of genetic diversity.

**For harvest,** the Action Agencies have observed the following:

- In the Colville selective fisheries study, the immediate release survival of summer/fall Chinook and steelhead was assessed for three gear types. Mortality was lowest for fish captured in the purse and beach seines (100 and 99 percent immediate release survival, respectively), compared to traditional hoop, dip, and tangle nets, which had only an 80 percent immediate release survival.

**Regarding fish status,** the Action Agencies have observed the following:

- Adult fish returns in 2008 were good, with counts of adult and jack summer Chinook, fall Chinook, and sockeye passing Bonneville Dam all exceeding the 10-year average and spring Chinook, steelhead, and coho counts being below the 10-year average. This is likely a result of both the survival improvements made in recent years and excellent ocean conditions. It is not likely that current levels will be sustained, and future variability is expected. We will be looking for overall trends that are stable and increasing at the species level.

# Working with the Region

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Regional efforts to protect and recover threatened and endangered fish in the Columbia River basin are comprehensive and reflect the complex life cycles of the fish themselves. Progress has been made each year by building step by step on each preceding year's successful effort. It will take many years to rebuild sustainable populations of some species.

The Action Agencies work with regional interests to improve regional coordination and collaboration, and to implement actions to strengthen Columbia River basin salmon and steelhead stocks. Tribal, state, and federal agency representatives are jointly looking at options for a better way to stabilize salmon and steelhead populations in the Columbia River basin and bring these fish back to sustainable levels. The Action Agencies work closely with the region through the federal-state-tribal Regional Implementation Oversight Group (RIOG), the Columbia Basin Fish Accords, and Northwest Power and Conservation Council Fish and Wildlife Program.

## Regional Implementation Oversight Group for RPA Implementation

In 2008, the RIOG was established to provide high-level policy review for the Columbia River basin—to discuss and coordinate implementation of the FCRPS and related BiOps. The RIOG is the successor to the Policy Working Group formed in 2005 to address court concerns and collaborate on development of the BiOp. The RIOG involves federal,

state, and tribal agencies actively engaged in salmon recovery efforts. The group reviews the Action Agencies' progress reports under the BiOp, considers adaptive management decisions based on emerging scientific information, evaluates contingency plans, and helps to resolve policy and technical disputes. The group encourages collaboration, accountability, and transparency for BiOp implementation. The RIOG structure includes technical subgroups for each H (e.g., the Technical Management Team or TMT) in order to support regional review.

## Columbia Basin Fish Accords in Support of RPA Implementation

In 2008, the Action Agencies entered into the Columbia Basin Fish Accords with the Confederated Tribes of the Warm Springs Reservation of Oregon (Warm Springs), the Confederated Tribes of the Umatilla Indian Reservation (Umatillas), the Confederated Tribes and Bands of the Yakama Nation (Yakama Nation), the Columbia River Inter-Tribal Fish Commission (CRITFC), the Confederated Tribes of the Colville Indian Reservation (Colvilles), the Shoshone-Bannock Tribes of Fort Hall, and the States of Idaho and Montana. (In addition, in 2009, the Action Agencies entered into an Estuary Habitat Memorandum of Agreement with the State of Washington.) These historical, long-term agreements are intended to support and strengthen RPA implementation, foster cooperation and partnership, and advance fish recovery for

all. These partnerships help accomplish "on-the-ground" implementation of actions that are beneficial to listed fish.

During 2008, tribal, state, and federal partners launched new projects and expanded existing projects under the Columbia Basin Fish Accords. Projects under way include improvements in passage and assurance of sufficient water for the Walla Walla River's salmon populations, recovery of sockeye runs in Redfish Lake, installation of lamprey passage systems at Bonneville Dam, and numerous other projects designed to restore critical habitat from the estuary to the tributaries.

## Northwest Power and Conservation Council Fish and Wildlife Program

Under the Northwest Power Act, the Northwest Power and Conservation Council works to protect, mitigate, and enhance Columbia Basin fish and wildlife and their related spawning grounds and habitat that have been affected by hydropower development. The Council's Columbia Basin Fish and Wildlife Program guides BPA's funding and must be taken into account by all federal agencies that manage, operate, or regulate hydropower dams in the basin. During 2007 and 2008, the Council reviewed and updated its program as required under the Northwest Power Act. The Council's amended program (finalized in 2009) can be found at <http://www.nwpc.org/library/2009/2009-02.htm>.

## Conclusion

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In 2008, as the result of a multi-year collaboration process, the Action Agencies began implementing the 2008 FCRPS BiOps. This progress report summarizes our first year of implementation. Major dam improvements occurred, acres of habitat were improved, predators were controlled, and fish status was good overall. Working with our regional partners, the Action Agencies will build on these accomplishments in the years ahead.

### For More Information on Regional Efforts:

- Pacific Coastal Salmon Recovery Fund: [www.nwr.noaa.gov/Salmon-Recovery-Planning/PCSRF/](http://www.nwr.noaa.gov/Salmon-Recovery-Planning/PCSRF/)
- Columbia River Inter-Tribal Fish Commission: [www.critfc.org](http://www.critfc.org)
- Upper Columbia United Tribes: [www.ucut.org](http://www.ucut.org)
- Columbia Basin Fish and Wildlife Authority: [www.cbfga.org](http://www.cbfga.org)
- Northwest Power and Conservation Council: [www.nwcouncil.org](http://www.nwcouncil.org)
- Oregon Watershed Enhancement Board: [www.oregon.gov/OWEB/index.shtml](http://www.oregon.gov/OWEB/index.shtml)
- Washington Salmon Recovery Office: [www.governor.wa.gov/gdro/default.htm](http://www.governor.wa.gov/gdro/default.htm)
- Idaho Office of Species Conservation: [www.species.idaho.gov](http://www.species.idaho.gov)
- *Federal Columbia River Power System 2008 Annual Report*, website links, and more information on federal agency efforts for salmon and steelhead: [www.salmonrecovery.gov](http://www.salmonrecovery.gov)



*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><b>Implementation Plans</b><br/> <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&amp;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><b>Annual Progress Reports</b><br/> <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>   |

## Adaptive Management Actions

| RPA No. | Action Description  | 2008 Actions and Accomplishments                    |
|---------|---|---|
|         | <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&amp;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><b><i>Comprehensive RPA Evaluations</i></b><br/> <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

| RPA No.   | Action Description   | 2008 Actions/Accomplishments   |
|---|--|--|
| <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"> <li>▪ Hydropower Strategy 1—Operate the FCRPS to provide flows and water quality to improve juvenile and adult fish survival</li> <li>▪ Hydropower Strategy 2—Modify Columbia and Snake River dams to maximize juvenile and adult fish survival</li> <li>▪ Hydropower Strategy 3—Implement spill and juvenile transportation improvements at Columbia River and Snake River dams</li> <li>▪ Hydropower Strategy 4—Operate and maintain facilities at Corps mainstem projects to maintain biological performance</li> </ul> <p><b>Each strategy consists of one or more specific actions. These are summarized in the following sections.</b></p> |  |  |
| <p><b>Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival</b></p>  |  |  |
| 4   | <p><b><i>Storage Project Operations</i></b><br/> <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> |

## Hydro Actions

| RPA No.   | Action Description   | 2008 Actions/Accomplishments   |
|---|--|--|
| <b>Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival</b> |  |  |
| 5   | <p><b>Lower Columbia and Snake River Operations</b><br/> <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"> <li>■ <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></li> <li>■ <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></li> <li>■ <i>These run-of-river operations will be included in the annual WMP.</i></li> </ul> | <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> |

## Hydro Actions

| RPA No.   | Action Description   | 2008 Actions/Accomplishments   |
|---|--|--|
| <b>Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival</b> |  |  |
| 6   | <p><b><i>In-Season Water Management</i></b><br/> <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 <a href="http://www.nwd-wc.usace.army.mil/tmt/documents/wmp/2008/final/">http://www.nwd-wc.usace.army.mil/tmt/documents/wmp/2008/final/</a></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><b><i>Forecasting and Climate Change/Variability</i></b><br/> <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> |

## Hydro Actions

| RPA No.  | Action Description  | 2008 Actions/Accomplishments   |
|--|---|--|
| <p><b>Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival</b></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>  |  |
| 8  | <p><b>Operational Emergencies</b><br/> <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>  |
| 9  | <p><b>Fish Emergencies</b><br/> <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> |
| 10   | <p><b>Columbia River Treaty Storage</b><br/> <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"> <li>▪ <i>Providing the greatest flexibility possible for releasing water to benefit U.S. fisheries May through July.</i></li> <li>▪ <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></li> </ul>   | <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>   |

## Hydro Actions

| RPA No.   | Action Description  | 2008 Actions/Accomplishments  |
|---|---|---|
| <b>Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival</b> |   |   |
|   | <ul style="list-style-type: none"> <li>▪ <i>Releasing flow augmentation storage to avoid causing damaging flow or excessive TDG in the United States or Canada.</i></li> </ul>  | 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><b>Non-Treaty Storage (NTS)</b><br/> <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><b>Non-Treaty Long-Term Agreement</b><br/> <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"> <li>▪ Substantially refilling the U.S. account</li> <li>▪ The dry year strategy work group defining potential use of non-treaty storage in dry years</li> <li>▪ Coordinating with federal agencies, states, and tribes under the BiOp</li> <li>▪ Coordination with tribes under the Fish Accords</li> <li>▪ Establishing the collective U.S. interests in terms of such a new NTS agreement</li> </ul> |
|   | <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.   |

## Hydro Actions

| RPA No.   | Action Description  | 2008 Actions/Accomplishments   |
|---|---|--|
| <b>Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival</b> |   |  |
| 13  | <p><i>Non-Treaty Coordination with Federal Agencies, States, and Tribes</i><br/>           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><b>Dry Water Year Operations</b><br/>           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"> <li>▪ 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.</li> <li>▪ 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.</li> <li>▪ 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.</li> </ul> | <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> |

## Hydro Actions

| RPA No.   | Action Description   | 2008 Actions/Accomplishments  |
|---|--|---|
| <b>Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival</b> |  |   |
|   | <ul style="list-style-type: none"> <li>▪ <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></li> <li>▪ <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></li> </ul>  | <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"> <li>▪ <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></li> </ul>   | <p>No action; water year 2008 did not meet the definition of a dry year.</p>  |
|   | <ul style="list-style-type: none"> <li>▪ <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></li> </ul>  | <p>No action; water year 2008 did not meet the definition of a dry year.</p>  |
| 15  | <p><b>Water Quality Plan for Total Dissolved Gas and Water Temperature in the Mainstem Columbia and Snake Rivers</b></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> |

## Hydro Actions

| RPA No.   | Action Description  | 2008 Actions/Accomplishments   |
|---|---|--|
| <b>Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival</b> |   |  |
|   | <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"> <li>▪ <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></li> </ul>   | <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>  |
| 16  | <p><b>Tributary Projects</b><br/> <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> |

## Hydro Actions

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|---|---|---|
| <b>Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival</b> |   |   |
|   |   | Reclamation worked on a Tualatin BA in 2008 for submission to NOAA in 2009.   |
| 17  | <p><b><i>Chum Spawning Flows</i></b><br/> <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"> <li>▪ <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></li> <li>▪ <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></li> <li>▪ <i>Make adjustments to the tailwater elevation through the TMT process consistent with the size of the spawning population and water supply forecasts.</i></li> <li>▪ <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></li> </ul> | <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 <a href="http://www.nwd-wc.usace.army.mil/tmt/agendas/2007/">http://www.nwd-wc.usace.army.mil/tmt/agendas/2007/</a>. 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 <a href="http://www.nwd-wc.usace.army.mil/tmt/">http://www.nwd-wc.usace.army.mil/tmt/</a></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 <a href="http://www.nwd-wc.usace.army.mil/tmt/agendas/2007/">http://www.nwd-wc.usace.army.mil/tmt/agendas/2007/</a></p> |

## Hydro Actions

| RPA No.   | Action Description   | 2008 Actions/Accomplishments  |
|---|--|---|
| <b>Hydropower Strategy 1—Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival</b> |  |   |
|   | <ul style="list-style-type: none"> <li>▪ <i>If the emergence period extends beyond April 10<sup>th</sup> 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></li> </ul> | <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 <a href="http://www.nwd-wc.usace.army.mil/tmt/agendas/2008/0409min.pdf">http://www.nwd-wc.usace.army.mil/tmt/agendas/2008/0409min.pdf</a></p>        |
|   | <ul style="list-style-type: none"> <li>▪ <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></li> </ul>  | <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 <a href="http://www.nwd-wc.usace.army.mil/tmt/">http://www.nwd-wc.usace.army.mil/tmt/</a></p> |

## Hydro Actions

| RPA No.  | Action Description  | 2008 Actions/Accomplishments  |
|--|---|---|
| <p><b>Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival<sup>1</sup></b></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><b>Configuration and Operational Plan for Bonneville Project</b><br/> <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>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><i>Bonneville Powerhouse I</i></p> <ul style="list-style-type: none"> <li>▪ <i>Sluiceway modifications to optimize surface flow outlet to improve fish passage efficiency (FPE) and reduce forebay delay (2009).</i></li> </ul>  | <p>Contract for initial work awarded late 2008. Automated sluice gates to be installed 2009. Sluiceway divider wall to be removed by 2010.</p>  |
|  | <ul style="list-style-type: none"> <li>▪ <i>Minimum-gap turbine runner installation to improve survival of fish passing through turbines (2009)</i></li> </ul>  | <p>Turbine rehab continued in 2008, with completion of Unit 8. Final two units to be completed in 2009.</p>   |
|  | <p><i>Bonneville Powerhouse II</i></p> <ul style="list-style-type: none"> <li>▪ <i>Screened bypass system modification to improve fish guidance efficiency (FGE) and reduce gatewell residence time (2008)</i></li> </ul>   | <p>Work complete in 2008. Investigating potential problems with injuries in gatewells.</p>  |
|  | <ul style="list-style-type: none"> <li>▪ <i>Shallow BGS installation to increase Corner Collector efficiency and reduce forebay delay (prototype 2008)</i></li> </ul>   | <p>Behavioral guidance screen (BGS) installed and tested. Second year of testing planned for 2009.</p>  |

<sup>1</sup> Dates shown are scheduled planning dates for completion.

## Hydro Actions

| RPA No.  | Action Description  | 2008 Actions/Accomplishments   |
|--|---|--|
| <p><b>Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival<sup>1</sup></b></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><br/> <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><b>Configuration and Operational Plan for The Dalles Project</b><br/> <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"> <li>▪ <i>Turbine operation optimization to improve overall dam survival (2011)</i></li> <li>▪ <i>Extended tailrace spill wall to increase direct and indirect survival of spillway passed fish (2010)</i></li> </ul> <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><b>Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival<sup>1</sup></b></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><b>Configuration and Operational Plan for John Day Project</b><br/> <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"> <li>▪ <i>Full-flow bypass and PIT-tag detection installation to reduce handling stress of bypassed fish (2007)</i></li> <li>▪ <i>Turbine operation optimization to improve overall dam survival (2011)</i></li> <li>▪ <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></li> </ul> <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><b>Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival<sup>1</sup></b></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><b>Configuration and Operational Plan for McNary Project</b><br/> <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>■ <i>Turbine operation optimization to improve survival of fish passing through turbines (2013)</i></li> <li>■ <i>Improve debris management to reduce injury of bypass and turbine passed fish (2011)</i></li> <li>■ <i>Relocate juvenile bypass outfall to improve egress, direct, and indirect survival on bypassed fish (2011)</i></li> </ul> <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><b>Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival<sup>1</sup></b></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><b><i>Configuration and Operational Plan for Ice Harbor Project</i></b><br/> <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>■ <i>Guidance screen modification to improve FGE (2010)</i></li> <li>■ <i>Turbine operation optimization to improve survival of turbine passed fish (2011)</i></li> <li>■ <i>Spillway chute and/or deflector modification to reduce injury and improve survival of spillway passed fish through the RSW (2009)</i></li> </ul> | <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><b>Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival<sup>1</sup></b></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"> <li>▪ <i>Turbine unit 2 replacement to improve the survival of fish passing through turbines and reduce oil spill potential (2012)</i></li> </ul> <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><b>Configuration and Operational Plan for Lower Monumental Project</b></p> <p><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"> <li>▪ <i>Primary bypass operations with PIT-tag detection installation to reduce handling stress of bypassed fish (2007)</i></li> <li>▪ <i>Juvenile bypass system outfall relocation to improve egress, direct and indirect survival on bypassed fish (2011)</i></li> </ul> | <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><b>Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival<sup>1</sup></b></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"> <li>▪ <i>Turbine operation optimization to improve the survival of fish passing through turbines (2013)</i></li> </ul>   | <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"> <li>▪ <i>RSW installation to improve FPE, reduce forebay delay, and improve direct and indirect survival (2008)</i></li> </ul>   | <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>  |
| <p>24</p>  | <p><b>Configuration and Operational Plan for Little Goose Project</b><br/> <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"> <li>▪ <i>Turbine operation optimization to improve the survival of fish passing through turbines (2014)</i></li> </ul>   | <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><b>Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival<sup>1</sup></b></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"> <li>▪ <i>Primary bypass operations with PIT-tag detection installation to reduce handling stress of bypassed fish (2008)</i></li> </ul>  | 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"> <li>▪ <i>Primary bypass outfall relocation to improve egress, direct and indirect survival on bypassed fish (2009)</i></li> </ul>  | 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"> <li>▪ <i>Surface spillway weir and deflector installation to improve FPE, reduce forebay delay and improve direct and indirect survival (2009)</i></li> </ul>  | 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><b>Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival<sup>1</sup></b></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><b><i>Configuration and Operational Plan for Lower Granite Project</i></b><br/> <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"> <li>▪ <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></li> </ul>  | <p>Continued development of the Engineering Design Report and conducted a Value Engineering Study.</p>   |
|  | <ul style="list-style-type: none"> <li>▪ <i>Turbine operation optimization to improve survival of turbine passed fish (2014).</i></li> </ul>   | <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><b>Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival<sup>1</sup></b></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><b>Chief Joseph Dam Flow Deflector</b><br/> <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><b>Turbine Unit Operations</b><br/> <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"> <li>▪ Studies were completed on the effects of rapid decompression (to be completed 2009).</li> <li>▪ A physical model study was completed.</li> <li>▪ 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).</li> </ul> |
| 28   | <p><b>Columbia and Snake River Project Adult Passage Improvements</b><br/> <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><b>Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival<sup>1</sup></b></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"> <li>■ <i>Improve the Bradford Island ladder system to reduce stress and improve reliability of upstream adult passage (2013).</i></li> </ul>  | <p>Planned for 2013.</p>   |
|  | <p><i>The Dalles Dam</i></p> <ul style="list-style-type: none"> <li>■ <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></li> </ul>        | <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"> <li>■ <i>Adult ladder systems modifications to improve upstream adult passage conditions (2011).</i></li> </ul>   | <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"> <li>■ <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></li> </ul>   | <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"> <li>■ <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&amp;E Action 54).</i></li> </ul> | <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><b>Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival<sup>1</sup></b></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"> <li>▪ <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></li> </ul> | <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  |
|--|---|---|
| <b>Hydropower Strategy 3—Implement Spill and Juvenile Transportation Improvements at Columbia River and Snake River Dams</b> |   |   |
| 29   | <p><i>Spill Operations to Improve Juvenile Passage</i><br/> <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&amp;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 <a href="http://www.nwd-wc.usace.army.mil/tmt/wq/tdg_and_temp/2008/">http://www.nwd-wc.usace.army.mil/tmt/wq/tdg_and_temp/2008/</a>.</p> |

## Hydro Actions

| RPA No.  | Action Description   | 2008 Actions/Accomplishments  |
|--|--|---|
| <b>Hydropower Strategy 3—Implement Spill and Juvenile Transportation Improvements at Columbia River and Snake River Dams</b> |  |   |
| 30   | <p><i>Juvenile Fish Transportation in the Columbia and Snake Rivers</i><br/> <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&amp;E Strategy 2) with some adaptive management modifications based on results of RM&amp;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 |
|--|--|------------------------------|
| <b>Hydropower Strategy 3—Implement Spill and Juvenile Transportation Improvements at Columbia River and Snake River Dams</b> |  |                              |
|  | <p><i>dates mentioned in this section should be considered firm planning dates, if in-season information or results of ongoing RM&amp;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   |
|--|--|--|
| <b>Hydropower Strategy 3—Implement Spill and Juvenile Transportation Improvements at Columbia River and Snake River Dams</b> |  |  |
| 31   | <p><b><i>Configuration and Operational Plan Transportation Strategy</i></b><br/> <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  |
|---|--|---|
| <b>Hydropower Strategy 4—Operate and Maintain Facilities at Corps’ Mainstem Projects to Maintain Biological Performance</b> |  |   |
| 32  | <p><b><i>Fish Passage Plan</i></b><br/> <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"> <li>▪ Operate according to project-specific criteria and dates to operate and maintain fish facilities, turbine operating priorities, and spill patterns;</li> <li>▪ Operate according to fish transportation criteria;</li> <li>▪ Maintain turbine operations within the 1% of best efficiency range;</li> <li>▪ Maintain spillway discharge levels and dates to provide project spill for fish passage;</li> <li>▪ Implement TDG monitoring plan;</li> <li>▪ Operate according to protocols for fish trapping and handling;</li> <li>▪ 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;</li> <li>▪ Coordinate routine and non-routine maintenance that affects fish operations or structures to eliminate and/or minimize fish operation impacts;</li> <li>▪ Schedule routine maintenance during non-fish passage periods;</li> <li>▪ Conduct non-routine maintenance activities as needed; and</li> <li>▪ Coordinate criteria changes and emergency operations with FPOM.</li> </ul> |   |
|   | <p><b><i>Operations and Maintenance</i></b></p> <ul style="list-style-type: none"> <li>▪ 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.</li> <li>▪ Evaluate the condition of items necessary (e.g., spillway hoist systems, cranes,</li> </ul>  |   |

## 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   |
|--|---|--|
| <p><b>Hydropower Strategy 5—Develop and Implement a Kelt Management Plan</b></p> |   |  |
| <p>33</p>  | <p><b><i>Snake River Steelhead Kelt Management Plan</i></b><br/> <i>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:</i></p> <ul style="list-style-type: none"> <li>▪ <i>Measures to increase the in-river survival of migrating kelts,</i></li> <li>▪ <i>Potential for the collection and transport (either with or without short-term reconditioning) of kelts to areas below Bonneville Dam,</i></li> <li>▪ <i>Potential for long-term reconditioning as a tool to increase the number of viable females on the spawning grounds,</i></li> <li>▪ <i>Research as necessary to accomplish the elements of this plan.</i></li> </ul> | <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"> <li>▪ Habitat Strategy 1—Protect and improve tributary habitat based on biological needs and prioritized actions</li> <li>▪ Habitat Strategy 2—Improve juvenile and adult fish survival in estuary habitat</li> </ul> <p>Each strategy consists of one or more specific actions. These are summarized in the following sections.</p> |  |   |
| <p><b>Habitat Strategy 1—Protect and Improve Tributary Habitat Based on Biological Needs and Prioritized Actions</b></p>  |  |   |
| 34  | <p><b><i>Tributary Habitat Implementation 2007 to 2009 – Progress Toward 2018 Habitat Quality Improvement Targets.</i></b></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. 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   |
|---|--|--|
| <b>Habitat Strategy 1—Protect and Improve Tributary Habitat Based on Biological Needs and Prioritized Actions</b> |  |  |
| 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"> <li>■ 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.</li> <li>■ No further action for this RPA was needed in 2008.</li> </ul> |

## Habitat Actions

| RPA No.   | Action Description  | 2008 Actions/Accomplishments |
|---|---|------------------------------|
| <b>Habitat Strategy 1—Protect and Improve Tributary Habitat Based on Biological Needs and Prioritized Actions</b> |   |                              |
|   | <ul style="list-style-type: none"> <li>▪ <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></li> <li>▪ <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></li> <li>▪ <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></li> <li>▪ <i>RM&amp;E will inform the relationship between actions, habitat quality and salmon productivity for use in a model developed through the FCRPS RM&amp;E Strategy 3, Action 57 and new scientific information will be applied to estimate benefits for future implementation.</i></li> </ul> |                              |

## Habitat Actions

| RPA No.   | Action Description   | 2008 Actions/Accomplishments |
|---|--|------------------------------|
| <b>Habitat Strategy 1—Protect and Improve Tributary Habitat Based on Biological Needs and Prioritized Actions</b> |  |                              |
|   | <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**

| <b>ESU</b>                           | <b>Major Population Group</b> | <b>Population</b>                              | <b>Estimated Percentage Habitat Quality Improvement of 2007-2009 Actions</b> | <b>Total Estimated Percentage Habitat Quality Improvement of 2007-2018 Actions</b> |
|--------------------------------------|-------------------------------|--|--|--|
| Snake River<br>Spring/Summer Chinook | Grand Ronde/Imnaha            | <b>Catherine Creek</b>                         | <b>4</b>   | <b>23</b>  |
|                                      |                               | Lostine/Wallowa River                          | 2  | 2 *  |
|                                      |                               | <b>Grand Ronde River upper mainstem</b>        | <b>2</b>   | <b>23</b>  |
|                                      |                               | 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                   | <b>Tucannon River</b>                          | <b>7</b>   | <b>17</b>  |
|                                      | 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 *  |
|                                      |                               | <b>Yankee Fork</b>                             | <b>10</b>  | <b>30</b>  |

**Table 5. Estimated Habitat Quality Improvements (continued)**

| <b>ESU</b>                    | <b>Major Population Group</b>       | <b>Population</b>                         | <b>Estimated Percentage Habitat Quality Improvement of 2007-2009 Actions</b> | <b>Total Estimated Percentage Habitat Quality Improvement of 2007-2018 Actions</b> |
|-------------------------------|-------------------------------------|---|--|--|
| Upper Columbia Spring Chinook | Upper Columbia – Below Chief Joseph | <b>Entiat River</b>                       | <b>10</b>  | <b>22</b>  |
|                               |                                     | <b>Methow River</b>                       | <b>2</b>   | <b>6</b>   |
|                               |                                     | <b>Wenatchee River</b>                    | <b>1</b>   | <b>3</b>   |
| 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)**

| <b>ESU</b>            | <b>Major Population Group</b> | <b>Population</b>   | <b>Estimated Percentage Habitat Quality Improvement of 2007-2009 Actions</b> | <b>Total Estimated Percentage Habitat Quality Improvement of 2007-2018 Actions</b> |
|-----------------------|-------------------------------|---|--|--|
|                       | 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              | <b>Lochsa River</b>   | <b>6</b>   | <b>16</b>  |
|                       |                               | <b>Lolo Creek</b>   | <b>8</b>   | <b>12</b>  |
|                       |                               | <b>Selway River</b>   | <b>&lt;1</b>   | <b>&lt;1</b>   |
|                       |                               | <b>South Fork Clearwater River</b>  | <b>5</b>   | <b>14</b>  |
| 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                  | <b>Lower Middle Fork mainstem and tribs (Big, Camas, and Loon Creeks)</b> | <b>1</b>   | <b>2</b>   |

**Table 5. Estimated Habitat Quality Improvements (continued)**

| <b>ESU</b>               | <b>Major Population Group</b>             | <b>Population</b>              | <b>Estimated Percentage Habitat Quality Improvement of 2007-2009 Actions</b> | <b>Total Estimated Percentage Habitat Quality Improvement of 2007-2018 Actions</b> |
|--------------------------|---|--------------------------------|--|--|
|                          |   | East Fork Salmon River         | 2  | 2 *  |
|                          |   | Lemhi River                    | 3  | 3 *  |
|                          |   | Pahsimeroi River               | 9  | 9 *  |
|                          |   | Salmon River upper mainstem    | 6  | 6 *  |
|                          |   | <b>Secesh River</b>            | <b>1</b>   | <b>6</b>   |
|                          |   | <b>South Fork Salmon River</b> | <b>&lt;1</b>   | <b>1</b>   |
| Upper Columbia Steelhead | Upper Columbia River – below Chief Joseph | <b>Entiat River</b>            | <b>6</b>   | <b>8</b>   |
|                          |   | <b>Methow River</b>            | <b>2</b>   | <b>4</b>   |
|                          |   | <b>Okanogan River</b>          | <b>12</b>  | <b>14</b>  |
|                          |   | <b>Wenatchee River</b>         | <b>1</b>   | <b>4</b>   |

\* 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  |
|---|---|---|
| <b>Habitat Strategy 2—Improve Juvenile and Adult Fish Survival in Estuary Habitat</b> |   |   |
| 36  | <p><b>Estuary Habitat Implementation 2007 to 2009</b><br/> <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><b>Estuary Habitat Implementation 2010-2018—Achieving Habitat Quality and Survival Improvement Targets</b><br/> <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"> <li>▪ <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></li> <li>▪ <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></li> </ul> | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul> |

## Habitat Actions

| RPA No.   | Action Description   | 2008 Actions/Accomplishments  |
|---|--|---|
| <b>Habitat Strategy 2—Improve Juvenile and Adult Fish Survival in Estuary Habitat</b> |  |   |
|   | <ul style="list-style-type: none"> <li>▪ <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></li> <li>▪ <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&amp;E to estimate the change in overall estuary habitat and resultant change in population survival.</i></li> <li>▪ <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></li> <li>▪ <i>FCRPS RM&amp;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></li> <li>▪ <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></li> </ul> | <ul style="list-style-type: none"> <li>▪ 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.</li> <li>▪ 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.</li> <li>▪ 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.</li> </ul> |
| 38  | <p><b><i>Piling and Piling Dike Removal Program</i></b></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"> <li>▪ <i>In 2008, the Action Agencies will work with Lower Columbia River Estuary Program to</i></li> </ul>  | <ul style="list-style-type: none"> <li>▪ In 2008, the Action Agencies collaborated with LCREP and others to set up a Pile Structure Program subcommittee</li> </ul>   |

## Habitat Actions

| RPA No.   | Action Description  | 2008 Actions/Accomplishments  |
|---|---|---|
| <b>Habitat Strategy 2—Improve Juvenile and Adult Fish Survival in Estuary Habitat</b> |   |   |
|   | <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"> <li>▪ <i>Beginning in 2008 and 2009, the Action Agencies will begin implementation. Implementation will continue through 2018.</i></li> </ul> | <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"> <li>▪ 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.</li> </ul> |

## 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"> <li>▪ 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</li> <li>▪ Hatchery Strategy 2—Preserve and rebuild the genetic resources through safety-net and conservation actions to reduce short-term extinction risk and promote recovery</li> </ul> <p>Each strategy consists of two specific actions. These are summarized in the following sections.</p> |  |                              |
| <b>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</b>  |  |                              |
| 39  | <p><i>FCRPS Funding of Mitigation Hatcheries - Programmatic</i><br/> <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"> <li>▪ 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.</li> <li>▪ Middle Columbia: No action in 2008. the status of this RPA will be reported in the 2010 Annual Progress Report.</li> <li>▪ Lower Columbia: No action in 2008. The status of this RPA will be reported in the 2011 Annual Progress Report.</li> </ul> |

## Hatchery Actions

| RPA No. | Action Description   | 2008 Actions/Accomplishments  |
|---------|--|---|
| 40      | <p><b><i>Reform FCRPS Hatchery Operations to Reduce Genetic and Ecological Effects on ESA-Listed Salmon and Steelhead</i></b></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"> <li>▪ 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.</li> <li>▪ 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.</li> <li>▪ 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.</li> <li>▪ 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.</li> </ul> |

**Table 6.** Specific Projects to Implement Hatchery RPA Actions

| <b>Hatchery Strategy 1, Action 40</b><br><b>Reform FCRPS Hatchery Operations to Reduce Genetic and Ecological Effects on ESA-Listed Salmon and Steelhead</b> |  |
|--|--|
|  | For <b>Lower Columbia Chinook</b> : The COE will review the John Day Hatchery Mitigation Program.  |
|  | For <b>Snake River Steelhead</b> : Fund the Tucannon River steelhead supplementation program to transition to local broodstock using BMPs. <sup>2</sup>  |
|  | For <b>Middle Columbia Steelhead</b> : Fund the Touchet River steelhead supplementation program to transition to local broodstock using BMPs. <sup>3</sup>   |
|  | For <b>Upper Columbia Steelhead</b> : 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. |

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

<sup>3</sup> 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   |
|---|---|--|
| <b>Hatchery Strategy 2—Preserve and Rebuild Genetic Resources Through Safety-net and Conservation Actions to Reduce Short-term Extinction Risk and Promote Recovery</b> |   |  |
| 41  | <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"> <li>▪ 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.</li> <li>▪ BPA continued to fund this safety-net program through the Tucannon River Spring Chinook Captive Broodstock Program, a BPA project.</li> <li>▪ In 2008, BPA continued to fund this safety-net program through the Oregon Spring Chinook Captive Propagation Program, a BPA project.</li> <li>▪ In 2008, BPA continued to fund this safety-net program through the Johnson Creek Artificial Propagation Enhancement Project, a BPA project.</li> <li>▪ In 2008, BPA continued to fund an experimental captive rearing program through the Idaho Snake River Spring Chinook Captive Propagation Project, a BPA project.</li> <li>▪ 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.</li> </ul> |

**Table 7.** Specific Projects to Implement Hatchery RPA Actions

| <b>Hatchery Strategy 2, Action 41<br/>                     Implement Safety-Net Programs to Preserve Genetic Resources and Reduce Short-term Extinction Risk</b> |   |
|--|---|
|  | <p>For <b>Snake River sockeye</b>:<br/>                     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 <b>Snake River Spring/Summer Chinook</b>:<br/>                     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 <b>Snake River Spring/Summer Chinook</b>:<br/>                     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><b>For Snake River Spring/Summer Chinook:</b><br/> <b>Fund the Johnson Creek / South Fork Salmon River safety net supplementation program, as described in the existing Section 10 permit.</b></p>   |
|  | <p><b>For Snake River Spring/Summer Chinook:</b><br/> <b>Fund the experimental captive rearing program for East Fork and West Fork Yankee Fork Salmon River (until phased out by IDFG).</b></p>   |
|  | <p>For <b>Snake River Steelhead</b>, 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   |
|---|---|--|
| <b>Hatchery Strategy 2—Preserve and Rebuild Genetic Resources Through Safety-net and Conservation Actions to Reduce Short-term Extinction Risk and Promote Recovery</b> |   |  |
| 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"> <li>■ 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.</li> <li>■ 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.</li> <li>■ 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.</li> <li>■ In 2008, BPA continued to fund this action through the BPA project Kelt Reconditioning/Reproductive Success.</li> <li>■ In 2008, BPA continued to fund operation and maintenance for this action through the LSRCP Direct Funding Agreement.</li> <li>■ 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</li> </ul> |

## Hatchery Actions

| RPA No.   | Action Description | 2008 Actions/Accomplishments   |
|---|--------------------|--|
| <b>Hatchery Strategy 2—Preserve and Rebuild Genetic Resources Through Safety-net and Conservation Actions to Reduce Short-term Extinction Risk and Promote Recovery</b> |                    |  |
|   |                    | <p>in 2008.</p> <ul style="list-style-type: none"> <li>▪ 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).</li> <li>▪ No action in 2008 for Subaction 8.</li> </ul> |
|   |                    | <ul style="list-style-type: none"> <li>▪ In 2008, BPA continued to fund this action through the BPA project Reintroduction of Chum Salmon into Duncan Creek.</li> <li>▪ 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.</li> </ul>   |

**Table 8.** Specific Projects to Implement Hatchery RPA Actions

| <b>Hatchery Strategy 2, Action 42<br/>           Implement Conservation Programs to Build Genetic Resources &amp; Assist in Promoting Recovery</b> |  |
|--|--|
|  | <p>For <b>Upper Columbia Spring Chinook</b>: 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 <b>Upper Columbia Steelhead</b>: 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 <b>Upper Columbia Steelhead</b>: 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

| <b>Hatchery Strategy 2, Action 42</b><br><b>Implement Conservation Programs to Build Genetic Resources &amp; Assist in Promoting Recovery</b> |   |
|---|---|
|   | For <b>Middle Columbia Steelhead</b> : Fund a program to recondition natural origin kelts in the Yakima River basin including capital construction, implementation and monitoring and evaluation costs  |
|   | For <b>Snake River Steelhead</b> : 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 <b>Snake River Spring/Summer Chinook Salmon</b> : 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 <b>Snake River Sockeye</b> : Fund further expansion of the sockeye program to increase total smolt releases to between 500,000 and 1 million fish.  |
|   | For <b>Snake River Sockeye</b> : 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 <b>Columbia River Chum</b> : 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 <b>Columbia River Chum</b> : 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 effects strategies to meet this overall objective:</i></p> <ul style="list-style-type: none"> <li>▪ 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</li> <li>▪ 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</li> <li>▪ Predation and Invasive Species Management Strategy 3—Implement marine mammal control measures to increase survival of adult salmonids at Bonneville Dam</li> </ul> <p>Each strategy consists of two specific actions. These are summarized in the following sections.</p> |  |  |
| <p><b>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</b></p>   |  |  |
| 43  | <p><i><b>Northern Pikeminnow Management Program (NPMP)</b></i><br/> <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><br/> <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"> <li>▪ The Northern Pikeminnow Management Program (NPMP) was again implemented in 2008.</li> <li>▪ 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.</li> <li>▪ In 2008, researchers increased cumulative tagging efforts, increasing year-over-year application of tags by 75 percent.</li> <li>▪ 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.</li> </ul> |

## Predation and Invasive Species Management Actions

| RPA No.  | Action Description  | 2008 Actions/Accomplishments   |
|--|---|--|
| <b>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</b> |   |  |
| 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"> <li>▪ In September 2008, BPA sponsored a one-day workshop entitled “Review, Evaluate, and Develop Strategies to Reduce Non-Native Piscivorous Predation on Juvenile Salmonids.”</li> <li>▪ 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.</li> </ul> |

## Predation and Invasive Species Management Actions

| RPA No.   | Action Description   | 2008 Actions/Accomplishments     |  |                                  |  |                        |   |           |           |                    |     |      |      |                   |   |      |      |  |   |           |           |   |     |           |           |  |       |      |      |  |
|---|--|----------------------------------|--|----------------------------------|--|------------------------|---|-----------|-----------|--------------------|-----|------|------|-------------------|---|------|------|--|---|-----------|-----------|---|-----|-----------|-----------|--|-------|------|------|--|
| <b>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</b> |  |                                  |  |                                  |  |                        |   |           |           |                    |     |      |      |                   |   |      |      |  |   |           |           |   |     |           |           |  |       |      |      |  |
| 45  | <p><i>Reduce Caspian Terns on East Sand Island in the Columbia River Estuary</i><br/> <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"> <thead> <tr> <th><i>Site</i></th> <th><i>Acres</i></th> <th><i>Proposed Year of Creation</i></th> <th><i>Proposed Year in which Target Acreage Is Achieved</i></th> </tr> </thead> <tbody> <tr> <td><i>Fern Ridge Lake</i></td> <td>1</td> <td>2007/2008</td> <td>2007/2008</td> </tr> <tr> <td><i>Summer Lake</i></td> <td>1.5</td> <td>2008</td> <td>2008</td> </tr> <tr> <td><i>Crump Lake</i></td> <td>1</td> <td>2009</td> <td>2009</td> </tr> <tr> <td><i>Brooks Island (San Francisco Bay)</i></td> <td>2</td> <td>2008/2009</td> <td>2008/2009</td> </tr> <tr> <td><i>Hayward Regional Shoreline (San Francisco Bay)</i></td> <td>0.5</td> <td>2008/2009</td> <td>2008/2009</td> </tr> <tr> <td><i>Don Edwards NWR (San Francisco Bay)</i></td> <td>0.5-1</td> <td>2009</td> <td>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"> <li>■ 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.</li> <li>■ The first of three islands was constructed in the Summer Lake State Wildlife Area.</li> <li>■ 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.</li> <li>■ No construction was necessary in 2008 for Subactions 4, 5, or 6.</li> </ul> |
| <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   |                                  |  |                        |   |           |           |                    |     |      |      |                   |   |      |      |  |   |           |           |   |     |           |           |  |       |      |      |  |

## Predation and Invasive Species Management Actions

| RPA No.   | Action Description  | 2008 Actions/Accomplishments  |
|---|---|---|
| <b>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</b> |   |   |
| 46  | <b>Double-Crested Cormorant</b><br><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  | <b>Inland Avian Predation</b><br><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&amp;E) for Corps-owned lands and associated shallow-water habitat.</i>                   | Initiated discussions with NOAA and USFWS on project approach and scope.  |
| 48  | <b>Other Avian Deterrent Actions</b><br><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   |
|--|--|--|
| <b>Predation and Invasive Species Management Strategy 3—Implement Marine Mammal Control Measures to Increase Survival of Adult Salmonids at Bonneville Dam</b> |  |  |
| 49   | <b>Marine Mammal Control Measures</b><br><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><b>Research, Monitoring and Evaluation Actions</b></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"> <li>▪ <i>RME Strategy 1—Monitor Status of Selected Fish Populations Related to FCRPS Actions</i></li> <li>▪ <i>RME Strategy 2—Hydropower RME</i></li> <li>▪ <i>RME Strategy 3—Tributary Habitat RME</i></li> <li>▪ <i>RME Strategy 4—Estuary and Ocean RME</i></li> <li>▪ <i>RME Strategy 5—Harvest RME</i></li> <li>▪ <i>RME Strategy 6—Hatchery RME</i></li> <li>▪ <i>RME Strategy 7—Predation and Invasive Species Management RME</i></li> <li>▪ <i>RME Strategy 8—Coordination and Data Management</i></li> <li>▪ <i>RME Strategy 9—Project Implementation and Compliance Monitoring</i></li> </ul> <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"> <li>▪ <i>Programmatic performance. This will be tracked through project implementation and compliance monitoring.</i></li> <li>▪ <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></li> </ul> |                    |                              |

## Research, Monitoring, and Evaluation Actions

| RPA No.   | Action Description   | 2008 Actions/Accomplishments  |
|---|--|---|
| <p><b>RME Strategy 1—Monitor the Status of Selected Fish Populations Related to FCRPS Actions</b></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><b><i>Fish Population Status Monitoring</i></b><br/> <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"> <li>▪ <i>Implement and maintain the Columbia River Basin passive integrated transponder (PIT)-Tag Information System. (Annually)</i></li> </ul>   | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul> |
|   | <ul style="list-style-type: none"> <li>▪ <i>Monitor adult returns at mainstem hydroelectric dams using both visual counts and the PIT-tag detection system (see Hydrosystem section). (Annually)</i></li> </ul>  | <ul style="list-style-type: none"> <li>▪ 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).</li> </ul>   |
|   | <ul style="list-style-type: none"> <li>▪ <i>Monitor juvenile fish migrations at mainstem hydroelectric dams using smolt monitoring and the PIT-tag detection system (see Hydrosystem section). (Annually)</i></li> </ul>   | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul>   |
|   | <ul style="list-style-type: none"> <li>▪ <i>Fund status and trend monitoring as a component of the pilot studies in the</i></li> </ul>   | <ul style="list-style-type: none"> <li>▪ Thirty-eight projects were implemented to support ongoing</li> </ul>   |

## Research, Monitoring, and Evaluation Actions

| RPA No. | Action Description  | 2008 Actions/Accomplishments   |
|---------|---|--|
|         | <ul style="list-style-type: none"> <li>– <i>Wenatchee, Methow, and Entiat river basins in the Upper Columbia River,</i></li> <li>– <i>the Lemhi and South Fork Salmon river basins, and the John Day River Basin</i></li> <li>– <i>to further advance the methods and information needed for assessing the status</i></li> <li>– <i>of fish populations. (Initiate in FY 2007-2009 Project Funding, review and</i></li> <li>– <i>modify annually to ensure that these projects continue to provide a means of</i></li> <li>– <i>evaluating the effectiveness of tributary mitigation actions).</i></li> </ul> | <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"> <li>▪ <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></li> </ul>   | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul> |
|         | <ul style="list-style-type: none"> <li>▪ <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></li> </ul>  | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul>   |
|         | <ul style="list-style-type: none"> <li>▪ <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></li> </ul>   | <ul style="list-style-type: none"> <li>▪ Twenty-seven BPA projects were continued and one was initiated in 2008 that supported monitoring and research on hatchery marking.</li> </ul>   |
|         | <ul style="list-style-type: none"> <li>▪ <i>Report available information on population viability metrics in annual and comprehensive evaluation reports. (Initiate in FY 2008)</i></li> </ul>   | <ul style="list-style-type: none"> <li>▪ Regarding the synthesis of fish population data for annual comprehensive reports, the Action Agencies and NOAA</li> </ul>   |

## 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  |
|---|---|---|
| <p><b>RME Strategy 1—Monitor the Status of Selected Fish Populations Related to FCRPS Actions</b><br/> <i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to the status of fish populations.</i></p> |   |   |
| 51  | <p><b>Collaboration Regarding Fish Population Status Monitoring</b><br/> <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"> <li>▪ <i>Support the coordination, data management, and annual synthesis of fish population metrics through Regional Data Repositories and reports. (Annually)</i></li> <li>▪ <i>Facilitate and participate in ongoing regional RM&amp;E collaboration process to develop a regional strategy for status and trend monitoring for key ESA fish populations. (Initiate in FY 2008)</i></li> <li>▪ <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></li> </ul> | <ul style="list-style-type: none"> <li>▪ 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.</li> <li>▪ Action Agency staff participated in RME Hydro and Hatchery RME work groups through which this was pursued.</li> <li>▪ 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.</li> </ul> |

## Research, Monitoring, and Evaluation Actions

| RPA No.   | Action Description | 2008 Actions/Accomplishments |
|---|--------------------|------------------------------|
| <b>RME Strategy 2—Hydrosystem Research, Monitoring, and Evaluation</b>  |                    |                              |
| <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><i>Juvenile Dam Passage Performance Standards</i></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><i>Juvenile In-River Survival Performance Metric</i></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><i>Juvenile System Survival Performance Targets</i></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><i>Adult Performance Standards</i></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   |
|--|---|------------|--|
| <b>RME Strategy 2—Hydrosystem Research, Monitoring, and Evaluation</b> |   |            |  |
| <b>Table 7. Adult Performance Standard by ESU.*</b>                    |   |            |  |
| 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   |
|---|--|------|--|
| <b>RME Strategy 2—Hydrosystem Research, Monitoring, and Evaluation</b>  |  |      |  |
| 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><b>Monitor and Evaluate Fish Performance within the FCRPS</b><br/> <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"> <li>▪ <i>Monitor and evaluate salmonid dam survival rates for a subset of FCRPS projects.</i></li> </ul>  |      | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul> |
|   | <ul style="list-style-type: none"> <li>▪ <i>Monitor and evaluate juvenile salmonid in-river and system survival through the FCRPS, including estimates of differential post-Bonneville survival of transported</i></li> </ul>  |      | <ul style="list-style-type: none"> <li>▪ PIT-tag-based survival estimates using tagged smolts entering and migrating through the FCRPS (Lower Granite</li> </ul>   |

## Research, Monitoring, and Evaluation Actions

| RPA No.  | Action Description   | 2008 Actions/Accomplishments   |
|--|--|--|
| <b>RME Strategy 2—Hydrosystem Research, Monitoring, and Evaluation</b> |  |  |
|  | <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"> <li>▪ <i>Monitor and evaluate adult salmonid system survival upstream through the FCRPS.</i></li> </ul>   | <ul style="list-style-type: none"> <li>▪ The BPA-funded PTAGIS system project provides data on returning adults of known origin. NOAA biologists conduct analyses and report upstream passage survival.</li> </ul>   |
|  | <ul style="list-style-type: none"> <li>▪ <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></li> </ul>  | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul>   |
|  | <ul style="list-style-type: none"> <li>▪ <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></li> </ul>  | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul>  |
|  | <ul style="list-style-type: none"> <li>▪ <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></li> </ul>   | <ul style="list-style-type: none"> <li>▪ Projects were initiated to support action required in 2009.</li> </ul>  |
|  | <ul style="list-style-type: none"> <li>▪ <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></li> </ul> | <ul style="list-style-type: none"> <li>▪ Complied with all provisions in 2008. This RPA action will be fully addressed in FY 2009 with expanded emplacement of stream-based detection systems.</li> </ul>  |

## Research, Monitoring, and Evaluation Actions

| RPA No.  | Action Description  | 2008 Actions/Accomplishments |
|--|---|------------------------------|
| <b>RME Strategy 2—Hydrosystem Research, Monitoring, and Evaluation</b> |   |                              |
|  | <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  |                |
|--|---|---|----------------|
| <b>RME Strategy 2—Hydrosystem Research, Monitoring, and Evaluation</b> |   |   |                |
| 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><b><i>Monitor and Evaluate Migration Characteristics and River Condition</i></b><br/> <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"> <li>Monitor and estimate the abundance of smolts passing index dams.</li> </ul>  | <ul style="list-style-type: none"> <li>The BPA-funded Fish Passage Center project calculated passage indices at all collector dams, as well population estimates at Lower Granite Dam.</li> </ul>   |                |
|  | <ul style="list-style-type: none"> <li>Monitor and describe the migration timing of smolts at index dams, identify potential problems, and evaluate implemented solutions.</li> </ul>   | <ul style="list-style-type: none"> <li>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.</li> </ul> |                |

## Research, Monitoring, and Evaluation Actions

| RPA No.  | Action Description   | 2008 Actions/Accomplishments   |
|--|--|--|
| <b>RME Strategy 2—Hydrosystem Research, Monitoring, and Evaluation</b> |  |  |
|  | <ul style="list-style-type: none"> <li>▪ <i>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.</i></li> </ul>  | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul>  |
|  | <ul style="list-style-type: none"> <li>▪ <i>Monitor and enumerate adult salmonids passing through fishways in the FCRPS, identify potential problems, and evaluate implemented solutions.</i></li> </ul>   | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul>  |
|  | <ul style="list-style-type: none"> <li>▪ <i>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.<sup>4</sup></i></li> </ul> | <ul style="list-style-type: none"> <li>▪ Conducted March-April evaluation of kelt passage through the corner collector.</li> </ul>   |
| 54   | <p><b><i>Monitor and Evaluate Effects of Configuration and Operation Actions</i></b><br/> <i>The following will be conducted at specific projects for specific years as operations or configurations change, or new problems are identified.</i></p>   |  |
|  | <ul style="list-style-type: none"> <li>▪ <i>Monitor and evaluate the effects of existing spillways, modifications, and operations on smolt survival.</i></li> </ul>  | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul> |
|  | <ul style="list-style-type: none"> <li>▪ <i>Monitor and evaluate the effectiveness of traditional juvenile bypass systems and modifications to such, on smolt survival and condition.</i></li> </ul>   | <ul style="list-style-type: none"> <li>▪ The passage and survival studies above also estimated the proportions collected by the bypass system and the resulting survival rates.</li> </ul>   |
|  | <ul style="list-style-type: none"> <li>▪ <i>Monitor and evaluate the effectiveness of surface bypass structures and</i></li> </ul>   | <ul style="list-style-type: none"> <li>▪ Estimated route-specific passage and survival rates at Lower Monumental, Ice Harbor, McNary, John Day, and</li> </ul>   |

<sup>4</sup> 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   |
|--|--|--|
| <b>RME Strategy 2—Hydrosystem Research, Monitoring, and Evaluation</b> |  |  |
|  | <i>modifications on smolt survival and condition.</i>  | Bonneville dams.   |
|  | <ul style="list-style-type: none"> <li>▪ <i>Monitor and evaluate the effectiveness of turbine operations and modifications on smolt survival and condition.</i></li> </ul>                       | <ul style="list-style-type: none"> <li>▪ Estimated route-specific passage and survival rates at Lower Monumental, Ice Harbor, and McNary dams.</li> </ul>  |
|  | <ul style="list-style-type: none"> <li>▪ <i>Monitor and evaluate overall dam passage with respect to modifications at projects (including forebay delay and survival).</i></li> </ul>            | <ul style="list-style-type: none"> <li>▪ Passage and survival studies also estimated forebay and tailrace passage times and survival rates in the forebay.</li> </ul>  |
|  | <ul style="list-style-type: none"> <li>▪ <i>Monitor and evaluate the effectiveness of the juvenile fish transportation program and modifications to operations.</i></li> </ul>                   | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul>  |
|  | <ul style="list-style-type: none"> <li>▪ <i>Monitor and evaluate the effects of environmental conditions affecting juvenile fish survival.</i></li> </ul>  | <ul style="list-style-type: none"> <li>▪ Passage and survival studies also considered river discharges, temperatures, etc. in their analyses.</li> </ul>   |
|  | <ul style="list-style-type: none"> <li>▪ <i>Monitor and evaluate the effectiveness of reducing predation toward improving juvenile fish survival.</i></li> </ul>                                 | <ul style="list-style-type: none"> <li>▪ Ongoing research under Columbia River Fish Mitigation (CRFM) and BPA Fish and Wildlife Program funding continued monitoring of avian predators and their colonies (O&amp;M), and dam angling and estimates of annual exploitation of pikeminnow (modeling), in conjunction with juvenile dam survival studies.</li> </ul> |
|  | <ul style="list-style-type: none"> <li>▪ <i>Investigate, evaluate and deploy alternative technologies and methodologies for fish passage and the RM&amp;E Action.</i></li> </ul>                 | <ul style="list-style-type: none"> <li>▪ Two prototype top spillway weirs (TSWs) were deployed at John Day Dam, and a new RSW was installed at Lower Monumental Dam.</li> </ul>  |
|  | <ul style="list-style-type: none"> <li>▪ <i>Determine if actions directed at benefiting juveniles have an unintended effect on migrating adults (e.g., certain spill operations).</i></li> </ul> | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul>  |

## Research, Monitoring, and Evaluation Actions

| RPA No.  | Action Description   | 2008 Actions/Accomplishments   |
|--|--|--|
| <b>RME Strategy 2—Hydrosystem Research, Monitoring, and Evaluation</b> |  |  |
|  | <ul style="list-style-type: none"> <li>▪ <i>Install and maintain adult PIT-tag detectors in fish ladders at key dams in the FCRPS and evaluate adult survival (conversion rates).</i></li> </ul>   | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul> |
|  | <ul style="list-style-type: none"> <li>▪ <i>Monitor and evaluate the effects of fish ladder operations and configurations on adult passage rates.</i></li> </ul>   | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul>  |
|  | <ul style="list-style-type: none"> <li>▪ <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.<sup>5</sup></i></li> </ul> | <ul style="list-style-type: none"> <li>▪ Evaluation initiated in December 2008 (and continued in spring 2009). Results are pending.</li> </ul>   |
|  | <ul style="list-style-type: none"> <li>▪ <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></li> </ul>   | <ul style="list-style-type: none"> <li>▪ See work at the Dalles Dam, immediately above.</li> </ul>   |
| 55   | <p><b><i>Investigate Hydro Critical Uncertainties and Investigate New Technologies</i></b><br/> <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"> <li>▪ <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></li> </ul>  | <ul style="list-style-type: none"> <li>▪ Initiated a post-Bonneville JSAT survival study.</li> </ul>   |
|  | <ul style="list-style-type: none"> <li>▪ <i>Investigate the post-Bonneville mortality effect of changes in fish arrival timing and transportation to below Bonneville. (Initiate in FY 2007-2009)</i></li> </ul>   | <ul style="list-style-type: none"> <li>▪ Ongoing study. See discussion for RPA 31.</li> </ul>  |

<sup>5</sup> 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   |
|--|--|--|
| <b>RME Strategy 2—Hydrosystem Research, Monitoring, and Evaluation</b> |  |  |
|  | <ul style="list-style-type: none"> <li>▪ <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></li> </ul>  | <ul style="list-style-type: none"> <li>▪ No action required in 2008.</li> </ul>  |
|  | <ul style="list-style-type: none"> <li>▪ <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></li> </ul>  | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul> |
|  | <ul style="list-style-type: none"> <li>▪ <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></li> </ul> | <ul style="list-style-type: none"> <li>▪ Research was completed and a draft report presented in 2008. The report will be finalized in 2009.</li> </ul>   |
|  | <ul style="list-style-type: none"> <li>▪ <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></li> </ul>   | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul>   |
|  | <ul style="list-style-type: none"> <li>▪ <i>Investigate feasibility of developing PIT-tag detectors for spillways and turbines.</i></li> </ul>   | <ul style="list-style-type: none"> <li>▪ 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</li> </ul>   |

## Research, Monitoring, and Evaluation Actions

| RPA No.  | Action Description  | 2008 Actions/Accomplishments  |
|--|---|---|
| <b>RME Strategy 2—Hydrosystem Research, Monitoring, and Evaluation</b> |   |   |
|  |   | 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"> <li>Evaluate new tagging technologies for use in improving the accuracy and assessing delayed or indirect hydro effects on juvenile or adult fish.</li> </ul>  | <ul style="list-style-type: none"> <li>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.</li> </ul> |
|  | <ul style="list-style-type: none"> <li>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.</li> </ul> | <ul style="list-style-type: none"> <li>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.)</li> </ul>  |

## Research, Monitoring, and Evaluation Actions

| RPA No.   | Action Description   | 2008 Actions/Accomplishments  |
|---|--|---|
| <b>RME Strategy 3—Tributary Habitat Research, Monitoring, and Evaluation</b>  |  |   |
| <i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to tributary habitat actions.</i> |  |   |
| 56  | <b>Monitor and Evaluate Tributary Habitat Conditions and Limiting Factors</b><br>The Action Agencies will:   |   |
|   | <ul style="list-style-type: none"> <li>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</li> </ul> | <ul style="list-style-type: none"> <li>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</li> </ul> |

## Research, Monitoring, and Evaluation Actions

| RPA No.  | Action Description   | 2008 Actions/Accomplishments  |
|--|--|---|
| <b>RME Strategy 3—Tributary Habitat Research, Monitoring, and Evaluation</b> |  |   |
|  | <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>   | basins in the Upper Columbia River, the Lemhi and South Fork Salmon river basins, and the John Day River Basin).  |
|  | <ul style="list-style-type: none"> <li>▪ <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></li> </ul> | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul> |
|  | <ul style="list-style-type: none"> <li>▪ <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></li> </ul>   | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul>   |
| 57   | <ul style="list-style-type: none"> <li>▪ <i>Evaluate the Effectiveness of Tributary Habitat Actions</i></li> <li>▪ <i>The Action Agencies will evaluate the effectiveness of habitat actions through RM&amp;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></li> </ul>  |   |
|  | <ul style="list-style-type: none"> <li>▪ <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></li> </ul>  | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul>   |

## Research, Monitoring, and Evaluation Actions

| RPA No.  | Action Description  | 2008 Actions/Accomplishments   |
|--|---|--|
| <b>RME Strategy 3—Tributary Habitat Research, Monitoring, and Evaluation</b> |   |  |
|  | <ul style="list-style-type: none"> <li>▪ <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></li> </ul>   | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul>   |
|  | <ul style="list-style-type: none"> <li>▪ <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></li> </ul> | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul>  |
|  | <ul style="list-style-type: none"> <li>▪ <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></li> </ul>   | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul> |
|  | <ul style="list-style-type: none"> <li>▪ <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></li> </ul>   | <ul style="list-style-type: none"> <li>▪ 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).</li> </ul>   |

| RPA No.   | Action Description  | 2008 Actions/Accomplishments  |
|---|---|---|
| <b>RME Strategy 4—Estuary Habitat and Ocean Research, Monitoring, and Evaluation</b>  |   |   |
| <i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to estuary habitat actions.</i> |   |   |
| 58  | <b>Monitor and Evaluate Fish Performance in the Estuary and Plume</b><br><i>The Action Agencies will monitor biological responses and/or environmental attributes, and report in the following areas:</i>   |   |
|   | <ul style="list-style-type: none"> <li>▪ <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></li> </ul>   | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul> |
|   | <ul style="list-style-type: none"> <li>▪ <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></li> </ul>   | <ul style="list-style-type: none"> <li>▪ Planning within the AFEP process was initiated during 2008 for a project addressing this RPA subaction.</li> </ul>   |
|   | <ul style="list-style-type: none"> <li>▪ <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></li> </ul>  | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul>  |
|   | <ul style="list-style-type: none"> <li>▪ <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></li> </ul> | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul>     |

| RPA No.  | Action Description   | 2008 Actions/Accomplishments  |
|--|--|---|
| <b>RME Strategy 4—Estuary Habitat and Ocean Research, Monitoring, and Evaluation</b> |  |   |
| 59   | <p><b>Monitor and Evaluate Migration Characteristics and Estuary/Ocean Conditions</b><br/> <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"> <li>▪ <i>Map bathymetry and topography of the estuary as needed for RM&amp;E. (Initiate in FY 2007-2009 Projects)</i></li> </ul>  | <ul style="list-style-type: none"> <li>▪ Several projects completed this RME work, which included collection of site-scale elevation data and light detection and ranging (LIDAR) data for topography.</li> </ul>   |
|  | <ul style="list-style-type: none"> <li>▪ <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></li> </ul>  | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul>  |
|  | <ul style="list-style-type: none"> <li>▪ <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></li> </ul>   | <ul style="list-style-type: none"> <li>▪ Planning within the AFEP process was initiated during 2008 for a project addressing this RPA subaction.</li> </ul>   |
|  | <ul style="list-style-type: none"> <li>▪ <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></li> </ul>   | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul>  |
|  | <ul style="list-style-type: none"> <li>▪ <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&amp;E. (FY 2007-2009 Projects, then annually)</i></li> </ul> | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul> |
| 60   | <p><b>Monitor and Evaluate Habitat Actions in the Estuary</b><br/> <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  |
|--|--|---|
| <b>RME Strategy 4—Estuary Habitat and Ocean Research, Monitoring, and Evaluation</b> |  |   |
|  | <ul style="list-style-type: none"> <li>▪ <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></li> </ul>   | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul>   |
|  | <ul style="list-style-type: none"> <li>▪ <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></li> </ul>  | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul>  |
|  | <ul style="list-style-type: none"> <li>▪ <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></li> </ul> | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul> |
| 61   | <p><b><i>Investigate Estuary/Ocean Critical Uncertainties</i></b><br/> <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  |
|--|--|---|
| <b>RME Strategy 4—Estuary Habitat and Ocean Research, Monitoring, and Evaluation</b> |  |   |
|  | <ul style="list-style-type: none"> <li>▪ <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></li> </ul> | <ul style="list-style-type: none"> <li>▪ Six multi-year projects collectively investigated the relationships between juvenile salmonid condition, growth, and survival indicators.</li> </ul>   |
|  | <ul style="list-style-type: none"> <li>▪ <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></li> </ul>   | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul> |
|  | <ul style="list-style-type: none"> <li>▪ <i>Investigate the importance of early life history of salmon populations in tidal fresh water of the lower Columbia River.</i></li> </ul>  | <ul style="list-style-type: none"> <li>▪ Seven projects conducted research to address this subaction. See RPA Action 61 in Section 3 or Table 1 of Section 4 for more information.</li> </ul>   |
|  | <ul style="list-style-type: none"> <li>▪ <i>Continue development of a hydrodynamic numerical model for the estuary and plume to support critical uncertainties investigations.</i></li> </ul>  | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul>  |

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

| RPA No.  | Action Description   | 2008 Actions/Accomplishments  |
|--|--|---|
| <b>RME Strategy 5—Harvest Research, Monitoring, and Evaluation</b> |  |   |
|  | <ul style="list-style-type: none"> <li>▪ <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></li> </ul> | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul>  |
|  | <ul style="list-style-type: none"> <li>▪ <i>Evaluate methods to develop or expand use of selective fishing methods and gear. (Initiate in FY 2007-2009 Projects)</i></li> </ul>  | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul> |
|  | <ul style="list-style-type: none"> <li>▪ <i>Evaluate post-release mortality rates for selected fisheries. (Initiate in FY 2007-2009 Projects)</i></li> </ul>   | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul>   |
|  | <ul style="list-style-type: none"> <li>▪ <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></li> </ul>   | <ul style="list-style-type: none"> <li>▪ BPA funded ten projects that implemented recovery efforts in ocean and in-river fisheries, as well as some limited spawning ground surveys.</li> </ul>   |

| RPA No.  | Action Description  | 2008 Actions/Accomplishments   |
|--|---|--|
| <b>RME Strategy 5—Harvest Research, Monitoring, and Evaluation</b> |   |  |
|  | <ul style="list-style-type: none"> <li>▪ <i>Investigate the feasibility of genetic stock identification monitoring techniques. (Initiate in FY 2007-2009 Projects)</i></li> </ul> | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul> |

## Research, Monitoring, and Evaluation Actions

| RPA No.  | Action Description   | 2008 Actions/Accomplishments  |
|--|--|---|
| <b>RME Strategy 6—Hatchery Research, Monitoring, and Evaluation</b>  |  |   |
| <i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to hatchery actions.</i> |  |   |
| 63   | <p><b>Monitor Hatchery Effectiveness</b><br/> <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"> <li>▪ <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></li> </ul>   | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul> |
|  | <ul style="list-style-type: none"> <li>▪ <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></li> </ul>  | <ul style="list-style-type: none"> <li>▪ 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</li> </ul>  |

## Research, Monitoring, and Evaluation Actions

| RPA No.   | Action Description   | 2008 Actions/Accomplishments  |
|---|--|---|
| <b>RME Strategy 6—Hatchery Research, Monitoring, and Evaluation</b> |  |   |
|   |  | completed, with products incorporated into annual progress reports.   |
| 64  | <p><b><i>Investigate Hatchery Critical Uncertainties</i></b><br/> <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"> <li>▪ <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></li> </ul> | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul>  |
|   | <ul style="list-style-type: none"> <li>▪ <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></li> </ul>   | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul> |
|   | <ul style="list-style-type: none"> <li>▪ <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></li> </ul>        | <ul style="list-style-type: none"> <li>▪ Four projects were implemented in 2008 to support this subaction. See discussion in Chapter 4 for details.</li> </ul>  |

## Research, Monitoring, and Evaluation Actions

| RPA No.   | Action Description  | 2008 Actions/Accomplishments   |
|---|---|--|
| <b>RME Strategy 6—Hatchery Research, Monitoring, and Evaluation</b> |   |  |
| 65  | <i>Investigate Hatchery Critical Uncertainties</i><br><i>The Action Agencies will fund research directed at resolving critical uncertainties:</i>   |  |
|   | <ul style="list-style-type: none"> <li>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.</li> </ul> | <ul style="list-style-type: none"> <li>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.</li> </ul> |
|   | <ul style="list-style-type: none"> <li>Estimate fall Chinook hatchery program effects on the productivity of the fall Chinook salmon ESU.</li> </ul>  | <ul style="list-style-type: none"> <li>The projects associated with Subaction 1 of RPA 65 (see above) were also implemented to support Subaction 2.</li> </ul>   |
|   | <ul style="list-style-type: none"> <li>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.</li> </ul>  | <ul style="list-style-type: none"> <li>No action in 2008. NOAA is expected to provide the necessary technical assistance to BPA in 2009.</li> </ul>  |

## Research, Monitoring, and Evaluation Actions

| RPA No.  | Action Description  | 2008 Actions/Accomplishments  |
|--|---|---|
| <b>RME Strategy 7—Predation and Invasive Species Management Research, Monitoring, and Evaluation</b>                                       |   |   |
| <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><br><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  |
|--|---|---|
| <b>RME Strategy 7—Predation and Invasive Species Management Research, Monitoring, and Evaluation</b> |   |   |
| 67   | <p><b>Monitor and Evaluate the Double-Crested Cormorant Population in the Columbia River Estuary</b><br/> <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><b>Monitor and Evaluate Inland Avian Predators</b><br/> <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><b>Monitoring Related to Marine Mammal Predation</b><br/> <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"> <li>▪ Sea lion abundance below Bonneville Dam was estimated in 2008. See the discussion in Section 3 for details.</li> </ul>   |
|  | <ul style="list-style-type: none"> <li>▪ <i>Monitor the spatial and temporal distribution of sea lion predation attempts and estimate predation rates. (Initiate in FY 2007-2009 Projects)</i></li> </ul>   | <ul style="list-style-type: none"> <li>▪ Spatial and temporal distribution of predation attempts and predation rates were monitored in 2008 through BPA- and Corps-funded efforts.</li> </ul>   |
|  | <ul style="list-style-type: none"> <li>▪ <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></li> </ul>                               | <ul style="list-style-type: none"> <li>▪ The effectiveness of deterrent actions and the timing of application on spring runs was determined in 2008 through BPA- and Corps-funded efforts.</li> </ul>   |
| 70   | <p><b>Monitoring Related to Piscivorous (Fish) Predation</b><br/> <i>The Action Agencies will:</i></p>  |   |
|  | <ul style="list-style-type: none"> <li>▪ <i>Continue to update and estimate the cumulative benefits of sustained removals of northern pikeminnow since 1990. (Initiate in FY 2007-2009 Projects)</i></li> </ul>   | <ul style="list-style-type: none"> <li>▪ 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</li> </ul>  |

## Research, Monitoring, and Evaluation Actions

| RPA No.  | Action Description  | 2008 Actions/Accomplishments  |
|--|---|---|
| <b>RME Strategy 7—Predation and Invasive Species Management Research, Monitoring, and Evaluation</b> |   |   |
|  |   | <p>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.</p>  |
|  | <ul style="list-style-type: none"> <li>▪ <i>Continue to evaluate if inter and intra compensation is occurring. (Initiate in FY 2007-2009 Projects)</i></li> </ul>   | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul>   |
|  | <ul style="list-style-type: none"> <li>▪ <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></li> </ul> | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul> |
|  | <ul style="list-style-type: none"> <li>▪ <i>Develop a study plan to review, evaluate, and develop strategies to reduce non-indigenous piscivorous predation. (Initiate in FY 2007-2009 Projects)</i></li> </ul>   | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul>   |

## Research, Monitoring, and Evaluation Actions

| RPA No.  | Action Description  | 2008 Actions/Accomplishments   |
|--|---|--|
| <b>RME Strategy 8—Coordination and Data Management Research, Monitoring, and Evaluation</b>  |   |  |
| <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><b>Coordination</b><br/> <i>The Action Agencies will coordinate RM&amp;E activities with other Federal, State and Tribal agencies on an ongoing annual basis, including:</i></p>   |  |
|  | <ul style="list-style-type: none"> <li>▪ <i>Organizing and supporting the Corps AFEP.</i></li> </ul>  | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul> |
|  | <ul style="list-style-type: none"> <li>▪ <i>Supporting and participating in the Council's Columbia River Basin Fish and Wildlife Program project planning and review efforts.</i></li> </ul>  | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul>  |
|  | <ul style="list-style-type: none"> <li>▪ <i>Supporting the standardization and coordination of tagging and monitoring efforts through participation and leadership in regional coordination forums such as PNAMP.</i></li> </ul>  | <ul style="list-style-type: none"> <li>▪ Five BPA projects were initiated to support the standardization and coordination of tagging and monitoring efforts.</li> </ul>  |
|  | <ul style="list-style-type: none"> <li>▪ <i>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.</i></li> </ul> | <ul style="list-style-type: none"> <li>▪ Thirteen BPA projects were implemented to support this RPA.</li> </ul>  |

## Research, Monitoring, and Evaluation Actions

| RPA No.   | Action Description   | 2008 Actions/Accomplishments   |
|---|--|--|
| <b>RME Strategy 8—Coordination and Data Management Research, Monitoring, and Evaluation</b> |  |  |
|   | <ul style="list-style-type: none"> <li>▪ <i>Coordinating the further development and implementation of Hydrosystem, Tributary Habitat, Estuary/Ocean, Harvest, Hatchery, and Predation RM&amp;E through leadership and participation in ongoing collaboration and review processes and workgroups.</i></li> </ul>  | <ul style="list-style-type: none"> <li>▪ Five BPA projects were implemented to support the ongoing BiOp RPA RME work group implementation processes.</li> </ul>  |
|   | <ul style="list-style-type: none"> <li>▪ <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></li> </ul>  | <ul style="list-style-type: none"> <li>▪ 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.</li> </ul> |
| 72  | <p><b>Data Management</b><br/> <i>The Action Agencies will ensure that the information obtained under the auspices of the FCRPS RM&amp;E Program is archived in appropriate data management systems. Actions include:</i></p>  |  |
|   | <ul style="list-style-type: none"> <li>▪ <i>Continue to work with regional, Federal, State and Tribal agencies to establish a coordinated and standardized information system network to support the RM&amp;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&amp;E pilot studies in the Wenatchee River, John Day River, Upper Salmon River, and Columbia River Estuary. (Initiate in FY 2007-2009 Projects)</i></li> </ul> | <ul style="list-style-type: none"> <li>▪ Twelve projects were implemented to support development of a coordinated and standardized information management network.</li> </ul>  |
|   | <ul style="list-style-type: none"> <li>▪ <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&amp;E. (Initiate in FY 2007-2009 Projects)</i></li> </ul>   | <ul style="list-style-type: none"> <li>▪ 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).</li> </ul>                  |

## Research, Monitoring, and Evaluation Actions

| RPA No.   | Action Description   | 2008 Actions/Accomplishments   |
|---|--|--|
| <b>RME Strategy 8—Coordination and Data Management Research, Monitoring, and Evaluation</b> |  |  |
|   | <ul style="list-style-type: none"> <li>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)</li> </ul> | <ul style="list-style-type: none"> <li>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.</li> </ul> |

## Research, Monitoring, and Evaluation Actions

| RPA No.   | Action Description  | 2008 Actions/Accomplishments   |
|---|---|--|
| <b>RME Strategy 9—Project Implementation and Compliance Monitoring Research, Monitoring, and Evaluation</b>   |   |  |
| <p><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></p> |   |  |
| 73  | <p><b>Implementation and Compliance Monitoring</b><br/>The Action Agencies will:</p>  |  |
|   | <ul style="list-style-type: none"> <li>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.</li> </ul>   | <ul style="list-style-type: none"> <li>BPA implemented the Pisces program to track project implementation to support compliance and project effectiveness evaluations.</li> </ul>  |
|   | <ul style="list-style-type: none"> <li>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.</li> </ul> | <ul style="list-style-type: none"> <li>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.</li> </ul> |

## Research, Monitoring, and Evaluation Actions

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

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

## **Detailed Description of Reasonable and Prudent Alternative (RPA) Action Implementation**

Under the second Reasonable and Prudent Alternative (RPA) action, the Action Agencies are required to submit an annual progress report that describes the status of implementation for the previous calendar year. Section 3 describes this progress for each RPA action. Section 4 includes a list of all projects implemented in 2008 along with their associated RPA subactions.

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## Hydropower Implementation Reports, RPAs 4–32

This document reports on actions taken during calendar year 2008, which includes the first 7 months of the 10-year Biological Opinion (BiOp) period. The Hydropower RPA actions are intended to be implemented over the term of the BiOp. Although many of these actions were under way or being implemented during 2008, some will be implemented later in the BiOp period. For hydro operations, actions are reported by water year (October thru September) rather than calendar year because this is more meaningful.

**Table 1. Hydropower Strategy Requirements**

| RPA No.                      | Action                                     | Annual Progress Report Requirement   |
|------------------------------|--|--|
| <b>Hydropower Strategy 1</b> |  |  |
| 4                            | Storage Project Operations                 | Prepare an annual year-end review.   |
| 5                            | Lower Columbia and Snake River Operations  | Prepare an annual year-end review.   |
| 6                            | In-Season Water Management                 | Annual progress reports will describe Federal Columbia River Power System (FCRPS) operations for the fish passage season. There is no other physical or biological monitoring or reporting.  |
| 7                            | Forecasting and Climate Change/Variability | Annual progress reports will include a summary of the annual forecast review and any new, pertinent climate change information or research.  |
| 8                            | Operational Emergencies                    | Annual progress reports will describe any emergency situations and actions taken per the emergency protocols. There is no other physical or biological monitoring or reporting.  |
| 9                            | Fish Emergencies                           | Annual progress reports will describe any fish emergency situations and actions taken. There is no other physical or biological monitoring or reporting.   |
| 10                           | Columbia River Treaty Storage              | Annual progress reports will describe actions taken to provide 1 million acre-feet (MAF) of storage in treaty space. There is no other physical or biological monitoring or reporting.   |
| 11                           | Non-Treaty Storage (NTS)                   | Annual progress reports will describe actions taken to refill non-treaty storage space. There is no other physical or biological monitoring or reporting.  |
| 12                           | Non-Treaty Long-Term Agreement             | Annual progress reports will describe actions taken to develop long-term and/or annual agreements that affect lower Columbia River flows during the April through August period. There is no other physical or biological monitoring or reporting. |

**Table 1. Hydropower Strategy Requirements**

| <b>RPA No.</b> | <b>Action</b>  | <b>Annual Progress Report Requirement</b>   |
|----------------|--|---|
| 13             | Non-Treaty Coordination with Federal Agencies, States, and Tribes  | Annual progress reports will describe actions to coordinate non-treaty storage agreements. There is no other physical or biological monitoring or reporting.                                    |
| 14             | Dry Water Year Operations  | Annual progress reports will describe actions taken during dry water years. There is no other physical or biological monitoring or reporting.   |
| 15             | Water Quality Plan for Total Dissolved Gas and Water Temperature in the Mainstem Columbia and Snake Rivers | Annual progress reports will describe actions taken to implement Endangered Species Act (ESA) commitments. There is no other physical or biological monitoring or reporting.                    |
| 16             | Tributary Projects   | Status of the consultations for Reclamation's tributary projects will be provided in the annual progress reports.   |
| 17             | Chum Spawning Flows  | Annual progress reports will describe in-season water management actions taken during the water year, which includes part of the previous calendar year.  |
| 18             | Configuration and Operational Plan for Bonneville Project  | Annual progress reports will describe status of the actions taken in the Configuration and Operational Plan (CO)P and the results of the associated research, monitoring, and evaluation (RME). |
| 19             | Configuration and Operational Plan for the Dalles Project  | Annual progress reports will describe the status of the actions taken in the COP and the results of the associated RME.   |
| 20             | Configuration and Operational Plan for John Day Project  | Annual progress reports will describe the status of the actions taken in the COP and the results of the associated RME.   |
| 21             | Configuration and Operational Plan for McNary Project  | Annual progress reports will describe the status of the actions taken in the COP and the results of the associated RME.   |
| 22             | Configuration and Operational Plan for Ice Harbor Project  | Annual progress reports will describe the status of the actions taken in the COP and the results of the associated RME.   |
| 23             | Configuration and Operational Plan for Lower Monumental Project  | Annual progress reports will describe status of the actions taken in the COP and the results of the associated RME  |
| 24             | Configuration and Operational Plan for Little Goose Project  | Annual progress reports will describe the status of the actions taken in the COP and the results of the associated RME.   |
| 25             | Configuration and Operational Plan for Lower Granite Project   | Annual progress reports will describe the status of the actions taken in the COP and the results of the associated RME.   |

**Table 1. Hydropower Strategy Requirements**

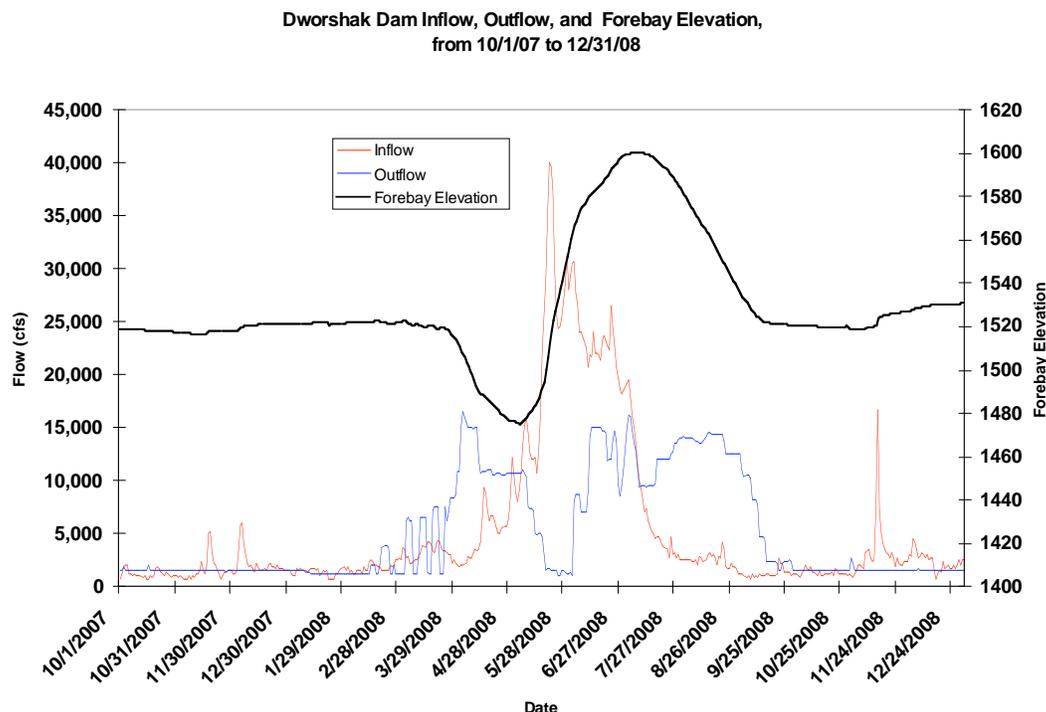
| <b>RPA No.</b>               | <b>Action</b>   | <b>Annual Progress Report Requirement</b>   |
|------------------------------|---|---|
| 26                           | Chief Joseph Dam Flow Deflector                               | Annual progress reports will describe the status of the flow deflector construction. Note: This construction project was completed in spring 2009.        |
| 27                           | Turbine Unit Operations                                       | Annual progress reports are developed by Bonneville Power Administration (BPA).   |
| <b>Hydropower Strategy 2</b> |   |   |
| 28                           | Columbia and Snake River Project Adult Passage Improvements   | Annual progress reports will describe the status of the actions taken.  |
| <b>Hydropower Strategy 3</b> |   |   |
| 29                           | Spill Operations to Improve Juvenile Passage                  | Spill operations are reported annually.   |
| 30                           | Juvenile Fish Transportation in the Columbia and Snake Rivers | Annual progress reports will provide the number of fish collected and transported in an annual report each February.                                      |
| 31                           | Configuration and Operational Plan Transportation Strategy    | Annual progress reports will describe the status of the construction and operational actions and associated RME to support the transportation strategy.   |
| <b>Hydropower Strategy 4</b> |   |   |
| 32                           | Fish Passage Plan   | Not applicable.   |
| <b>Hydropower Strategy 5</b> |   |   |
| 33                           | Snake River Steelhead Kelt Management Plan                    | Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans. |

### *Hydropower Strategy 1 (RPA Actions 4–27)*

*RPA Action 4 – Storage Project Operations: The Action Agencies will operate the FCRPS storage projects (Libby, Hungry Horse, Albeni Falls, Grand Coulee, and Dworshak projects) for flow management to aid anadromous fish. 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.*

The FCRPS storage projects were operated in compliance with the 2008 Water Management Plan (WMP, at [http://www.nwd-wc.usace.army.mil/tmt/documents/wmp/2008/final/wmp\\_final\\_20080402.pdf](http://www.nwd-wc.usace.army.mil/tmt/documents/wmp/2008/final/wmp_final_20080402.pdf)), which was developed in the fall of 2007 with full regional coordination. The 2008 FCRPS 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 of the operations of the projects are shown in Figures 1 through 4 and described below. Further discussion of these operations is included

Dworshak Dam



**Figure 1. Dworshak Dam Inflow, Outflow, and Forebay Elevation from October 1, 2007, through December 31, 2008.**

From October 2007 through February 2008, Dworshak Dam released the minimum flow requirements of approximately 1,500 cubic feet per second (cfs). Beginning in March, discharges were increased because of a 72 thousand acre-feet (kaf) increase in the April through July forecast. By March 30, 147 kaf of system flood control space was shifted to Grand Coulee. The April 1 forecast was 3,010 kaf, or 112 percent of average. To meet the shifted April 15 target elevation of 1,501.4 feet (a shift of 500 kaf), releases were increased to 15,000 cfs April 2 to April 10 and then decreased to power plant capacity (10,400 cfs). The average release for April was approximately 12,000 cfs, and the forebay elevation for Dworshak was 1,476.1 feet on April 30. Dworshak was operated to standard flood control criteria during the winter and spring flood control season.

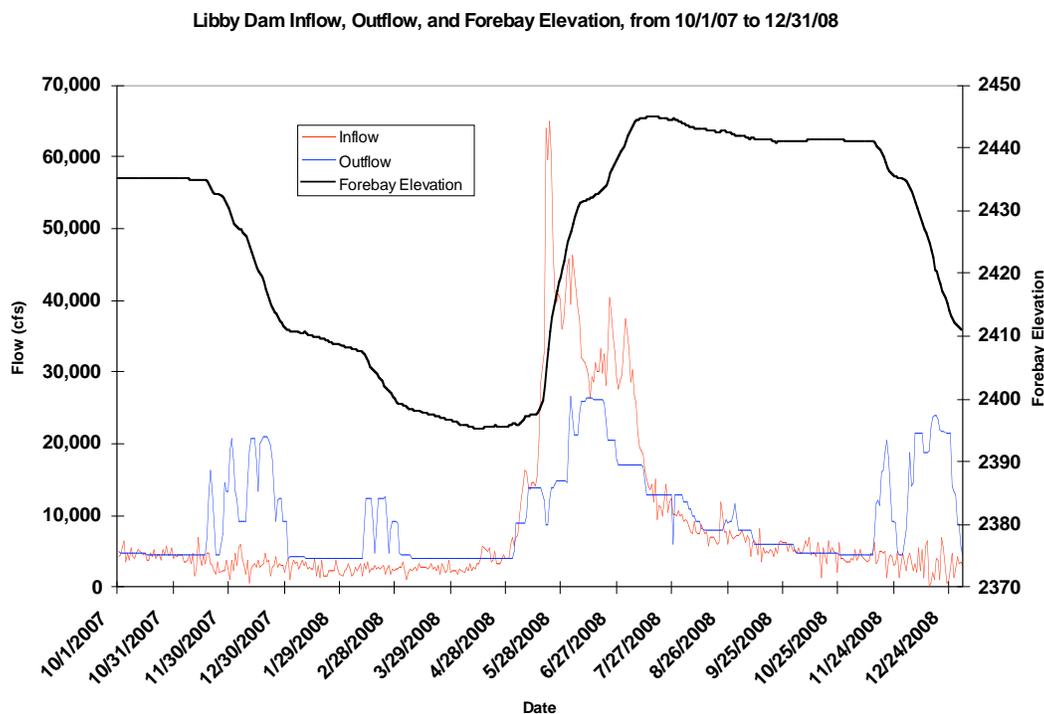
The start of refill began on May 15, when Dworshak began operating according to Flood Control/Refill Curve procedures. Releases from Dworshak Dam in May averaged 5,000 cfs. The May forecast for the May to July inflow volume was 2,680 kaf, which was 135 percent of average. During April and May, the inflows averaged 5,400 cfs and 21,400 cfs, respectively. Dworshak reached full levels (maximum elevation of 1,599.9 feet) on July 7.

The reservoir began drafting on July 8 to provide temperature and flow augmentation for the lower Snake. Discharges for salmon flow augmentation did not exceed the Idaho state total dissolved gas (TDG) standard of 110 percent. Because of rising temperatures, discharge was increased on July 17 from 9.7 thousand cfs (kcfs) to 12 kcfs. Summer temperature augmentation was successful, maintaining Lower Granite tailwater temperatures below 68 degrees Fahrenheit throughout the summer. The maximum Lower Granite tailwater temperature recorded in 2008 was 67.7 degrees. By

August 31, the reservoir was drafted to elevation 1,535.3 feet, despite a mechanical failure that resulted in loss of the use of Regulating Outlet 2 and limited discharges through the other two regulating outlets. September operations followed the Nez Perce 200 kaf operational plan for 2008, with discharges reduced from 10 kcfs to minimum flows in approximately 2-kcfs increments. The reservoir reached 1,520 feet on September 28.

From October to December, Dworshak released minimum flows of 1,500 cfs, except during brief periods of turbine testing following normal maintenance activities. During all periods when Dworshak was releasing minimum flow, the total dissolved gas was maintained below the Idaho state standard of 110 percent. Winter flood control started on December 15, with Dworshak Reservoir 28.7 feet below the flood control elevation of 1,558.2 feet.

### Libby Dam



**Figure 2. Libby Dam Inflow, Outflow, and Forebay Elevation from October 1, 2007, through December 31, 2008.**

From January through April 2008, Libby Dam released the minimum flow of 4,000 cfs, except for February when flows averaged 7,970 cfs. The increase was due to a fairly significant increase in the forecast of 200 kaf. To meet the April 10 target elevation of 2,401.8 feet, Libby operated at the 4,000 cfs minimum, and the forebay elevation for Libby was 2,395.3 feet on April 10.

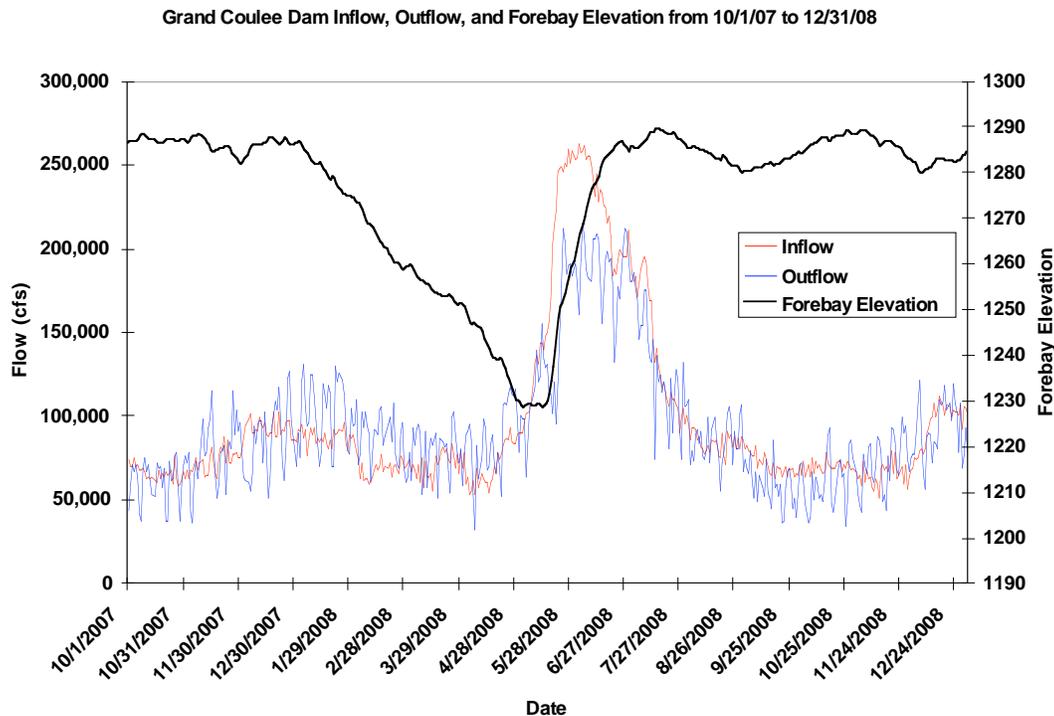
Libby operated consistent with the variable outflow flood control procedures (VARQ) that were incorporated into RPA Action 4 of the 2008 BiOp. The start of refill was declared on May 15, with outflows averaging 13,500 cfs for the remainder of May. The project was then operated to provide tiered white sturgeon augmentation volumes to achieve habitat attributes for sturgeon spawning/recruitment shaped through coordination with the regional Technical Management Team (TMT) and consistent with the portion of the 2008 BiOp RPA action regarding May, June, and July operations (FWS 2006). The May forecast for the April through August inflow volume was 6,128 kaf,

which set the sturgeon volume at 1.04 MAF and established the tiered bull trout minimum flows from the end of the sturgeon pulse through August 31 to 8,000 cfs. The sturgeon pulse started June 1 and used the entire volume of 1.04 MAF through June 26. The pulse included 14 days at Libby's full powerhouse and an additional 6 days above 20,000 cfs on the descending limb. Libby reached a maximum elevation of 2,444.8 feet on July 17 and technically did not refill. This was due to colder than average temperatures in June for a 2-week period that dropped inflows to Lake Koochanusa and caused some of the headwaters' snowpack to sublimate.

For the remainder of the summer, Libby Dam was regulated to meet the rollover operations based on the 2000 NOAA FCRPS BiOp requirement to draft to 2,439 feet by August 31. The objective was to provide even or gradually declining flows following sturgeon flows during the summer months. This operation was discussed and approved by the TMT. Libby also was used in a swap between Libby Dam and Arrow Reservoir in Canada. The swap enabled Libby to store an additional 120 kaf—or an extra 2.8 feet—on top of the 2,439-foot target by the end of August, which changed the end-of-August elevation target to 2,441.8 feet. On August 31, the elevation at Libby Dam was 2,441.76 feet. Through September, Libby operated to the minimum bull trout flow of 6,000 cfs.

From October to December 2008, Libby was regulated to meet the projected end-of-December For the remainder of the summer, Libby Dam was regulated to meet the rollover operations based on the 2000 NOAA FCRPS BiOp requirement to draft to 2,439 feet by August 31.<sup>1</sup> The objective was to provide even or gradually declining flows following sturgeon flows during the summer months. This operation was discussed and approved by the TMT. Libby also was used in a swap between Libby Dam and Arrow Reservoir in Canada. The swap enabled Libby to store an additional 120 kaf—or an extra 2.8 feet—on top of the 2,439-foot target by the end of August, which changed the end-of-August elevation target to 2,441.8 feet. On August 31, the elevation at Libby Dam was 2,441.76 feet. Through September, Libby operated to the minimum bull trout flow of 6,000 cfs.

<sup>1</sup> The operation described here differs from that described in the 2008 NOAA FCRPS BiOp. The 2008 BiOp was released in May, a month following release of the 2008 operation plan by the regional TMT. Therefore, the TMT decided to follow the original 2000 BiOp guidance.



**Figure 3. Grand Coulee Dam Inflow, Outflow, and Forebay Elevation from October 1, 2007, through December 31, 2008.**

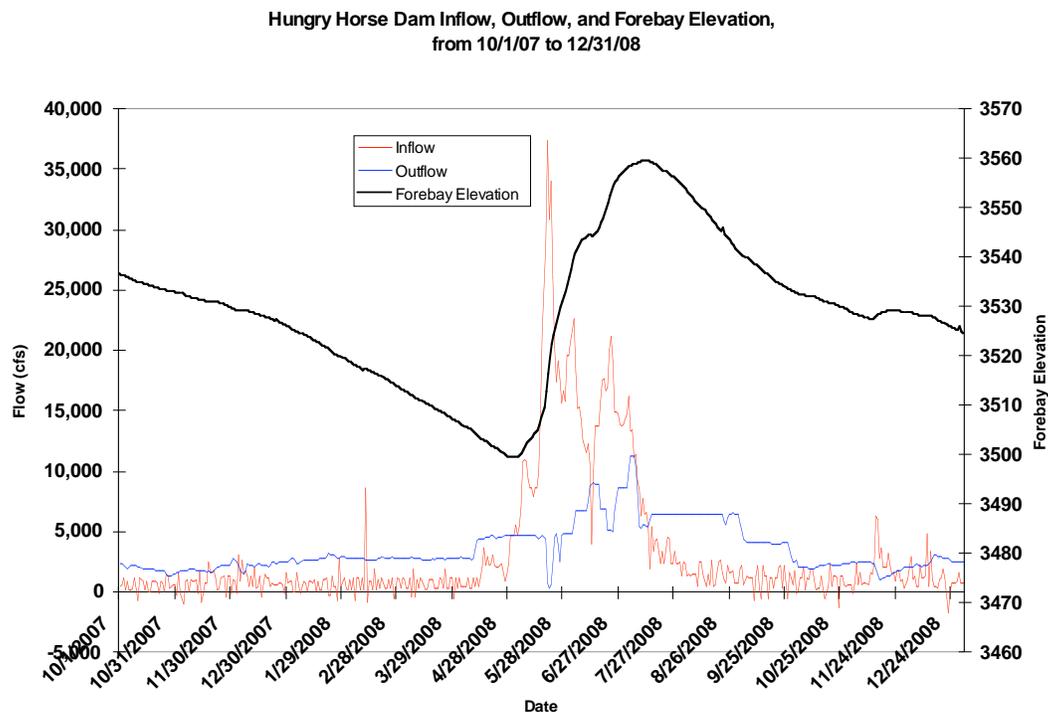
From October to December 2008, Libby was regulated to meet the projected end-of-December target, to optimize for power any draft to meet the December flood control target, and to limit any fluctuations by operating to the ramping rates in the 2006 U.S. Fish and Wildlife Service (USFWS) BiOp. The project followed the end-of-December variable flood control draft based on the December early season forecast. This forecast was 5,944 kaf for the April-to-August inflow volume forecast. This forecast set the end-of-December flood control target at 2,411 feet. Actual elevation on December 31 was 2,410.9 feet. Throughout 2008, Libby Dam avoided spill and did not violate the Montana state total dissolved gas standard of 110 percent. In accordance with the 2008 BiOp, Libby Dam also was regulated consistently with the Columbia River Treaty, the International Joint Commission, and the 1938 Order on Kootenay Lake.

Grand Coulee was operated during November and December of 2007 to help support chum spawning below Bonneville Dam and to help maintain the chum redd protection tailwater below Bonneville Dam of 11.5 feet through the winter of 2008. Also during this period, Grand Coulee was operated to help support the Vernita Bar protection flows of 50 kcfs. The project was operated using standard flood criteria, which included accepting a 147-kaf shift of flood control space from Dworshak on March 31 and a 500-kaf shift by April 15. Water supply forecasts for the basin above Grand Coulee during the April to September period were at 98 percent of average in January and 99 percent of average in June. To provide water for spring flows, Grand Coulee met the April 10 elevation objective of 1,244.5 feet and then drafted to 1,229.95 feet on April 30. In response to System Operations Request (SOR) 2008-2, Grand Coulee was drafted to provide flows to support McNary Dam flow objectives until the spring freshet began reaching minimum elevation of 1228.2 feet on May 3. Because of the flood

control draft, the Bureau of Reclamation was able to perform drum gate maintenance at Grand Coulee in 2008.

During the refill, there were periods of high flows and elevated TDG because of forced spill in the Columbia River. To minimize downstream spill and TDG production in the Columbia River, operations were coordinated through the TMT and in accordance with the 2008 Total Dissolved Gas Management Plan (Appendix 4 of the 2008 Water Management Plan). Grand Coulee refilled to elevation 1,290 feet on July 14, as coordinated through the TMT and then began drafting for summer flow augmentation. Grand Coulee hit its elevation target of 1,280 feet on August 31. Pumping was reduced to Banks Lake during August, and Banks Lake reached an elevation of 1,565.1 feet on August 31.

### *Hungry Horse Dam*



**Figure 4. Hungry Horse Dam Inflow, Outflow and Forebay Elevation from October 1, 2007, through December 31, 2008.**

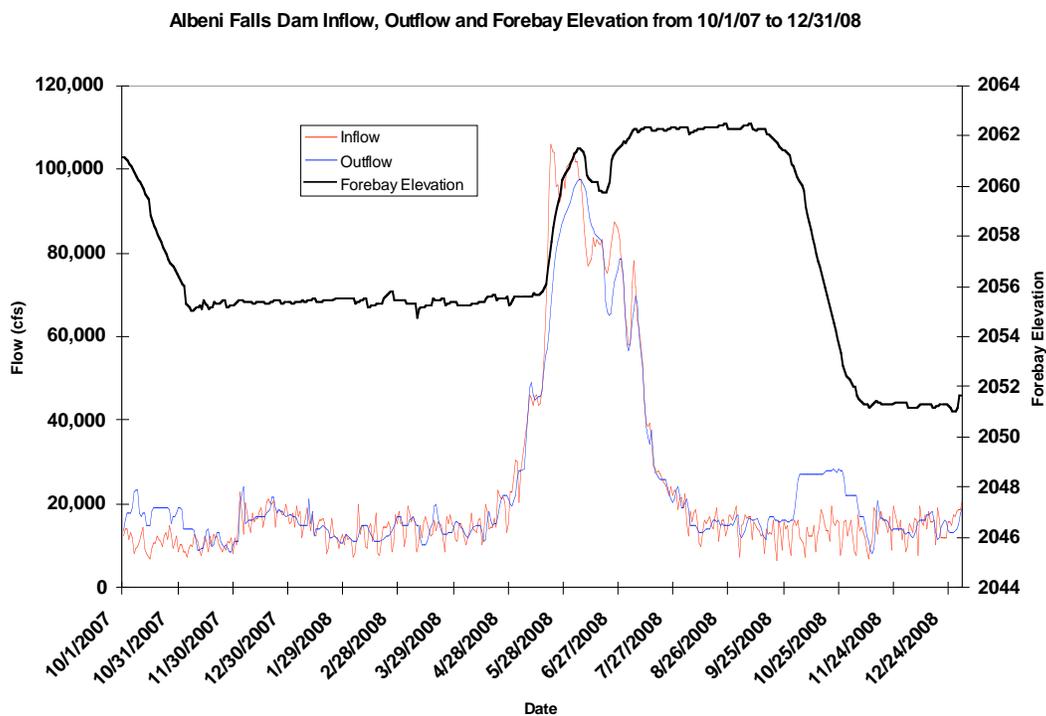
Hungry Horse was operated through fall 2007 and throughout 2008 to maintain the minimum flow requirements of 3,500 cfs at Columbia Falls and 900 cfs in the South Fork Flathead River. Minimum flows were for ESA-listed bull trout and were calculated from a sliding scale based on the Hungry Horse inflow volume forecast. Hungry Horse operations in 2008 followed VARQ flood control procedures. The water supply forecast for Hungry Horse inflow from May to September was at 100 percent of average in January and increased to 116 percent of average by May. Hungry Horse was drafted to elevation 3,504.67 feet by April 10 for minimum flow requirements at Columbia Falls. The April 10 elevation target was 3,528.3 feet. Flows were increased to around 5 kcfs by April 11 to target refill and to shape the discharges into the spring migration period. Discharges were decreased twice in May for local flood protection on the mainstem of the Flathead River. During refill and throughout the 2008 water year, Hungry Horse was operated to avoid spill and to limit TDG production in the South Fork of the Flathead River to below Montana’s standard of 110 percent. Hungry Horse also was

operated using the ramping rates as prescribed in the 2000 BiOp (FWS 2000). Hungry Horse refilled to elevation 3,559.04 feet on July 13 and then began drafting for summer flow augmentation.

Hungry Horse was operated to provide a stable flow operation during the summer flow augmentation period. The actual operation, which was coordinated through the Regional Forum, was a stable flow of 6.5 kcfs through August 31. Discharges were decreased temporarily August 23 to 24 to recover a drowning victim in the South Fork of the Flathead River below Hungry Horse Dam. Hungry Horse reached an elevation of 3541.02 feet on August 31.

Discharges ramped down from 6.5 kcfs to 4 kcfs between September 1 and 4 and were maintained at 4 kcfs until September 26. Flows were then ramped down to Columbia Falls minimum flow by October 1. The flat-flow operation through most of September, which is considered beneficial for resident fisheries, was coordinated with Montana.

### Albeni Falls



**Figure 5. Albeni Falls Dam Inflow, Outflow and Forebay Elevation from October 1, 2007, through December 31, 2008.**

The project was operated to standard flood control criteria. Lake Pend Oreille was drawn down to a minimum control elevation (MCE) of 2,055 feet for kokanee spawning in November 2007 after inter-agency coordination consistent with the USFWS' 2000 FCRPS BiOp (FWS 2000). The lake was operated between elevations 2055 and 2056 feet for kokanee incubation from January through April in 2008. Refill of Lake Pend Oreille started May 1, and the lake reached its target elevation 2062.25 feet in early July. For the remainder of the summer and through September, the lake elevation was maintained at between 2,062 and 2,062.5 feet. The lake was drawn down from October through November to reach an MCE of 2,051 feet, as determined through interagency coordination for kokanee spawning. The lake elevation was then held through December at between 2,051 and 2,051.5 feet

until the Idaho Department of Fish and Game declared the end of kokanee spawning on December 24. After the end of spawning was declared, the lake was managed to between 2,051 and 2,052 feet.

*RPA Action 5 – Lower Columbia and Snake River Operations: The Action Agencies will operate the FCRPS run-of-river mainstem lower Columbia River and Snake River projects (Bonneville, The Dalles, John Day, McNary, Ice Harbor, Lower Monumental, Little Goose and Lower Granite projects) to minimize water travel time through the lower Columbia and Snake rivers to aid in juvenile fish passage. These run-of-river operations will be included in the annual WMP (see RPA Action 6).*

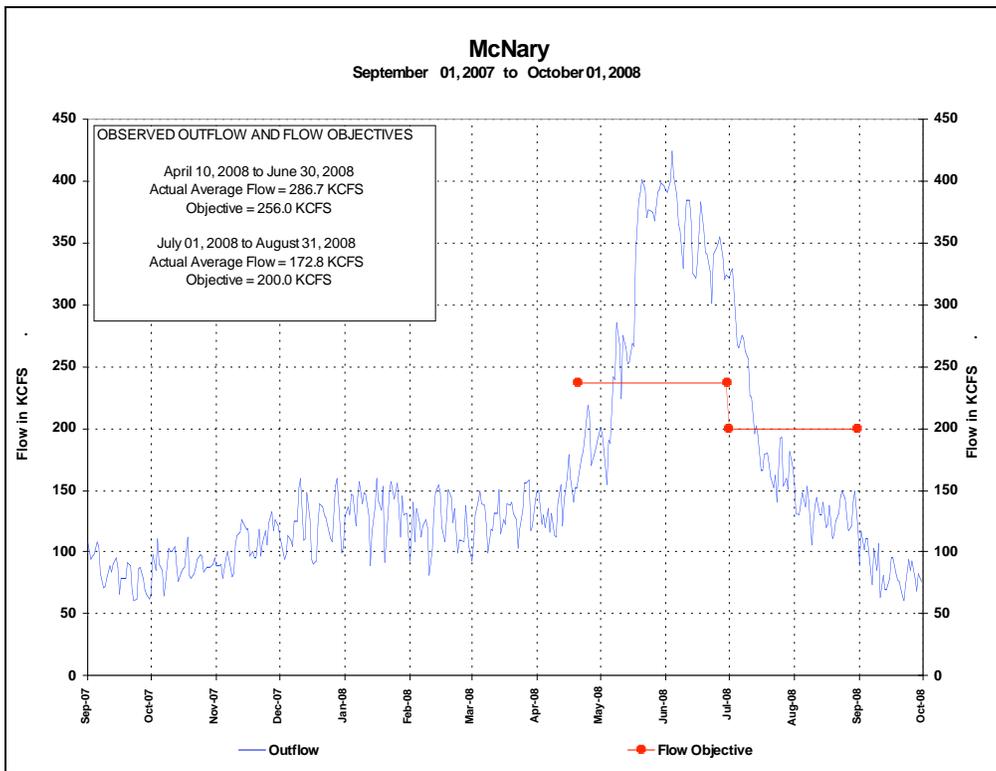
The 2008 WMP included operations for these run-of-river projects. The projects were operated consistent with the WMP to minimize water travel time through the lower Columbia and Snake rivers to aid in juvenile fish passage and water temperature management. River operators do as much as possible to manage flows to help fish, while also managing for flood risk. Specific operating rules, including earmarking amounts of water for fish flows, are used at individual reservoirs to provide salmon flows, protect resident fish, control floods, and operate for other authorized purposes. Further discussions of these operations are included in the minutes of the TMT meeting “Annual Review of Lessons Learned 2008” at <http://www.nwd-wc.usace.army.mil/tmt/agendas/2008/1121min.pdf>

Lower Monumental and Ice Harbor projects operated from minimum operating pool (MOP) to MOP + 1 foot from April 3 through September 10. Before and after those dates, the projects operated in their full operating ranges. Lower Granite project operated from MOP to MOP + 1 foot from April 3 through September 10 and, after that, operated at elevation 734.5 to 738 feet to support broodstock collection. Little Goose project operated from MOP to MOP + 1 foot from April 3 through September 10 and, after that date, operated at elevation 633.5 to 638 feet, then 634 to 638 feet on September 12 for navigation safety. In a few instances, pool levels exceeded MOP criteria at Little Goose. This was due to the need to provide safe navigation conditions in the Little Goose pool, especially at the downstream sill of the Lower Granite navigation lock.

John Day Dam was operated at 262.5 to 264 feet from April 10 through September 30.

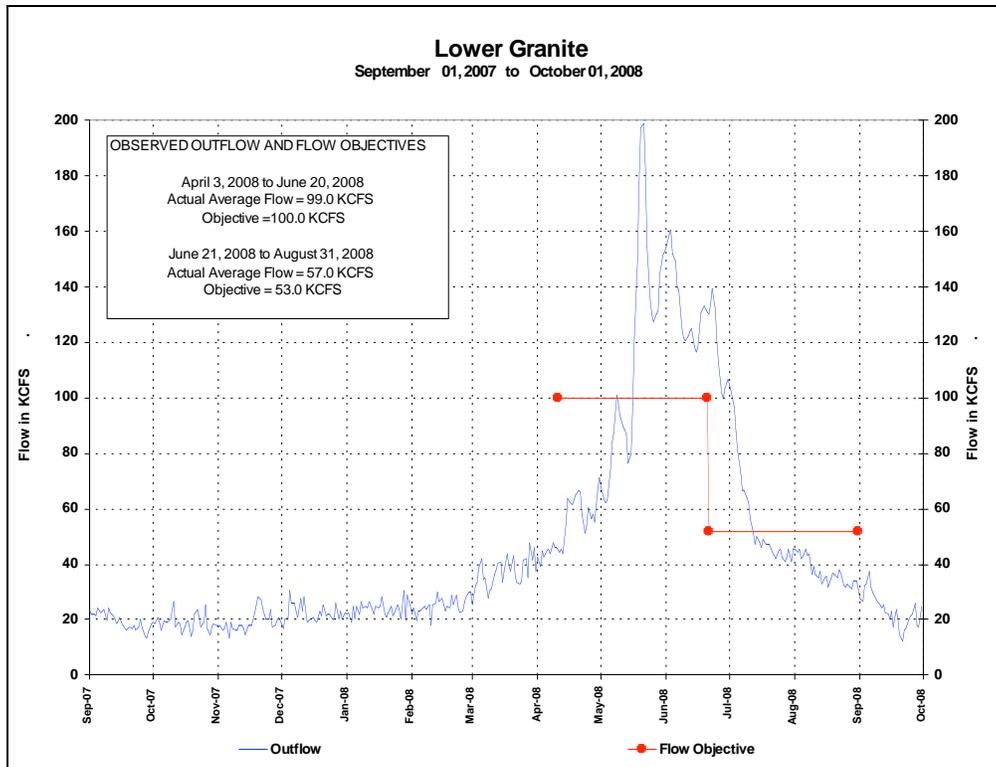
The storage projects in the Columbia and Snake rivers systems, which are describe under RPA 4 above, have limited ability to shape natural runoff. This limited storage capability can be managed to make modest adjustments in river flows for fish but cannot convert a dry water year into a much better one or save water from a wet year for future dry years. As a result, flow objectives for juvenile fish are goals that cannot be physically achieved under many conditions. The flow objectives were used for pre-season planning and in-season water management to guide decision making. Figures 6, 7, and 8 show the observed outflow at McNary, Lower Granite, and Priest Rapids relative to the flow objectives.

In 2008, the Columbia River had an average water year. During the spring, flows were low through mid-April and gradually increased through mid-May before increasing substantially in late May. Flows remained high from late May through mid-June before receding to low-flow conditions by mid-July. Flows remained low through the rest of the fish passage season.



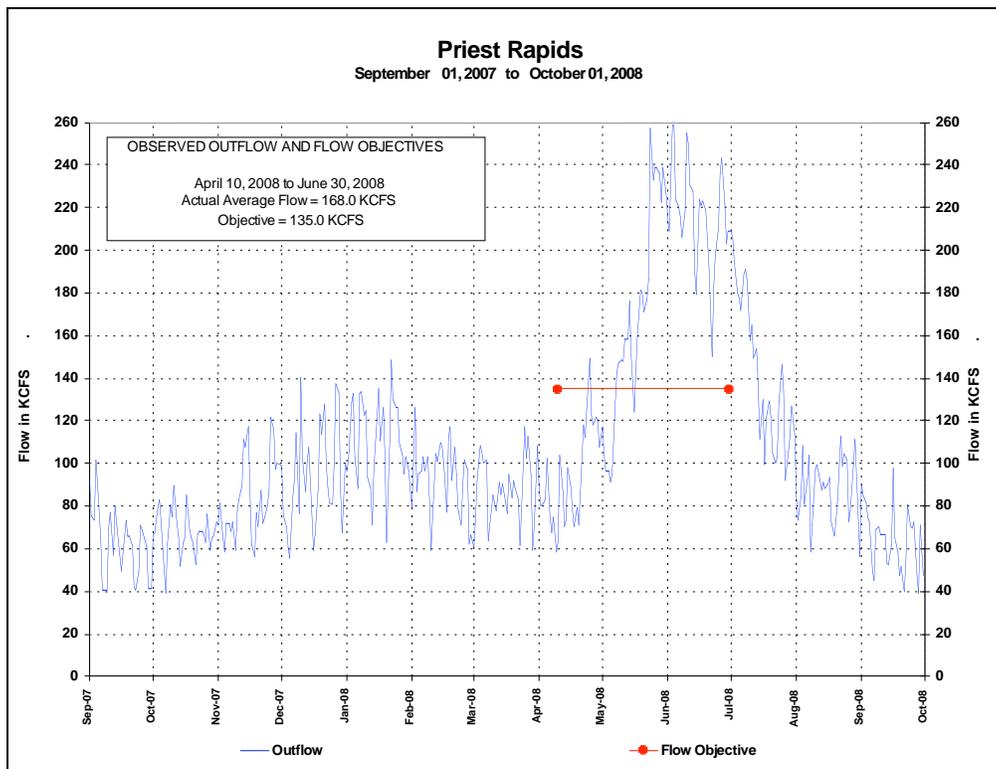
**Figure 6. McNary Dam, Observed Outflow and Flow Objectives.**

The flow objectives are not intended to be achieved in most water conditions; rather they are used for pre-season planning and in-season water management to guide decision making.



**Figure 7. Lower Granite Dam, Observed Outflow and Flow Objectives.**

The flow objectives are not intended to be achieved in most water conditions; rather they are used for pre-season planning and in-season water management to guide decision making.



**Figure 8. Priest Rapids Dam, Observed Outflow and Flow Objectives.**

The flow objectives are not intended to be achieved in most water conditions; rather they are used for pre-season planning and in-season water management to guide decision making.

*RPA Action 6 – In-Season Water Management:* Prioritization of the use of flow augmentation water is done through in-season management by the Regional Forum. 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. A draft update of the WMP will be prepared by October 1 each year, with a final plan completed by January 1. The fall/winter update to the WMP will be drafted by November 1 and finalized by January 1. A draft of the spring/summer update to the WMP will be prepared by March 1 and finalized by May 15.

The annual Water Management Plan for the 2008 operating season (October 1, 2007, through September 30, 2008) was developed collaboratively with the region prior to the issuance of the 2008 FCRPS BiOp. The 2008 FCRPS BiOp was issued in May 2008; however, as described above, the court ordered a continuation of 2007 operations. Therefore, there were differences between the 2008 WMP and the 2008 BiOp.

The WMP for the 2009 operating season (October 1, 2008, through September 30, 2009) was prepared in accordance with the 2008 BiOp requirements. A draft was released on October 1, 2008; the fall/winter update was released on November 20. The final WMP was released on December 31 (Action Agencies 2008b), and the final fall/winter update was released on May 15, 2009.

*RPA Action 7 – Forecasting and Climate Change/Variability:* The Action Agencies will hold annual forecast performance reviews looking at in-place tools for seasonal volume forecasts and to report on the effectiveness of experimental or developing/emerging technologies and procedures. As new procedures and techniques become available and are identified to have significant potential to reduce forecast error and improve the reliability of a forecast, the Action Agencies will discuss the implementation possibilities with regional interests. The purpose is to improve upon achieving upper rule curve elevations by reducing forecasts errors and thereby providing for improved spring flows. The Action Agencies will work collaboratively with other agencies and research institutions to investigate the impacts of

possible climate change scenarios to the Pacific Northwest and listed salmon and steelhead. Focus areas will cover 1) modeling the hydrology and operations of the Columbia River system using possible future climate change scenarios, 2) investigating possible adaptation strategies for the system, 3) monitoring the hydrologic system for trends, cycles, and changes, and 4) staying abreast of research and studies that address climate cycles, trends, and modeling.

The Action Agencies and Fish Accord partners formed the Columbia River Forecast Group (CRFG), whose purpose is to promote and support the advancement of forecasting skill, products, and techniques in the Columbia River basin to improve reservoir operations for the benefit of the region. The group will provide an avenue for sharing, discussing, evaluating, and potentially implementing new forecasting techniques for the planning and operation of the FCRPS. The group's purview includes water supply, operational streamflow, and weather forecasting as it pertains to improving water supply and operational streamflow forecasting, hydrometeorological data quality and availability, and climate change. A key responsibility of the group will be to conduct an annual forecast performance workshop, slated for the fall of each year, to evaluate the performance of current and potential forecast techniques.

The CRFG began forming late in the year and met for the first time with only a core group in December 2008. The initial meeting focused on developing a charter and organizational structure, including a potential participant list. Because it was not possible to hold a fall 2008 workshop, the group decided that an interim workshop would be held in March 2009, with the intent to hold the full forecast performance workshop in either late October or early November 2009.

Recognizing the importance of assessing climate change impacts in reservoir models and water quality modeling, the Action Agencies provided funding and collaborative support to the Washington Department of Ecology (WDOE) to contract with the University of Washington's Climate Impacts Group (CIG) to develop climate change streamflow scenarios for the Columbia River basin. Understanding the development and appropriate application of these scenarios to regional modeling will aid in assessing the range and uncertainty associated with climate modeling and the potential impacts to the region's FCRPS BiOp recovery efforts. The scenarios defined under the WDOE contract were delivered in September 2009, and additional scenarios will be completed in the fall of 2009. All scenarios are being reviewed to ensure that they reflect scientifically sound methodologies for downscaling and bias correcting. The scenarios are a subset of the latest climate change models and emission scenarios produced under the Intergovernmental Panel on Climate Change (4th report).

*RPA Action 8 – Operational Emergencies: The Action Agencies will manage interruptions or adjustments in water management actions, which may occur due to unforeseen power system, flood control, navigation, dam safety, or other emergencies. Such emergency actions will be viewed by the Action Agencies as a last resort and will not be used in place of operations outlined in the annual WMP. Emergency operations will be managed in accordance with TMT Emergency Protocols, the Fish Passage Plan (FPP) and other appropriate Action Agencies emergency procedures. The Action Agencies will take all reasonable steps to limit the duration of any emergency impacting fish.*

No operational emergencies occurred in 2008.

*RPA Action 9 – Fish Emergencies: The Action Agencies will manage operations for fish passage and protection at FCRPS facilities. They may be modified for brief periods of time due to unexpected equipment failures or other conditions. These events can result in short periods when projects are operating outside normal specifications due to unexpected or emergency events. Where there are significant biological effects of more than short duration resulting from emergencies impacting fish, the Action Agencies will develop (in coordination with the in-season management Regional Forum 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 to limit emergency.*

Two "fish emergency" situations occurred during 2008, one at Bonneville Dam and one at Little Goose Dam:

*Bonneville Guidance Screen Removal.* Starting May 16, 2008, high juvenile fish descaling was observed at the Bonneville Second Powerhouse (PH2) smolt monitoring facility. Upon inspection of the

juvenile bypass system, the project staff discovered a heavy accumulation of small sticks, leaves, and other detritus on vertical barrier screens (VBSs) in the system. The screens are designed to guide migrating juvenile fish to the juvenile bypass system (JBS). Coinciding with these events was an increase in total river flows to above 300 kcfs and unusually high river debris levels. Sensors that normally would have alerted project operators to this problem were out of calibration. Additionally, project personnel were not able to keep up with screen cleaning because the turbine intake extension (TIE) crane— a critical component for cleaning screens—was out of service. While project personnel focused efforts on cleaning the VBSs, excessive debris was accumulating on other system components, such as adult ladder water supply intakes. Regional coordination occurred with the TMT on May 21. Subsequently, the U.S. Army Corps of Engineers, with support from all TMT members, elected to remove the JBS intake screens (submersible traveling screens, or STSs). With this operational adjustment, fish that would otherwise pass through the JBS pass instead through turbines. This action circumvented a potential VBS failure, eliminated fish exposure to plugged screens, allowed PH2 to operate at full capacity (thereby minimizing spill-generated total dissolved gas), and allowed project personnel to maintain other critical fish passage system components. A modeling analysis of removing the STSs under the current conditions suggested that the effect on overall survival would be negligible (< 0.1 percent change). On May 27, Operations Division and the Bonneville Project assessed river flows and debris and determined that the conditions were not suitable to reinstall the STSs. The decision on when to reinstall screens was coordinated through the TMT regional forum. All screens were installed in accordance with the Fish Passage Plan (FPP, at <http://www.nwd-wc.usace.army.mil/tmt/documents/fpp>) by June 18 and remained in place for the rest of the fish passage season.

*Little Goose Dam:* 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 TMT process.

*RPA Action 10 – Describe actions taken to provide 1 MAF of treaty storage:* BPA and the Corps will pursue negotiations with Canada of annual agreements to provide 1 MAF of storage in Treaty space by April 15 consistent with:

- Providing the greatest flexibility possible for releasing water to benefit U.S. fisheries May through July.
- Giving preference to meeting April 10 upper rule curve elevation or achieving refill at Grand Coulee Dam over flow augmentation storage in Canada in lower water supply conditions.
- Releasing flow augmentation storage to avoid causing damaging flow or excessive TDG in the United States or Canada.
- BPA and the Corps will coordinate with Federal agencies, States and Tribes on Treaty operating plans.

The Columbia River Treaty Operating Committee Agreement on Operation of Treaty Storage for Non-Power Uses for December 15, 2007, through July 31, 2008, was executed December 12, 2007. Under this agreement, 1 MAF of flow augmentation water was stored in Mica Reservoir during January 2008. All flow augmentation storage was released by June 30, 2008, under the Non-Power Uses Agreement. The Non-Power Uses Agreement for December 15, 2008, through July 31, 2009, was executed November 20, 2008.

*RPA Action 11 – Non-Treaty Storage:* 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.

Conditions were such that no Non-Treaty Storage was returned during the 2008 operating year (September 2007 - August 2008). However, because September 2008 falls within the period of this 2008 BiOp Progress Report, it should be noted that 52 thousand second-feet per day (ksfd) was stored into Non-Treaty storage and brought the U.S. account to 73 percent of full on September 30, 2008.

*RPA Action 12 – Non-Treaty Long-Term Agreement: BPA will seek to negotiate a new long-term agreement on use of non-Treaty space in Canada so long as such an agreement provides both power and non-power benefits for BC Hydro, BPA, and Canadian and U.S. interests. As part of these negotiations, BPA will seek opportunities to provide benefits to ESA-listed fish, consistent with the Treaty. If a new long-term, non-Treaty agreement is not in place, or does not address flows for fisheries purposes, BPA will approach BC Hydro about possibly negotiating an annual/seasonal agreement to provide U.S. fisheries benefits, consistent with the Treaty.*

Before approaching BC Hydro to negotiate a new long-term, non-treaty storage agreement, BPA has committed to the following:

- Substantial refilling the U.S. non-treaty storage 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
- Coordinating with tribes under the Fish Accords
- Establishing the collective U.S. interests in terms of such a new non-treaty storage (NTS) agreement

In addition, BC Hydro has agreed to coordinate with Canadian stakeholders on reservoir impacts in Canada. Stakeholder coordination in Canada and the United States could begin as early as fall 2009.

*RPA Action 13 – Non-Treaty Coordination with Federal Agencies, States, and Tribes: Prior to negotiations of new long-term or annual non-Treaty storage agreements, BPA will coordinate with Federal agencies, States, and Tribes to obtain ideas and information on possible points of negotiation, and will report on major developments during negotiations.*

No long-term or annual non-treaty storage agreements were negotiated.

*RPA Action 14 – Dry Water Year Operations: Flow management during dry years is often critical to maintaining and improving habitat conditions for ESA-listed species. A dry water year is defined as the lowest 20th percentile years based on the Northwest River Forecast Center's (NWRFC) averages for their statistical period of record (currently 1971 to 2000) using the May final water supply forecast for the April to August period as measured at The Dalles. The Action Agencies will complete the following activities to further the continuing efforts to address the dry flow years:*

- *Within the defined "buckets" of available water (reservoir draft limits identified in RPA Action 4), flexibility will be exercised in a dry water year to distribute available water across the expected migration season to optimize biological benefits and anadromous fish survival. The Action Agencies will coordinate use of this flexibility in the Regional Forum TMT.*
- *In dry water years, operating plans developed under the Treaty may result in Treaty reservoirs being operated below their normal refill levels in the late spring and summer, therefore, increasing flows during that period relative to a standard refill operation.*
- *Annual agreements between the U.S. and Canadian entities to provide flow augmentation storage in Canada for U.S. fisheries needs will include provisions that allow flexibility for the release of any stored water to provide U.S. fisheries benefits in dry water years, to the extent possible.*
- *BPA will explore opportunities in future long-term NTS storage agreements to develop mutually beneficial in-season agreements with BC Hydro to shape water releases using NTS space within the year and between years to improve flows in the lowest 20th percentile water years to the benefit of ESA-listed ESUs, considering their status.*
- *Upon issuance of the FCRPS Biological Opinion, the Action Agencies will convene a technical workgroup to scope and initiate investigations of*
- *Alternative dry water year flow strategies to enhance flows in dry years for the benefit of ESA-listed ESUs.*
- *In very dry years, the Action Agencies will maximize transport for Snake River migrants in early spring, and will continue transport through May 31.*
- *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.*

Because the 2008 water year did not meet the definition for a dry year, the dry year strategy was not implemented.

The Dry Year Strategy Work Group was to convene upon completion of the BiOp. The Action Agencies convened a Dry Year Strategy technical work group, which held its first meeting on July 17, 2008. Participants included Action Agencies, NOAA Fisheries, and representatives from the Colville and

Spokane tribes and Montana. Most of the discussion involved previous analyses of dry year operations and the need to evaluate biological effects. Numerous handouts were shared to refresh the participants' memories of the previous analyses conducted during the BiOp remand collaboration. Also, a biological team was formed to further discuss analytical methods for assessing biological effects.

The Dry Year Strategy Work Group met again on August 11, 2008. Additional participants at the second meeting included representatives from Oregon and the Northwest Power and Conservation Council (NPCC). Again, most of the discussion centered on previous analyses. Additionally, the group discussed and agreed to take more time to complete this work than was proposed in the Biological Assessment (BA) to allow participation by key stakeholders.

*RPA Action 15 – Water Quality Plan for Total Dissolved Gas and Water Temperature in the Mainstem Columbia and Snake Rivers: The Action Agencies will continue to update the Water Quality Plan for Total Dissolved Gas and Water Temperature in the Mainstem Columbia and Snake Rivers (WQP) and implement water quality measures to enhance ESA-listed juvenile and adult fish survival and mainstem spawning and rearing habitat.*

The Water Quality Plan for Total Dissolved Gas and Water Temperature in the Mainstem Columbia and Snake Rivers (ACOE 2009) was updated in January 2009. The 2009 plan was a collaborative effort among the Corps and regional federal, state, local, and tribal stakeholders and was tied into other past and current water quality efforts in the region. This document sets forth the Corps' plan to improve water quality in the mainstem Columbia and Snake rivers with respect to the following:

- Actions in the 2008 BiOp that pertain to improving water quality for ESA- listed salmon and steelhead
- Applicable total maximum daily loads (TMDLs) (Currently there are three TMDLs for TDG in the lower Columbia River, lower Snake River, and middle Columbia River, which are in effect until 2020.)
- Other actions to move toward attainment of U.S. Environmental Protection Agency (EPA) promulgated or approved state and tribal water quality standards in the Columbia and Snake rivers

In 2008 the Action Agencies implemented the water quality measures required by the previous (November 2006) Water Quality Plan.

*Real-time monitoring and reporting of TDG and temperatures measured at fixed monitoring sites:*

TDG and temperature were monitored and reported in 2008 according to the *Corps of Engineers Plan of Action for Dissolved Gas Monitoring in 2008* (ACOE 2008a). Access to the data is available by clicking on various links at <http://www.nwd-wc.usace.army.mil/tmt/>.

*Continued development of fish passage strategies with less production of TDG:*

In 2008 three planning studies analyzed opportunities to continue development of fish passage strategies and reduce TDG through structural and operational alternatives:

- Ice Harbor Dam: A study evaluated 12 structural and operational scenarios to meet fish passage and reduce TDG for the Ice Harbor Dam Configuration and Operation Plan. Results indicated that lower TDG loadings can be realized through optimizing spill volume and pattern with removable spillway weir (RSW) flows.
- John Day Dam: A decisional analysis framework was used to evaluate passage improvement alternatives. Evaluation factors included juvenile fish survival, effects on other species and life stages, costs, economic impacts, TDG, implementation timing, and data uncertainty. The

SYSTDG model was used to provide a relative comparison of TDG characteristics for the different alternatives. The results identified cost-effective surface flow routes such as the top spillway weir, tailrace improvement, and behavioral guidance through the spillway.

- The Dalles Dam: A study evaluated two spillway locations to improve egress conditions for fish passage. The preferred alternative (which is currently under construction) was selected based on TDG minimization.

Finally, the Corps' Portland and Walla Walla districts have continued to evaluate structural and operational alternatives that will satisfy objectives in the Endangered Species Act and Clean Water Act. Additionally, estimates have been developed describing the TDG exchange properties in the Snake River at Lower Granite Dam as a function of alternative structural configurations, operational policies, total river flow rate, and background TDG properties. These estimates are in a draft form and are expected to be finalized in 2009.

*Update the SYSTDG model to reflect modifications to spillways or spill operations:*

The SYSTDG model was used as a decision support tool to manage spill at lower Columbia and Snake River projects. As part of this use, the model was modified to account for structural and operational changes to the projects.

*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:*

After the completion of the fish migration season, a statistical evaluation of the predictive errors was performed on observed TDG levels during the 2008 fish passage season to quantify the uncertainty of SYSTDG estimates and improve modeling accuracy and reliability. The results of this analysis are included as Appendix G of the *2008 Dissolved Gas and Water Temperature Monitoring Report* at [http://www.nwd-c.usace.army.mil/tmt/wq/tdg\\_and\\_temp/2008/](http://www.nwd-c.usace.army.mil/tmt/wq/tdg_and_temp/2008/). Wind forecasting capabilities must await the acquisition of more comprehensive, representative, and reliable wind data, which are now being developed.

*Continued development of the CEQUAL-W2 model for estimating river temperatures from Dworshak Dam on the Clearwater and Upper Snake River near the confluence with the Grand Ronde River (USGS Anatone gauge) through the lower Snake River (all four Corps lower Snake River projects) to assist in real-time decision making for Dworshak Dam operations:*

The CEQUAL-W2 model was used in 2008 from late June through mid-August to support decisions regarding operation of Dworshak Dam for flow augmentation and temperature management on the lower Snake River. The model was run numerous times, and the results were presented to TMT on July 16, July 30, August 6, and August 13. Notes from these meetings can be found at <http://www.nwd-wc.usace.army.mil/tmt/agendas/2008/>. No modifications were made to the model in 2008 for developmental improvements or re-calibrations.

*Expand water temperature modeling capabilities to include Columbia River from Grande Coulee to Bonneville dams to better assess the effect of operations or flow depletions on summer temperatures:*

In 2008 this issue was addressed in the context of TMDL discussions with EPA. Supporting studies are scheduled to begin in January 2010.

*Investigate alternatives to reduce total mass loading of TDG at Bonneville Dam while maintaining juvenile survival performance:*

In 2008, as part of the COP update, a study was initiated to evaluate potential spillway improvements in conjunction with a planned rehab program. The study is looking at potential

spillway passage efficiency and survival improvements as well as opportunities to reduce spill and TDG levels below the project without compromising these passage parameters.

*Continued operation of the Lower Snake River projects at MOP:*

All of the lower Snake River projects were operated at minimum operating pool (MOP) for the 2008 fish migration season. See additional information under RPA 5.

*RPA Action 16 – Tributary Projects: The tributary projects that have not yet completed ESA Section 7 consultation are located in the Yakima, Okanogan, and Tualatin river basins. Reclamation will, as appropriate, work with NOAA Fisheries in a timely manner to complete supplemental, project-specific consultations for these tributary projects. These supplemental consultations will address effects on tributary habitat and tributary water quality, as well as direct effects on salmon survival in the tributaries. The supplemental consultations will address effects on mainstem flows only to the extent to which they reveal additional effects on the in-stream flow regime not considered in the FCRPS and Upper Snake River BA/Comprehensive Analysis.*

Reclamation is working on ESA Section 7 consultations for the Yakima, Okanogan, and Tualatin Project operations.

Consultation on Reclamation's Yakima Project continued during 2008. [For 2009, Reclamation is working on a supplement to the 2000 Biological Assessment "Yakima Project Operations and Maintenance, Supplemental to the 1999 Biological Assessment on the FCRPS."]

In May 2008, NOAA Fisheries indicated that it was going to delay work on the BiOp for the Okanogan Project for 6 months while information was collected that might result in modification of the proposed action. The Fish Accords included funds to acquire an additional 500 acre-feet of supplementation water. The provision of this water was included as part of the proposed action in the Okanogan Project BA, which was submitted to NOAA Fisheries in November 2008.

In March 2008, Reclamation submitted to NOAA Fisheries the final Biological Assessment for Bureau of Reclamation Future Operations and Maintenance in the Tualatin River Subbasin, Tualatin Project. NOAA Fisheries has accepted this BA for consultation purposes and a BiOp is under development.

*RPA Action 17 – Chum Spawning Flows: Provide adequate conditions for chum spawning in the mainstem Columbia River in the area of the Ives Island complex and/or access to the Hamilton and Hardy Creeks for this spawning population.*

For chum tailwater readings, the official gauge is 0.9 mile downstream from Bonneville Dam's first powerhouse, 50 feet upstream from Tanner Creek and at River Mile ®M 144.5.

Chum operations were coordinated regularly via TMT from before chum spawning began through the end of chum emergence. Beginning on the evening of November 9, 2007, Bonneville was operated at a tailwater elevation of between 11.3 and 11.7 feet. High inflows from the end of November through December necessitated deviations to move excess water at night (1900-0700) when chum tend not to spawn.

On the morning of December 24, 2007, when operations shifted from a spawning to an incubation operation, a 24-hour minimum tailwater elevation of 11.5 feet took effect to protect chum redds through incubation and the end of emergence. From March 6 through March 10, spill was provided at Bonneville Dam for the Spring Creek Hatchery release. During this period through 0500 on March 10 a minimum tailwater was maintained between 12.5 and 13 feet to provide depth compensation and protect chum redds from TDG produced by the spill operation. Salmon managers advised the action agencies that chum emergence had ended by April 9 and so there was no need to delay the start of spring spill for juvenile passage or provide depth compensation to keep TDG levels below 105 percent in the vicinity of the redds. The project operated to 11.5-foot tailwater as a soft constraint to facilitate chum fry egress following emergence. This soft constraint was removed on April 11.

Beginning November 7, 2008, Bonneville was operated at a tailwater elevation of between 11.3 and 11.7 feet with excess water shaped into evening hours during chum spawning to the extent possible. Chum operations were complicated by forebay constraints in place to facilitate construction of the spillwall at the Dalles Dam. As a result, the TMT developed contingency plans for managing chum operations that established a priority for actions to be taken to manage excess water if it could not be managed at night.

*RPA Action 18 – Configuration and Operation Plan for Bonneville Project: The Corps will consider all relevant biological criteria and prepare, in cooperation with NOAA Fisheries and the co-managing agencies, a Configuration and Operational Plan for the Bonneville Project (2008). As part of the first phase of modifications, the Corps will investigate, and implement the following reasonable and effective measures to reduce passage delay and increase survival of fish passing through the forebay, dam, and tailrace as warranted. Initial modifications will likely include:*

- *Bonneville Powerhouse I*
- *Sluiceway modifications to optimize surface flow outlet to improve fish passage efficiency (FPE) and reduce forebay delay (2009).*
- *Minimum-gap turbine runner installation to improve survival of fish passing through turbines (2009)*
- *Bonneville Powerhouse II*
- *Screened bypass system modification to improve fish guidance efficiency (FGE) and reduce gatewell residence time (2008)*
- *Shallow BGS installation to increase Corner Collector efficiency and reduce forebay delay (prototype 2008)*
- *Bonneville Dam Spillway*
- *Spillway operation or structure (e.g., spillway deflectors) modification to reduce injury and improve survival of spillway passed fish; and to improve conditions for upstream migrants (2013).*

*The COP will be updated periodically and modifications may be made as new biological and engineering information is gathered. The COP and modifications will be coordinated through the Regional Forum. Comments developed by NOAA Fisheries on the draft COPs shall be reconciled by the Corps in writing to NOAA Fisheries' satisfaction before release of the final COP. If Phase I actions fail to meet the intended biological targets, the COP will be updated to identify additional Phase II actions for further implementation.*

In 2008, the Bonneville Configuration and Operation Plan was updated to document planned additional configuration actions with the intent to bring juvenile passage survival to levels meeting BiOp performance targets. Actions in 2008 in the COP are as follows:

- An initial contract was awarded in late 2008 for the first phase of modifications to the B1 sluiceway to improve its performance as a surface passage route. The work, which is scheduled for completion in 2009, replaced three chain gates with automated sluice gates that will change position as the forebay water elevation changes. This will improve entrance conditions and provide better flow conditions in the sluiceway. An additional modification to remove the existing sluiceway divider wall is currently scheduled to be completed by 2010.
- The construction contract for rehab of the B1 turbines and generators, including installation of minimum gap runners, continued through 2008, with completion of Unit 8. Completion of the final two units is scheduled for 2009.
- The multi-year contract to modify the 2nd powerhouse screened bypass system to improve fish guidance efficiency was completed in 2008. Follow-on work was done to investigate potential problems with some observed injuries and mortalities in the gate wells.
- A shallow draft behavioral guidance screen (BGS) was installed and tested in the 2nd powerhouse forebay. The purpose was to test the shallow draft BGS to determine whether it

could provide increased guidance of juvenile migrants in the forebay into the corner collector to take advantage of high survival rates for fish passing through that route. In 2008, 47 percent of the yearling Chinook that passed Powerhouse 2 went through the corner collector, compared to 44 percent in previous years. The percentage of subyearling Chinook and steelhead that passed through the corner collector was similar to previous years: 40 percent and 71 percent, respectively. A second year of testing is planned for 2009.

- A study was initiated to evaluate potential spillway improvements in conjunction with a planned rehab program. The study is looking at potential spillway passage efficiency and survival improvements as well as opportunities to reduce spill and TDG levels below the project without compromising these passage parameters. See also RPA Action 15.
- An evaluation of new spillway spill patterns and discharges was conducted in 2008 to determine whether operational changes would improve juvenile fish survival. In the spring, relative survival of yearling Chinook passing through the spillway under a 100-kcfs, 24-hour-per-day spill operation was evaluated. Relative survival was estimated at 100 percent, which is a substantial improvement compared to the 92 percent relative survival measured under the 75-kcfs day/120 percent TDG cap night operation in 2004–2005. In the summer, subyearling Chinook survival through the spillway was estimated under a 85-kcfs day/120 percent TDG cap night spill operation. Relative survival was estimated at 97 percent, a substantial increase over the 89 percent measured under the 75-kcfs day/120 percent TDG cap night operation in 2004–2005.

*RPA Action 19 – Configuration and Operation Plan for The Dalles Project: The Corps will consider all relevant biological criteria and prepare, in cooperation with NOAA Fisheries and the co-managing agencies, a Configuration and Operational Plan for The Dalles Project (2008). As part of the first phase of modifications, the Corps will investigate, and implement the following reasonable and effective measures to reduce passage delay and increase survival of fish passing through the forebay, dam, and tailrace as warranted. Initial modifications will likely include:*

- *Turbine operation optimization to improve overall dam survival (2011)*
- *Extended tailrace spill wall to increase direct and indirect survival of spillway passed fish (2010)*
- *The COP will be updated periodically and modifications may be altered as new biological and engineering information is gathered. The COP and modifications will be coordinated through the Regional Forum. Comments developed by NOAA Fisheries on the draft COPs shall be reconciled by the Corps in writing to NOAA Fisheries' satisfaction before release of the final COP. If Phase I actions fail to meet the intended biological targets, Phase II actions will be considered for further implementation.*

In 2008, an update of The Dalles COP was initiated to document planned additional configuration actions with the intent to bring juvenile passage survival to levels meeting BiOp performance targets. (The update was completed in 2009). The 2008 COP actions are as follows:

- A two-year construction contract was awarded to initiate construction of an extended (700-foot) spillwall between Spillway Bays 8 and 9. The contract is scheduled to be completed during 2009–2010 in the water work period. The purpose of the project is to improve juvenile passage egress and survival below the dam.

*RPA Action 20 – Configuration and Operation Plan for John Day Project: The Corps will consider all relevant biological criteria and prepare, in cooperation with NOAA Fisheries and the co-managing agencies, a Configuration and Operational Plan for the John Day Project (2008). As part of the first phase of modifications, the Corps will investigate, and implement the following reasonable and effective measures to reduce passage delay and increase survival of fish passing through the forebay, dam, and tailrace as warranted. Initial modifications will likely include:*

- *Full-flow bypass and PIT-tag detection installation to reduce handling stress of bypassed fish (2007)*
- *Turbine operation optimization to improve overall dam survival (2011)*

- *Surface flow outlet(s) construction to increase FPE, reduce forebay delay and improve direct and indirect survival (prototype 2008 with final installation by 2013), and improve tailrace egress conditions.*
- *The COP will be updated periodically and modifications may be altered as new biological and engineering information is gathered. The COP and modifications will be coordinated through the Regional Forum. Comments developed by NOAA Fisheries on the draft COPs shall be reconciled by the Corps in writing to NOAA Fisheries' satisfaction before release of the final COP. If Phase I actions fail to meet the intended biological targets, Phase II actions will be considered for further implementation.*

A COP for John Day was completed in 2007. The report laid out a two-phase plan to achieve performance standards. Phase 1 included continued evaluation of surface passage using top spill weirs to reduce turbine entrainment in conjunction with tailrace modifications for improved egress conditions. Following biological evaluations of Phase 1 modifications, Phase 2 alternatives may be necessary. An addendum to the 2007 COP will be prepared in 2009 to document the current plan to construct an extended deflector on Spillbay 20 to improve tailrace passage conditions. Actions in 2008 on measures being developed for the COP are summarized as follows:

**Fabrication and installation of a prototype top-spill weir (TSW)** for Spillbays 15 and 16 began in fiscal year 2007 and were completed for initial operation and testing in 2008. Two years of testing were planned. The purpose of the TSW test was to assess how effective surface spill is at reducing turbine entrainment, which would verify an assumption from the COP that surface spill will reduce turbine passage of juvenile salmon by 50 percent. In 2008, acoustic telemetry was used to evaluate yearling Chinook, steelhead, and subyearling Chinook passage distribution, behavior, and survival under the TSW configuration and operation.

For all species and age groups, fish passage efficiency (the proportion of fish passing non-turbine routes) and spill passage efficiency were higher than in previous years. Spill passage efficiency was 76 percent for yearling Chinook, 74 percent for steelhead, and 69 percent for subyearling Chinook. Turbine entrainment was reduced by 50 percent or more for all groups as well. Relative survival of yearling Chinook and steelhead passing the dam was 95.7 percent and 98.6 percent, respectively. Subyearling Chinook dam passage relative survival was 86.1 percent, which was lower than the 89 percent BiOp base condition. Numerous gulls were observed feeding in the John Day Dam tailrace during the summer study, and day/night survival differences suggest that subyearling Chinook mortality was related to the gull predation. A new avian wire array will be installed for 2009 to deter gull predation, and an avian predation component to the 2009 study will be added.

**Evaluations of alternatives for tailrace modifications** continued through 2008. This resulted in a tentative recommendation to construct an extended deflector at Spillbay 20.

*RPA Action 21 – Configuration and Operational Plan (COP) for the McNary Project: The Corps will consider all relevant biological criteria and prepare, in cooperation with NOAA Fisheries and the co-managing agencies, a Configuration and Operational Plan for the McNary Project (2009). As part of the first phase of modifications, the Corps will investigate, and implement the following reasonable and effective measures to reduce passage delay and increase survival of fish passing through the forebay, dam, and tailrace as warranted. Initial modifications will likely include:*

- *Turbine operation optimization to improve survival of fish passing through turbines (2013)*
- *Improve debris management to reduce injury of bypass and turbine passed fish (2011)*
- *Relocate juvenile bypass outfall to improve egress, direct, and indirect survival on bypassed fish (2011)*
- *Surface flow outlet installation to increase FPE, reduce forebay delay, and improve direct and indirect survival (temporary structure testing in 2007 and 2008 to develop a permanent system)*
- *The COP will be updated periodically and modifications may be altered as new biological and engineering information is gathered. The COP and modifications will be coordinated through the Regional Forum. Comments developed by NOAA Fisheries on the draft*

*COPs shall be reconciled by the Corps in writing to NOAA Fisheries' satisfaction before release of the final COP. If Phase I actions fail to meet the intended biological targets, Phase II actions will be considered for further implementation.*

Progress continued in 2008 on surface passage alternative feasibility studies and biological testing of prototype spillway weirs at McNary Dam. Information and data resulting from these actions will inform alternative evaluation and selection during preparation of the McNary COP in 2009. Significant accomplishments are as follows:

- **Juvenile Fish Surface Passage Feasibility Study** – A draft report evaluating the engineering feasibility, operational concerns, and magnitude of cost associated with various surface passage alternatives was completed in December 2008. Eleven alternatives taken to a concept level underwent an evaluation and selection process conducted with regional stakeholders. Four alternatives were carried forward for detailed evaluation of engineering feasibility and cost. The biological advantages and disadvantages of each of these alternatives will be more thoroughly evaluated during preparation of the COP, including tradeoff analyses. Alternatives will be prioritized using the COP tiered evaluation process developed with regional stakeholders in 2008.
- **Prototype Spillway Weir Evaluation** – In 2008, the second year of biological testing was conducted to assess relative juvenile survival, passage efficiencies, and forebay behavior while operating two prototype spillway weirs. In 2007, the weirs were installed in Spillbays 20 and 22. During 2008, the weir in Spillbay 22 was moved to Spillbay 19 to investigate whether this configuration would improve biological performance. Spill operations maintained for this test and biological performance are discussed below.
- **Evaluation of Survival and Passage Rates with Respect to Spill Operations** – In 2008, the primary objective was to gather information on approach behavior, passage route use, and survival after passage under changed spillway weir configuration. These data were collected to facilitate a decision on the most effective location for a permanent surface passage structure at McNary Dam.

During the spring fish passage season, a single treatment test of 40 percent spill was evaluated. Passage over the spillway weirs decreased, particularly for steelhead, when the spillway weir was shifted from Spillbay 22 to Spillbay 19. Overall steelhead passage dropped from 65.7 percent over the spillway weirs in 2007 to 53.1 percent in 2008. Yearling Chinook passage over spillway weirs also was lower during 2008. The flow years differed in that 2008 had an average flow 40 kcfs higher than in 2007. Surface flow outlets generally have shown less efficient passage at higher flow levels. Steelhead dam passage relative survival of 99.9 percent exceeded the 2008 BiOp spring performance standard<sup>2</sup> during 2008, but for yearling Chinook, dam passage relative survival was 95.8 percent, which is just under the 96.0 percent spring migrant BiOp performance standard.

<sup>2</sup> *The juvenile dam passage performance standards are an average across Snake River and Lower Columbia River dams of 96 percent dam passage survival for spring Chinook and steelhead and 93 percent average across all dams for Snake River subyearling Chinook, estimated to a precision level of +/- 3 percent at the 95 percent confidence interval precision using route specific relative survival estimating techniques. Dam passage survival is defined as survival from the upstream face of the dam to a standardized reference point in the tailrace. If the dam survival estimates exceed the standard in two separate years, the target would be met for that dam. Dam passage survival as defined in the BiOp is also called concrete survival in the research results.*

During the summer passage season, a two-treatment test (40 percent versus 60 percent spill operation) was performed. At 60 percent spill, subyearling Chinook passage over the spillway weirs was notably lower during 2008 than in 2007. The average summer flow volume was also higher in 2008, similar to that observed in the spring. The summer migrant dam passage BiOp survival performance standard of 93.0 percent was exceeded during 60 percent spill operations for subyearling Chinook (95.9 percent) and was just missed during 40 percent spill operations (92.9 percent).

*RPA Action 22 – Configuration and Operation Plan for the Ice Harbor Project: The Corps will consider all relevant biological criteria and prepare, in cooperation with NOAA Fisheries and the co-managing agencies, a Configuration and Operational Plan for the Ice Harbor Project (2008). As part of the first phase of modifications, the Corps will investigate, and implement the following reasonable and effective measures to reduce passage delay and increase survival of fish passing through the forebay, dam, and tailrace as warranted. Initial modifications will likely include:*

- *Guidance screen modification to improve FGE (2010)*
- *Turbine operation optimization to improve survival of turbine passed fish (2011)*
- *Spillway chute and/or deflector modification to reduce injury and improve survival of spillway passed fish through the RSW (2009)*
- *Turbine unit 2 replacement to improve the survival of fish passing through turbines and reduce oil spill potential (2012)*

The COP will be updated periodically and modifications may be altered as new biological and engineering information is gathered. The COP and modifications will be coordinated through the Regional Forum. Comments developed by NOAA Fisheries on the draft COPs shall be reconciled by the Corps in writing to NOAA Fisheries' satisfaction before release of the final COP. If Phase I actions fail to meet the intended biological targets, Phase II actions will be considered for further implementation.

The Ice Harbor COP, initiated in 2007, was further developed in 2008 with alternatives refined and screened. A regional alternative scoring meeting was held in April. Alternatives were scored, with uncertainty levels included, according to survival criteria for forebay, concrete, tailrace, and post-Ice Harbor survival. A draft of the report was distributed for regional review in December 2008. That review is still under way. Other significant accomplishments included the following:

- **Removable Spillway Weir (RSW):** Actions to replace three of the five transition plates on the RSW were performed prior to the fish passage season. Additionally, design was completed on a follow-up contract to make miscellaneous improvements to the RSW so it is more easily maintained.
- **Ice Harbor Unit 2 Runner Replacement:** Significant progress on completing the turbine design and runner contract for Unit 2 was made in 2008. The contract scope includes design of two runner styles (fixed blade and adjustable blade). (The contract was advertised in spring 2009 and included design, manufacture and delivery of a fixed blade for Unit 2 as a base contract item, with an option to manufacture and deliver a second adjustable blade runner for Unit 3).
- **Evaluation of Survival and Passage Rates with Respect to Spill Operations:** A passage and survival study was conducted in 2008. The goal of this study was to provide passage and survival information at Ice Harbor Dam under spill treatments of 30 percent spill and 45 kcfs daytime spill/gas cap nighttime spill. Results will help determine future operations to meet BiOp performance standards at Ice Harbor.

Non-turbine passage for spring migrants was 93 percent or more. For summer migrants, non-turbine passage was 96 percent. Survival estimates for 2008 were single-release estimates

because no fish were released below Ice Harbor. These are typically lower than paired-release estimates used in previous years and do not separate out mortality sustained between the Ice Harbor tailrace and the downstream point of detection. Survival estimates remained high in 2008 for all three species. Preliminary survival estimates show that performance standards from the 2008 BiOp may have been met or nearly met under all operations.

From 2008 preliminary data, juvenile Chinook salmon spill passage efficiency for 30 percent spill and 45 kcfs daytime spill/gas cap nighttime spill were 56 percent and 77 percent, respectively. Steelhead performed slightly higher with 77 percent and 89 percent respectively. During the summer there was not enough separation in spill patterns to distinguish them, yielding a combined spill passage efficiency of 66 percent.

Forebay retention times were 1 to 2 hours for all species with the exception of steelhead, which had a retention time of 4 hours under the 30 percent spill treatment.

*RPA Action 23 – Configuration and Operation Plan for the Lower Monumental Project: The Corps will consider all relevant biological criteria and prepare, in cooperation with NOAA Fisheries and the co-managing agencies, a Configuration and Operational Plan for the Lower Monumental Project (2010). As part of the first phase of modifications, the Corps will investigate, and implement the following reasonable and effective measures to reduce passage delay and increase survival of fish passing through the forebay, dam, and tailrace as warranted. Initial modifications will likely include:*

- *Primary bypass operations with PIT-tag detection installation to reduce handling stress of bypassed fish (2007)*
- *Juvenile bypass system outfall relocation to improve egress, direct and indirect survival on bypassed fish (2011)*
- *Turbine operation optimization to improve the survival of fish passing through turbines (2013)*
- *RSW installation to improve FPE, reduce forebay delay, and improve direct and indirect survival (2008)*
- *The COP will be updated periodically and modifications may be altered as new biological and engineering information is gathered. The COP and modifications will be coordinated through the Regional Forum. Comments developed by NOAA Fisheries on the draft COPs shall be reconciled by the Corps in writing to NOAA Fisheries' satisfaction before release of the final COP. If Phase I actions fail to meet the intended biological targets, Phase II actions will be considered for further implementation.*

The COP for Lower Monumental Dam is scheduled for completion in 2010; however, a significant configuration change was completed and biological performance testing was performed in 2008, as described below:

- **RSW** – Construction was completed on the RSW prior to the 2008 juvenile fish migration season. This surface passage route provides a more benign alternative to passing fish below the tainter (radial) gates during spill operations. Other benefits include attraction flow near the surface where juveniles are known to migrate. The attraction flow reduces forebay delay and increases spillway passage efficiency.
- **Evaluation of Survival and Passage Rates with Respect to Spill Operations** – An RSW post-construction passage and survival study conducted in 2008 compared two spill treatments, bulk spill versus a flat spill pattern. The yearling Chinook salmon relative survival estimate for concrete passage for the bulk spill pattern was 96.9 percent in 2008 but only 94.4 percent during the flat spill pattern. The lower overall relative survival numbers during flat spill were largely due to lower survival through the juvenile bypass system, which accounted for only 27 percent of the passage, with a relative survival of 88.6 percent. Survival estimates for the spillway were equal to or better than the performance standards, with the RSW exceeding all other passage routes. Steelhead relative survival estimates for concrete passage exceeded the spring performance standard for the bulk (100.3 percent) and flat (99.8 percent) spill

patterns in 2008. Subyearling Chinook salmon, sampled during the summer months, also exceeded the summer migrant performance standard criteria, with the bulk spill pattern operating (94.1 percent).

The RSW post-construction evaluation will continue in 2009 with the same two treatment tests. A study to determine the approaching depth of fish entering the RSW also will be conducted. The depth of balloon-tagged fish tested in 2008 indicated a higher level of injury among fish released close to the RSW (1.5 feet above the ogee) as opposed to fish released higher (6.5 feet above the ogee) of 12.8 percent and 2.2 percent, respectively. The vertical distribution study will determine the proportion of the migrant population, if any, that may be at higher risk of injury because of their approach depth.

Biological test results from the 2008 and 2009 fish passage seasons will be used to inform the discussions on future configuration and operational changes during preparation of the COP in 2010.

*RPA Action 24 – Configuration and Operation Plan for the Little Goose Project: The Corps will consider all relevant biological criteria and prepare, in cooperation with NOAA Fisheries and the co-managing agencies, a Configuration and Operational Plan for the Little Goose Project (2009). As part of the first phase of modifications, the Corps will investigate, and implement the following reasonable and effective measures to reduce passage delay and increase survival of fish passing through the forebay, dam, and tailrace as warranted. Initial modifications will likely include:*

- *Turbine operation optimization to improve the survival of fish passing through turbines (2014)*
- *Primary bypass operations with PIT-tag detection installation to reduce handling stress of bypassed fish (2008)*
- *Primary bypass outfall relocation to improve egress, direct and indirect survival on bypassed fish (2009)*
- *Surface spillway weir and deflector installation to improve FPE, reduce forebay delay and improve direct and indirect survival (2009)*
- *The COP will be updated periodically and modifications may be altered as new biological and engineering information is gathered. The COP and modifications will be coordinated through the Regional Forum. Comments developed by NOAA Fisheries on the draft COPs shall be reconciled by the Corps in writing to NOAA Fisheries' satisfaction before release of the final COP. If Phase I actions fail to meet the intended biological targets, Phase II actions will be considered for further implementation.*

Significant progress on configuration changes at Little Goose Dam was made during 2008. Remaining actions that may be necessary at this project will be evaluated during preparation of the COP in 2009. Accomplishments made in 2008 are as follows:

- **Spillway Weir** – Design of an adjustable spillway weir was completed, and a contract was awarded for construction. The spillway weir will be in service for the 2009 juvenile fish passage season, and its completion will result in a surface passage route at each of the Corps' eight Columbia and Snake River Dams. This is the first spillway weir that incorporates an adjustable flow feature that allows the flow over the weir to be higher for spring runoff conditions and lower for summer runoff conditions.
- **Spill Deflectors** – In conjunction with the spillway weir, design was completed and a contract awarded for installation of spill deflectors in Bay 1 (spillway weir bay) and Bay 8 at Little Goose Dam. The new deflectors are designed with a longer radius curve, which is expected to reduce potential injury to fish in addition to reducing TDG production. The addition of a deflector in Bay 8 also provides greater operational flexibility during voluntary spill conditions.
- **Juvenile Bypass System Full Flow PIT-Tag Monitoring** – A contract was awarded and construction initiated on the installation of a juvenile PIT-tag monitoring system in the full flow section of the primary bypass. The system provides PIT-tag detections while avoiding potential stressors in the facility and bypassing fish back to the river. (The system was completed before the 2009 juvenile fish migration season).

- **Juvenile Bypass Outfall Relocation** – Construction was initiated 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. This relocation is expected to decrease predation on the bypassed fish.

*RPA Action 25 – Configuration and Operation Plan for the Lower Granite Project: The Corps will consider all relevant biological criteria and prepare, in cooperation with NOAA Fisheries and the co-managing agencies, a Configuration and Operational Plan for Lower Granite Project (2009). As part of the first phase of modifications, the Corps will investigate, and implement the following reasonable and effective measures to reduce passage delay and increase survival of fish passing through the forebay, dam, and tailrace as warranted. Initial modifications will likely include:*

- *New juvenile fish facility including orifice configuration changes, primary dewatering, holding for transport, and primary bypass to improve direct and indirect survival for all collected fish (2012)*
- *Turbine operation optimization to improve survival of turbine passed fish (2014)*
- *The COP will be updated periodically and modifications may be altered as new biological and engineering information is gathered. The COP and modifications will be coordinated through the Regional Forum. Comments developed by NOAA Fisheries on the draft COPs shall be reconciled by the Corps in writing to NOAA Fisheries' satisfaction before release of the final COP. If Phase I actions fail to meet the intended biological targets, Phase II actions will be considered for further implementation.*

Work began on the COP for Lower Granite in 2008. A regional brainstorming session was held in May that led to formation and description of alternatives. Evaluation criteria also were developed and will be used to evaluate the alternatives in 2009. The alternative(s) to be implemented will likely target increased survival of summer subyearling Chinook migrants. This is based on extensive passage and survival studies conducted between 2002 and 2007, which found that spring migrant dam passage relative survival estimates were generally equal to or higher than the BiOp performance standard of 96 percent. Summer migrants, however, have generally been estimated to survive at a lower rate, typically between 85 percent and 93 percent. The relative survival of fish passing over the RSW is usually higher than that of other passage routes. When this alternative is implemented, passage and survival evaluations will be conducted to determine whether Lower Granite is meeting BiOp performance standards.

**Juvenile Fish Facility (JFF) Upgrade** – Efforts continued toward completing the Engineering Design Report on modifications to upgrade the JFF at Lower Granite. A major focus was a value engineering study to identify areas where estimated construction costs could be reduced. An additional goal of this study was to evaluate new ideas that could improve on the design to add operational flexibility, reduce handling and stress of fish, and decrease construction costs by varying operations during construction. Study recommendations are being evaluated, and the final Engineering Design Report is expected in 2009. In addition to improvements for juvenile salmon, features to improve the separation, handling, holding, and transportation of steelhead kelts also are part of this upgrade. The biological benefits and costs of this action will be evaluated thoroughly during the COP process. Final design of this facility will be contingent on this action being identified as a preferred alternative.

*RPA Action 26 – Chief Joseph Dam Flow Deflectors: The Corps will complete the flow deflector construction at Chief Joseph Dam by 2009.*

Deflector construction was initiated in 2005 in response to RPA Action 136 in the 2000 Biological Opinion and previous discussions on the importance of these deflectors. Chief Joseph Dam does not have spill for fish passage, but water is spilled at this project and Grand Coulee in order to pass high flows. Investigations by the Corps concluded that installing flow deflectors at Chief Joseph Dam, which

is immediately downstream of Grand Coulee, and shifting spill and power generation between the projects is the most cost-effective alternative for gas abatement at these two dams.

Construction of flow deflectors on all 19 spillway bays at Chief Joseph was completed in September 2008, completing the structural component of the two-part alternative to reduce TDG downstream of Chief Joseph and Grand Coulee dams. (A successful spill test was carried out in spring 2009).

*RPA Action 27 – Turbine Unit Operations: The Action Agencies will operate turbine units to achieve best fish passage survival (currently within 1 percent 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.*

Work continued to develop new turbine designs for safer fish passage. Studies on the effects of rapid decompression on fish injury and survival were completed in 2008. These results, along with physical model study results, are being used to develop a new turbine design for Ice Harbor Dam.

Work also continues to determine the safest operating point for fish passing through existing FCRPS turbines. Studies on rapid decompression, physical model studies, and numerical model studies were conducted in 2008 to further this understanding.

An alternatives study was initiated in 2008 to assess the feasibility of directly capturing juvenile fish that have passed through a mainstem dam turbine. If feasible, this method would provide a means of directly assessing turbine mortality, including capturing the effects of rapid decompression.

### *Hydropower Strategy 2 (RPA Action 28)*

*RPA Action 28 – Columbia and Snake River Project Adult Passage Improvements: The Corps will implement the following structural improvements to adult passage at the mainstem Columbia and Snake river projects:*

- *Bonneville Dam*
  - *Improve the Bradford Island ladder system to reduce stress and improve reliability of upstream adult passage (2013).*
- *The Dalles Dam*
  - *East ladder emergency auxiliary water supply system and/or modifications that return adult salmon and steelhead use of the North ladder to pre-spillwall conditions to improve reliability of upstream adult passage (2013).*
- *John Day Dam*
  - *Adult ladder systems modifications to improve upstream adult passage conditions (2011).*
- *Ice Harbor Dam*
  - *Repair or replace north shore fishway auxiliary water supply (AWS) equipment as needed so that any two of the three pumps can meet flow criteria.*
- *Little Goose Dam*
  - *Investigate adult passage and determine whether structural, operational, or tailrace modifications can alleviate adult passage delays or blockages during spill operations for optimum juvenile passage (See RME Action 54).*
- *Lower Granite Dam*
  - *Investigate and if necessary provide additional auxiliary water supply for the new adult trap at lower Granite so that it can operate at full capacity when the forebay is operated at MOP without affecting the fishway AWS (2012).*
  - *Adult fishway modification to improve upstream adult passage conditions impaired by temperature differentials (need will be determined by results of further research) (prototype 2011).*

The following progress was made toward improving adult passage at the mainstem Columbia and Snake River projects:

- **The Dalles:** Evaluation continued in 2008 of alternatives for adult east ladder emergency auxiliary water supply and/or restored use of the north ladder. Additional efforts on the north ladder have been deferred pending spillwall completion and spillway operations to evaluate the effects of the new configuration and operations on adult use of this facility.
- **John Day:** Efforts continued to develop improved entrance and passage conditions in the north fish ladder. In 2008, the following was accomplished:

Completed an entrance/Auxiliary Water System (AWS) alternatives study. Initiated the design documentation report.

Completed the design documentation report for the exit section and count station modification alternatives. Initiated plans and specifications for planned fiscal year 2010 construction start.

- **Ice Harbor North Shore Adult Fish Ladder AWS:** Warranty replacement of two of three gear shafts on the north shore auxiliary water supply pumps was completed in fall 2008. These actions will allow the system to meet the hydraulic criteria outlined in the fish operations plan. (Replacement of the third gear shaft was completed in early 2009).
- **Little Goose Adult Passage Delays:** Adult migration at Little Goose was slowed significantly during high-volume summer spill in 2005 and bulk pattern spill in spring 2007. A 2008 study to determine the cause of adult passage used two bulk patterns (to mimic a surface passage structure) and a uniform pattern that mimicked the anticipated training spill for a surface passage structure. Data indicated that adult passage percentage is slightly higher through the north shore ladder than the south shore, with about 10 percent of the adults entering the north powerhouse entrance near the dam's center. The uniform pattern produced the shortest median times from first tailrace record to first fishway approach, produced the highest percentage of first fishway approaches resulting in fishway entrance and produced the shortest median time from first tailrace record to last record at the top of the fish ladder.
- **Lower Granite Ladder Temperature Monitoring:** In 2008, the water temperatures within the Lower Granite fish ladder were monitored to identify areas of temperature gradients. In addition, radio-tagged adult salmon were monitored to determine whether there was a correlation between passage delays and large temperature differentials within the ladder. Generally, fish passed through the ladder more slowly when temperatures were higher than 18°C. In 2008, there were only two days when the temperature differential between the bottom and top of the ladder exceeded 1°C; consequently, the relationship between temperature differentials and salmon behavior could not be fully assessed. Data from this and future research will help determine whether future modifications to the ladder to introduce cooler water during the late summer are required.

### *Hydropower Strategy 3 (RPA Actions 29–31)*

*RPA Action 29 – Spill Operations to Improve Juvenile Passage: The Corps and BPA will provide spill to improve juvenile fish passage while avoiding high TDG supersaturation levels or adult fallback problems. Specific spill levels will be provided for juvenile fish passage at each project, not to exceed established TDG levels (either 110 percent TDG standard, or as modified by State water quality waivers, currently up to 115 percent TDG in the dam forebay and up to 120 percent TDG in the project tailwater, or if spill to these levels would compromise the likelihood of meeting performance standards (see RPA action table, RME 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 of the RPA action table. 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).

### *Spill Operations*

Spill operations for 2008 are reported in the 2008 Dissolved Gas and Water Temperature Monitoring Report (ACOE 2008d, at [http://www.nwd-wc.usace.army.mil/tmt/wq/tdg\\_and\\_temp/2008/](http://www.nwd-wc.usace.army.mil/tmt/wq/tdg_and_temp/2008/)). This report describes the Corps' water quality monitoring program for 2008 and covers the lower Columbia and Snake River projects. The report provides information consistent with the TDG waiver issued by Oregon and the criteria adjustment by Washington. The report also includes the following additional technical information:

- Flow and runoff conditions for the spill season
- Duration and volume of spill for fish passage versus spill for other reasons for each project
- Data from the physical and biological monitoring programs, including incidences of gas bubble trauma (GBT)
- Description and results of any biological or physical studies of spillway structures and prototype fish passage devices to test spill at operational levels
- Progress on implementing measures contained in the lower Columbia and lower Snake River total dissolved gas TMDL documents.

The report focuses on the water quality monitoring of TDG and temperature at the 12 Corps dams in the Columbia River Basin.

### *Spring Spill*

During 2008, spring spill at the lower Columbia and Snake River projects met the 2008 Fish Operations Plan (FOP) (<http://www.nwd-wc.usace.army.mil/tmt/documents/ops/FOP/FOP%202008%20final.pdf>). Spring spill began April 3 and continued through June 20 at the lower Snake River projects. Spring spill began April 10 and continued through June 21 at McNary, John Day, and Bonneville dams and continued to June 30 at The Dalles Dam.

The 2008 FOP called for the following spill operations during the spring:

- Lower Granite: 20 kcfs, 24 hours per day
- Little Goose: 30 percent of river flow, 24 hours/day, plus 14 days of spill to the spill cap between April 22 and May 15
- Lower Monumental: to the spill cap (estimated to be approximately 27 kcfs), 24 hours/day
- Ice Harbor: spill alternating between 30 percent of the river flow 24 hours/day or 45 kcfs during the day and up to the spill cap at night
- McNary: 40 percent of the project outflow.
- John Day: 60 percent of total outflow during the night with no spill during the day from April 10 through April 20, 30 percent of outflow from April 21 through May 1, and alternating between 30 percent and 40 percent of total outflow from April 21 through June 20
- The Dalles: 40 percent of the project outflow
- Bonneville: to the gas cap up to 100 kcfs

Total river flows remained elevated on the Columbia River from the third week of May to the first week of July, when the freshet occurred. Total river flows on the Columbia River during this period ranged from a daily average flow of 276 kcfs to 418 kcfs, with an overall daily average flow of 402 kcfs. These flows were lower than in 2007, when the daily average flow was between 250 and 300 kcfs. Flow began to taper off in July and August. Total river flows remained elevated on the Snake River from May to early July, when the freshet occurred there. Total river flows on the lower Snake River from early May to early July ranged from a daily average flow of 62 kcfs to 199 kcfs, which is similar to 2006, when the flow was between 83 and 200 kcfs.

### *Summer Spill*

During 2008, summer spill began June 21 and continued through August 31 at the lower Snake River projects and at McNary, John Day, and Bonneville dams on the lower Columbia River. Summer spill at The Dalles on the lower Columbia River began July 1 and continued through August 31.

The 2008 FOP called for the following spill operations during the summer:

- Lower Granite: 18 kcfs, 24 hours/day
- Little Goose: 30 percent of river flow, 24 hours/day
- Lower Monumental: 17 kcfs, 24 hours/day
- Ice Harbor: spill alternating between 30 percent of the river flow 24 hours/day or 45 kcfs during the day and up to the spill cap at night
- McNary: spill alternating between 40 percent and 60 percent of the project outflow
- John Day: spill alternating between 30 percent and 40 percent of total outflow from June 21 through July 18, then 30 percent of outflow from July 19 through August 31
- The Dalles: 40 percent of the project outflow
- Bonneville: spill 85 kcfs during the day and to the spill cap at night from June 21 through July 20. Spill 75 kcfs during the day and to the spill cap at night from July 21 through August 31.

Total river flows continued to be high on the Columbia River during July and tapered off in August. Total river flows on the Columbia River during July were between a daily average of 156 and 327 kcfs, with an overall daily average flow of 212 kcfs, which was much higher than in 2007 (174 kcfs) or 2006 (184 kcfs). Total river flows on the Columbia River during August were average at 135 kcfs. Total river flows continued to be high in July and began to taper off in August on the Snake River. Total river flows on the Snake River during the July-August period were between a daily average flow of 26 and 143 kcfs, with a summer average flow of 56 kcfs; this is high compared to 2007 (28 kcfs) and 2006 (37 kcfs).

### *Total Dissolved Gas (TDG) Exceedances*

When providing spill for fish passage, dam operators direct some water through the spillways instead of sending all of it through the turbines. At large dams, spilled water plunges to the river with enough force to supersaturate atmospheric gases in the water. These gases can build up to levels that are dangerous to salmon and other aquatic life. The Corps coordinates with the states of Washington and Oregon on total dissolved gas criteria that accommodate voluntary spill for fish passage resulting in TDG levels of up to 120 percent of saturation in dam tailraces or 115 percent of saturation in the forebay of the next dam downstream (measured as a 12-hour average).

Depending on the location and the time of day, spill for fish passage may be specified as a set amount of flow or as spill to the “gas cap,” meaning up to the state TDG standards. The maximum amount of spill projected not to result in a TDG level higher than the state TDG standards is known as the “spill cap” and changes with environmental conditions. The process of establishing daily spill caps entails reviewing existing hourly data at each dam (including flow, spill, temperature, and incoming TDG levels) and taking into consideration a number of forecast conditions (including total flow, flow through the powerhouse, wind and temperature forecast, etc.). This information is used as input into the SYSTDG (System TDG) modeling tool. The SYSTDG model estimates TDG levels in the rivers several days into the future and is integral to daily decision-making when establishing spill caps at individual dams.

Exceedances of the state TDG standards can result from voluntary spill for fish passage. There is an element of professional judgment involved in setting spill caps, and flow, wind, and temperature forecasts used to set spill caps are not always accurate. However, most instances in which the TDG levels are higher than the standard are the result of involuntary spill, meaning spill resulting from high river flows exceeding powerhouse hydraulic capacity; these may occur in addition to fish passage spill. In addition, powerhouse hydraulic capacity may be reduced as a result of turbine unit maintenance outages or low electrical power demand, especially during low demand hours at night and on weekends. Either can result in additional water (beyond the spill cap amount) being spilled, with resulting TDG levels higher than the standard.

During the 2008 fish passage spill season, there were 93 gauge-day exceedances of Washington and Oregon TDG criteria as a result of voluntary spill operations for fish, out of 2,504 possible daily occurrences ([number of TDG gauges] x [days in spill season, April 3 through August 31]).

- 64 were caused by uncertainties in best professional judgment in setting spill caps.
- 12 resulted from sharp, unforecasted increases in water temperature.
- 11 resulted from gauges malfunctioning and reporting very high TDG levels.
- 5 resulted from bulk spill patterns generating more TDG than expected.
- 1 resulted from a mechanical problem.

There were another 422 instances in which TDG levels were higher than the Washington and Oregon standards, but the exceedances were not associated with voluntary spill for fish:

- 400 resulted from high runoff flows or flood control operations.
- 21 resulted from high TDG levels coming from the Mid-Columbia River projects.
- 1 resulted from a turbine unit outage.

During the 2008 migration season, there also were 668 instances in which TDG levels were higher than either the Oregon 1-hour standard or Washington 2-hour standards of 125 percent TDG. A total of 652 of those instances resulted from involuntary spill that was due to high runoff. The other 16 resulted from special spill operations to pass woody debris. Woody debris in project forebays negatively affects project operations and can have a deleterious effect on fish, as the debris often accumulates in or near juvenile bypass systems and on dewatering screens. The buildup can cause injury or mortality of juvenile salmonids. Typical debris spill operations require opening individual spillbays far enough to allow floating debris to pass under the gates. Opening spill gates that far can elevate TDG levels for a short period of time (usually from 1 to 4 hours) during the operation.

*RPA Action 30 – Juvenile Fish Transportation in the Columbia and Snake Rivers: The Corps and BPA will continue the juvenile fish transportation program toward meeting system survival performance metrics of Snake and Columbia River salmon and steelhead with some adaptive management modifications based on results of RME. 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 of the RPA action table. While the dates mentioned in this section should be considered firm planning dates, if in-season information or results of ongoing RME indicates a need for adaptive management (for example, if modifying these dates are likely to increase in-river or system survival and would be likely to provide equivalent or increased SARs of the species transported), the Action Agencies will consider revising the dates and operations through the Regional Forum.*

The 2008 transportation program was conducted in accordance with NOAA ESA Permit Number 1237 and the Juvenile Fish Transportation Program criteria in the Corps' 2008 Fish Passage Plan. The start dates for initiating transport operations were staggered at Snake River operating projects. Collection of juvenile fish for transportation began May 1 at Lower Granite Dam, May 9 at Little Goose Dam, and May 12 at Lower Monumental Dam. Before transport began, sampling operations took place at the Lower Granite, Little Goose, and Lower Monumental facilities in support of research activities, BPA-sponsored smolt monitoring activities, and assessment of bypass system conditions, Smolt Monitoring Program activities took place daily at Lower Granite Dam throughout the entire season. Transport operations at the Snake River facilities continued through September 30 at Lower Monumental Dam and through November 1 at Little Goose and Lower Granite dams.

Fish at McNary Dam were bypassed from April 1 through July 16 and transported from July 16 to September 22. Sampling operations took place on an every-other-day basis from April 2 through August 16 to support research and BPA-sponsored smolt monitoring activities, as well as to assess bypass system conditions. Juvenile fish transportation by barge began July 17 and continued through August 16. Juvenile fish transportation by truck began August 17 and continued through September 22. Fish collected for transport at McNary Dam from September 22 through 25 were bypassed to the river because of excessive numbers of shad in the collection.

Juvenile fish barged during 2008 were released at varying locations below Bonneville Dam as required in the permit. The ending date for the barging season in 2008 for Snake River fish was August 15. Trucks carried juvenile fish from August 17 through the end of the transport season. Fish were released from a newly constructed truck pad into the Bonneville Juvenile Monitoring Facility outfall flume. In past years, trucks were driven onto barges and transported to mid-channel to release their fish. No early season (April) trucking took place in 2008.

Estimates of the number of fish collected, bypassed, and transported as part of the juvenile fish transportation program are based on sampling portions of the fish collected. Sampled numbers were expanded according to the percentage of the time sampled. At Snake River operating projects, the sampled fish were hand counted and differentiated by species and whether or not adipose fins were clipped. A total of 5,082,176 juvenile fish were collected at Lower Granite Dam, with 815,565 of these fish bypassed to the river and 4,252,195 transported. At Little Goose Dam, 4,885,642 juvenile salmon and steelhead were collected in 2008. Of these, 1,114,654 were bypassed back to the river, and 3,764,974 were transported. At Lower Monumental Dam, 2,097,408 juvenile salmon and steelhead were collected in 2008. Of these, 1,330,880 fish were bypassed, and 765,489 were transported. At McNary Dam, 2,395,116 juvenile salmon and steelhead were collected in 2008. Approximately 1,959,114 of the fish collected were bypassed back to the river to meet fishery agency requirements, and 425,743 juvenile fish were transported. Many collected fish at each project were used for research purposes. Consequently, not all collected fish were bypassed to the river or transported.

A total of 14,460,342 juvenile salmon and steelhead were collected at all transport program locations in 2008, with 9,208,401 fish transported (64 percent) and 5,250,143 bypassed (36 percent). Of the

fish transported, 9,095,546 were transported by barge (99 percent) and 112,855 were trucked (1 percent).

The estimated proportion of non-tagged spring/summer Chinook salmon smolts transported across the entire season in 2008 was 54.3 percent for wild fish and 45.3 percent for hatchery fish. For non-tagged steelhead, the estimated proportions transported were 50.5 percent and 46.6 percent for wild and hatchery smolts, respectively (Faulkner et al., 2009).

**Table 2. Estimated Proportion of Non-Tagged Spring/Summer Chinook and Steelhead Smolts Transported in the Columbia and Snake Rivers in 2008.**

| <b>Species</b>                        | <b>Percent Transported in 2008</b> |
|---------------------------------------|------------------------------------|
| Snake River Spring Chinook—Wild       | 54.3%                              |
| Snake River Spring Chinook—Hatchery   | 45.3%                              |
| Snake River Spring Steelhead—Wild     | 50.5%                              |
| Snake River Spring Steelhead—Hatchery | 46.6%                              |

The juvenile fish passage facilities also bypass adult salmon and steelhead from the juvenile fish separators back to the river. A total of 14,737 adult fallbacks were handled; these included 5,646 at Lower Granite Dam, 6,201 at Little Goose Dam, 1,206 at Lower Monumental Dam, and 1,684 at McNary Dam. Of these, 1,034 fish were spring/summer Chinook, 4,134 were fall Chinook, 9,379 were steelhead, 131 were sockeye, and 59 were coho.

*RPA Action 31 – Configuration and Operation Plan Transportation Strategy: The Corps, in coordination with the Regional Forum, will initiate a Configuration Operational Plan in 2009. The plan will be completed in 2010 and will present a strategy for prioritizing and carrying out further transportation actions at each dam. Comments developed by NOAA Fisheries on the draft COPs shall be reconciled by the Corps in writing to NOAA Fisheries’ satisfaction before release of the final COP. Construction actions for transportation are primarily in the context of changes to juvenile bypass systems. Changes meant to increase adult salmon returns through the juvenile fish transportation process are being evaluated. Some changes include additional barges, a new juvenile fish facility at Lower Granite Dam and modifications to the juvenile fish facilities at Little Goose, Lower Monumental and McNary dams.*

Various studies continued in 2008 to inform the Transportation Strategy COP, slated for completion in 2010. The data will be used to evaluate operational and construction alternatives to improve the transportation program. Significant among these were the following studies:

- **Differential Delayed Mortality.** Comparative studies evaluating the smolt-to-adult return (SAR) rates of fish with in-river migration life histories versus those that are barged continued in 2008. The goal of this work is to identify management options that will optimize in-river and barging operations to maximize SARs, taking into consideration predation, disease concerns associated with barging, and ocean entry timing.
- **Fish Transportation Spring Migrants.** The Action Agencies continued research to determine the potential of transportation to increase adult returns of anadromous salmon in 2008. A PIT-tag study to evaluate weekly SARs for natural spring Chinook and steelhead transported from Lower Granite Dam continued in 2008. More precise transportation data in the April time frame should help clarify effects of transportation on early migrating fish. More precise data in the May time frame should allow for correlation of physical and environmental factors to guide Action Agencies on appropriate triggers of how to operate transportation on an annual basis toward maximizing adult returns. This study included a comparison of SARs for transported and in-river

migrants using reach survival study fish as the in-river group. Results from this study will be available in 2011 and 2012.

- **Fish Transportation Summer Migrants.** In 2008, the Action Agencies continued implementing the 2007 fall Chinook salmon consensus transportation proposal and long-term framework developed collaboratively by the Idaho Department of Fish and Game, Nez Perce Tribe, National Marine Fisheries Service (NOAA Fisheries), Oregon Department of Fish and Wildlife, and U.S. Fish and Wildlife Service. This intensive research, monitoring, and evaluation effort for subyearling fall Chinook salmon will help determine the appropriate management strategy to optimize adult returns. Results from PIT-tag groups of fish in 2008 will be available in 2012–2013.

#### *Hydropower Strategy 4 (RPA Action 32)*

*RPA Action 32 – Fish Passage Plan: The Corps will annually prepare a FPP in coordination with NOAA Fisheries and the Regional Forum through the FPOM. The Corps will operate its projects (including juvenile and adult fish passage facilities) year-round in accordance with the criteria in the FPP. Comments developed by NOAA Fisheries on the draft FPP shall be reconciled by the Corps in writing to NOAA Fisheries' satisfaction before release of the final FPP.*

The draft 2008 Fish Passage Plan was released in October 2007; the final *Fish Passage Plan, Corps of Engineers Projects, EDNWD-NDW-R* (ACOE 2008b, at <http://www.nwd-wc.usace.army.mil/tmt/documents/fpp>) was released in March 2008.

#### *Hydropower Strategy 5 (RPA Action 33)*

*RPA Action 33 – Snake River Steelhead Kelt Management Plan: The BPA and Corps will prepare a Snake River Kelt Management Plan in coordination with NOAA Fisheries and the Regional Forum. The BPA and Corps will implement the plan to improve the productivity of interior basin B-run steelhead populations.*

Several actions were taken in 2008 to enable development of a Kelt Management Plan in 2009. The Corps and BPA met in Walla Walla in February 2008 to discuss the kelt work that would likely take place in 2009. Lower Granite was identified as the primary collection point for this work. BPA noted that a contractor would be performing the work at Lower Granite. Possible transport of kelts also was discussed. This meeting was followed by a site visit to Lower Granite Dam to discuss collection and holding. Two additional meetings with CRITFC and University of Idaho personnel were held at the Lower Granite and Dworshak Fish Hatchery in December 2008. The meetings addressed plans for kelt collection activities at the juvenile fish facility and potential reconditioning efforts at the Dworshak Fish Hatchery in 2009.

#### *Implementation*

BPA has funded CRITFC to prepare a Master Plan for kelt (BPA project number 2007-401-00), which could provide the detail on the reconditioning topic in the broader Kelt Management Plan. The Master Plan will focus on kelt collection and reconditioning at various locations. CRITFC has subcontracted portions of this project out to the University of Idaho. Preparing a Kelt Master Plan is one deliverable that CRITFC will provide as part of its contract with BPA. The Kelt Master Plan — which will apply to reconditioning Snake River kelts — is part of a three-step technical review process required by the Council for artificial propagation projects, particularly those that affect natural populations and involve construction of capital facilities.

## Habitat Implementation Reports, RPAs 34–38

Table 3. Habitat Strategy Requirements, RPA Actions 34–38

| RPA No.                   | Action   | Annual Progress Report Requirement  |
|---------------------------|--|---|
| <b>Habitat Strategy 1</b> |  |   |
| 34                        | Tributary Habitat Implementation 2007 to 2009 – Progress Toward 2018 Habitat Quality Improvement Targets | <p>Status of project implementation (including project milestones) through December of previous year for all 2007-2009 actions.</p> <p>Report physical metrics for implementation achieved (e.g., miles of access, cfs of streamflow acquired, numbers of screens, miles or acres of habitat protected or enhanced, and miles of complexity enhanced) relative to the project objectives.</p>   |
| 35                        | Tributary Habitat Implementation 2010-2018 – Achieving Habitat Quality and Survival Improvement Targets  | <ul style="list-style-type: none"> <li>• Status of project implementation (including project milestones) through December of previous year for all actions identified in implementation plans.</li> <li>• Report physical metrics for implementation achieved (e.g., miles of access, cfs of streamflow acquired, numbers of screens installed, miles of acres of habitat protected or enhanced, and miles of complexity enhanced by benefited population(s)) relative to the total needed to complete the project and achieve the estimated survival benefits, by project.</li> </ul>  |
| <b>Habitat Strategy 2</b> |  |   |
| 36                        | Estuary Habitat Implementation 2007 to 2009  | <ul style="list-style-type: none"> <li>• Status of project implementation (including project milestones) through December of previous year for all 2007-2009 actions.</li> <li>• Report physical metrics for implementation achieved (e.g., number of acres protected/restored/enhanced; riparian miles protected) relative to the total needed to complete project and achieve the estimated survival benefits.</li> </ul>   |
| 37                        | Estuary Habitat Implementation 2010-2018 – Achieving Habitat Quality and Survival Improvement Targets    | <ul style="list-style-type: none"> <li>• Status of project implementation (including project milestones) through December of previous year for all actions identified in implementation plans.</li> <li>• Report physical metrics for implementation achieved (e.g., number of acres protected, restored, enhanced; riparian miles protected) relative to the total needed to complete the project and achieve the estimated survival benefits, by project.</li> <li>• By ESU, report progress toward ESU/DPS-specific survival benefit.</li> <li>• Where ESU/DPS-specific survival benefits are not achieving the progress guidelines above, identify processes or projects in place to ensure achievements by the next comprehensive report.</li> </ul> |

**Table 3. Habitat Strategy Requirements, RPA Actions 34–38**

| RPA No. | Action                                 | Annual Progress Report Requirement   |
|---------|--|--|
| 38      | Piling and Piling Dike Removal Program | <ul style="list-style-type: none"> <li>• Status of project implementation (including project milestones) through December of previous year for all actions identified in implementation plans.</li> <li>• Report physical metrics for implementation achieved (e.g., number of pilings/pile dikes removed, habitat area restored) by project.</li> </ul> |

### *Habitat Strategy 1 (RPA Actions 34–35)*

*RPA Action 34 – Tributary Habitat Implementation 2007 to 2009: Progress Toward 2018 Habitat Quality Improvement Targets: The Action Agencies will provide funding and technical assistance necessary to implement the specific projects identified for implementation in 2007 to 2009 as part of a tributary habitat program to achieve the population-specific overall habitat quality improvement identified in Table 5 of the RPA action table.*

RPA Action 34 specifies requirements for the 3-year cycle from 2007 to 2009. Detailed information on the 2008 progress of individual projects and actions is presented in Section 4, Attachment 3, Tables 1 through 6. The projects and actions listed in Tables 1 through 6 were identified as implementation commitments in the 2007 FCRPS Biological Assessment. NOAA used these actions in its jeopardy analysis and to finalize RPAs 34 and 35 in the BiOp. The tables are organized by ESU and DPS and include project descriptions and habitat metrics that were completed in 2007 and 2008. Projects may be reported multiple times if they benefit more than one species or more than one population.

It should be noted that the metrics included in these tables are not yet consistent with the Katz et al. metrics described in RPA Action 73. The actual metrics reported will evolve as the Action Agencies, working with regional forums, develop a comprehensive system to collect, store, and report tributary habitat action implementation information consistent with the guidance provided in Katz et al. (2006). The Action Agencies will eventually track and report habitat metrics appropriate for their respective habitat programs that are consistent with the Katz et al. metrics.

The Population Summary in Section 4, Attachment 2, summarizes metrics completed in 2007 and 2008 that are related to the populations listed in the 2008 BiOp RPA 35, Table 5. Attachment 2 is included to provide an overview of implementation progress relative to the population-specific biological needs presented by state and tribal partners.

*RPA Action 35 – Tributary Habitat Implementation 2010–2018: Achieving Habitat Quality and Survival Improvement Targets: The Action Agencies will identify additional habitat projects for implementation based on the population specific overall habitat quality improvement still remaining in Table 5 of the RPA action table. 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.*

Annual progress for projects implemented under RPA Action 35, which specifies requirements for 3-year cycles between 2010 and 2018, will be reported in future progress reports.

However, one of the 2008 BiOp's key improvements over previous BiOps is the expanded use of population-specific biological information to target actions in combination with the use of on-the-ground experts to identify and prioritize tributary habitat projects and assess their biological benefits. In 2008 the "expert panel" process was initiated by the Action Agencies to address collaboration with states and tribes as recommended by the Oregon District Court and support the process called for in RPA Action 35.

The local expert panel process is being conducted in those areas where fish populations have the greatest biological need (as listed in RPA Action 35, Table 5): the Clearwater, lower Snake, Grande Ronde/Imnaha, upper Salmon, and upper Columbia (Wenatchee, Entiat, Methow, and Okanogan) geographic areas. The process will inform the 2010–2012 Implementation Plan that is due in December 2009 and provide input for the Action Agencies to assess habitat quality improvements for salmon and steelhead. Expert panel members will review the benefits associated with habitat actions completed between 2007 and 2009, revise those benefits if necessary, identify potential habitat improvement actions for the 2010–2012 implementation cycle, and associate biological benefits with the 2010–2012 actions (2008 FCRPS BiOp, RPA 35; 2007 FCRPS CA, Appendix C, Annex 1). Presentation of this information in upcoming Implementation Plans will illustrate the progress on commitments contained in RPA 35, Table 5 of the 2008 FCRPS BiOp.

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 2010–2012 habitat implementation planning. The orientation meetings were held in LaGrande, Oregon; Lewiston, Idaho; Salmon, Idaho; and Wenatchee, Washington.

Attendees at the orientation meetings included representatives from NOAA Fisheries, tribal and state fish and wildlife agencies, the U.S. Forest Service, the U.S. Fish and Wildlife Service, local watershed groups, conservation districts, and recovery boards. All had extensive knowledge and experience about the local habitat conditions, and many hold undergraduate and advanced degrees in natural resource-related fields.

### **Additional Reports**

Reclamation has produced a number of additional reports that document tributary habitat accomplishments. These reports are listed in Section 4, Attachment 3; the reports can be accessed by following links at <http://www.usbr.gov/pn/programs/fcrps/thp/index.html>.

#### *Habitat Strategy 2 (RPA Actions 36–38)*

*RPA Action 36 – Estuary Habitat Implementation 2007 to 2009: The Action Agencies will provide funding to implement specific actions identified for implementation in 2007–2009 as part of a 10-year estuary habitat program to achieve the estimated ESU survival benefits of 9.0 percent and 6.0 percent for ocean type and stream-type ESUs, respectively. 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.*

The Action Agencies expanded the level of on-the-ground implementation in 2008 with particular focus on projects that address biological priorities and key limiting factors identified for estuary habitat for all ESUs. Key limiting factors identified in NOAA's *Columbia River Estuary ESA Recovery Plan Module for Salmon and Steelhead* include reduced in-channel and off-channel habitat changes, food source changes, and competition and predation. Project types include land acquisition; protection of off-channel habitats; reduction of invasive plants; and protection and restoration of riparian and wetland areas.

During 2008, the Action Agencies completed eight on-the-ground habitat projects with another three estuary habitat projects in the planning and development phase. On-the-ground actions include two land acquisitions: Willow Grove and Wolf Bay. Management plans, including future restoration activities, on the acquired parcels have been or are being put in place. Additional habitat activities include removing riparian/wetland invasive plant species and planting native species, installing fence

in riparian areas to exclude cattle, removing riprap, improving fish passage structures, and placing large wood material.

Project planning and development occurred on Deer Island, where design and landowner outreach were under way in 2008 for possible future implementation actions. Overall long-term restoration goals seek to restore historical estuarine habitats where feasible on the 4,500-acre island.

In 2008 the new Pile Structure Program was initiated. The purpose of this initial stage was to produce a draft program plan and begin to inventory and assess pile structures, develop draft criteria for establishing project priorities, and identifies future possible project implementation sites.

See Section 4, Attachment 5, for further detail on the estuary projects and metrics accomplished.

*RPA Action 37 – Estuary Habitat Implementation 2010–2018 – Achieving Habitat Quality and Survival Improvement Targets: The Action Agencies will provide funding to implement additional specific projects as needed to achieve the total estuary survival benefits identified in the FCRPS BA. 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.*

Some, but not all, of the suite of projects that will be implemented during 2010–2018 have been identified. However, the Action Agencies have committed to continuing to implement the expanded estuary habitat program from the previous time frame of 2007–2009. As the estuary studies continue to inform, the Action Agencies will be better able to target the amount and types of habitat that would help increase survival and better quantify the biological benefits of these actions. The goal is to implement actions that provide the greatest and most efficient biological benefit to all listed ESUs.

If identified habitat projects are not implemented for some reason, such as because of local sponsorship or real estate issues, the Action Agencies will work to identify alternative projects to provide the same or greater benefits. Projects will be selected using the process identified below for future implementation.

Projects for longer term implementation will be identified based on research and regional coordination. The Action Agencies will use the *Columbia River Estuary ESA Recovery Plan Module for Salmon and Steelhead* (by NOAA Fisheries) to guide restoration and protection efforts through a collaborative process. Beginning in 2008, the Action Agencies 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 (USGS). 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, and local restoration practitioners, including the Columbia River Estuary Study Taskforce (CREST), the Cowlitz Tribe, the Columbia Land Trust, watershed councils, and conservation districts. When available, new scientific information resulting from FCRPS RME will be applied to estimate benefits for projects implemented between 2010 and 2018.

*RPA Action 38 – Piling and Piling Dike Removal Program: To increase access to productive habitat and to reduce avian predation, the Action Agencies will develop and implement a piling and pile dike removal program.*

In 2008, the Action Agencies, in collaboration with the Lower Columbia River Estuary Partnership, set up the Pile Structure Program subcommittee under the Estuary Partnership's Science Work Group. In 2008, the Action Agencies, in collaboration with others, began implementing the Pile Structure Program by gathering pile structure site condition data and designing a scientific approach to guide implementation.

In 2008 the Action Agencies made considerable progress on a draft program plan for the new Pile Structure Program. This document will be reviewed by the Independent Scientific Review Panel in 2009. Site-specific data collection and monitoring will begin in 2009 with on-the-ground implementation, including pile structure removal in 2010.

The Action Agencies conducted pre-monitoring at Coal Creek, a pile structure removal project funded and implemented by NOAA Fisheries in 2008. The Action Agencies' post-monitoring for this project will be completed in 2009. Pre- and post-monitoring for pile removal at the Coal Creek Project site included water quality monitoring of adjacent sediments, dissolved oxygen, and target analytes sampling. Concurrently, data were collected to investigate fish use, hydrology, and bathymetry at the removal site.

## Hatchery Implementation Reports, RPA Action 39–42

**Table 4. Hatchery Strategy RPA Action Requirements.**

| RPA No.                    | Action   | Annual Report Requirement   |
|----------------------------|--|---|
| <b>Hatchery Strategy 1</b> |  |   |
| 39                         | FCRPS Funding of Mitigation Hatcheries – Programmatic  | Status of submittal/approval of Hatchery Genetic Management Plans (HGMPs), including site-specific application of BMPs.   |
| 40                         | Reform FCRPS Hatchery Operations to Reduce Genetic and Ecological Effects on ESA-Listed Salmon and Steelhead | <ul style="list-style-type: none"> <li>• Status of implementation through December of the previous year for all reforms identified in Table 6.</li> <li>• Status of implementation of future reforms identified by the Action Agencies following the HSRG process.</li> </ul> |
| <b>Hatchery Strategy 2</b> |  |   |
| 41                         | Implement Safety Net Programs to Preserve Genetic Resources and Reduce Short-term Extinction Risk            | Status of implementation through December of the previous year for all safety net programs identified in Table 7.   |
| 42                         | Implement Conservation Programs to Build Genetic Resources and Assist in Promoting Recovery                  | Status of implementation through December of the previous year for all conservation programs identified in Table 6.   |

### *Hatchery Strategy 1 (RPA Actions 39–40)*

*RPA Action 39 – FCRPS Funding of Mitigation Hatcheries – Programmatic: The FCRPS Action Agencies will continue funding hatcheries in accordance with existing programs, and will adopt programmatic criteria for funding decisions on mitigation programs for the FCRPS that incorporate BMPs. The Hatchery Effects Report, the August 2006 NOAA Fisheries paper to the PWG and the NOAA Fisheries 2007 Guidance Paper should be considered in developing these criteria in addition to the BMPs in the Action Agencies' 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.*

In 2008, the Action Agencies continued to fund mitigation hatcheries in accordance with existing programs and developed programmatic funding criteria for funding decisions on mitigation programs

for the FCRPS. These funding criteria will be used to inform future funding decisions on FCRPS mitigation hatchery programs.

In September 2008, NOAA Fisheries announced initiation of its RPA Action 39 ESA consultation process for upper Columbia hatchery programs. Subsequently, the Action Agency-funded hatchery operators in the upper Columbia region began updating the Hatchery and Genetic Management Plans (HGMPs) for their respective hatchery programs. Information from the reports of the recently completed USFWS Hatchery Review Team process and the Hatchery Scientific Review Group will guide and inform the development of program-specific HGMPs. As of December 2008, development of updated HGMPs for all FCRPS hatchery programs in the upper Columbia requiring consultation (Table 5) was under way.

Table 5. FCRPS-Funded Hatchery Programs in the Upper Columbia Region.

| <b>Program</b>  | <b>Operator</b> | <b>Lead Action Agency</b> | <b>Basin</b> |
|---|-----------------|---------------------------|--------------|
| Leavenworth National Fish Hatchery (NFH) spring Chinook                   | USFWS           | Reclamation               | Wenatchee    |
| Entiat NFH program – undetermined stock (new program under development)   | USFWS           | Reclamation               | Entiat       |
| Entiat NFH steelhead kelt reconditioning (new program under development)* | Yakama Nation   | BPA                       | Entiat       |
| Winthrop NFH Methow Composite spring Chinook                              | USFWS           | Reclamation               | Methow       |
| Winthrop NFH steelhead  | USFWS           | Reclamation               | Methow       |
| Methow/Okanogan coho  | Yakama Nation   | BPA                       | Methow       |
| Wenatchee coho  | Yakama Nation   | BPA                       | Wenatchee    |

*\* At this time, it is uncertain where the Yakama Nation kelt reconditioning program will be located. Entiat NFH is a potential site. The Yakama Nation would be the operator, with funding from BPA, for this FCRPS BiOp/Columbia Basin Fish Accords project.*

*RPA Action 40 – Reform FCRPS Hatchery Operations to Reduce Genetic and Ecological Effects on ESA-listed Salmon and Steelhead: The Action Agencies will undertake/fund reforms to ensure that hatchery programs funded by the Action Agencies as mitigation for the FCRPS are not impeding recovery. The Action Agencies will work with FCRPS mitigation hatchery operators to cost effectively address needed reforms of current hatchery programs while continuing to meet mitigation responsibilities. Specific reforms to be implemented under this action (following any necessary regulatory approval) are listed in Table 6 of the RPA action table. Other reforms will be identified and implemented following the conclusion of the Columbia River Hatchery Scientific Review Group process.*

1. *For Lower Columbia Chinook: The COE will review the John Day Hatchery Mitigation Program.*

Review of the John Day Mitigation Program will have to take into account the requirements of *U.S. v. Oregon*. In late 2008 the Corps learned that the *U.S. v. Oregon* parties believed the magnitude and makeup (upriver brights v. tules) of hatchery releases in the John Day Mitigation Program should be adjusted. However, the Corps did not receive a written statement of and justification for

that position until 2009. Therefore, 2008 action on program review was limited to a review of the historical basis for the existing program. (Discussions and review are continuing in 2009.) However, in 2008 the Corps did finalize the plan for reprogramming production of juveniles and transferring releases between Spring Creek National Fish Hatchery (above Bonneville Dam) and Bonneville Hatchery (below Bonneville Dam).

The Corps coordinated with the *U.S. v. Oregon* parties regarding development of their position on, and justification for, the changes they believe necessary in the John Day Mitigation Program. In addition, the Corps reprogrammed production between Spring Creek NFH and Bonneville Hatchery.

2. *For Snake River Steelhead: Fund the Tucannon River steelhead supplementation program to transition to local broodstock using BMPs.*

This action will be funded by BPA and implemented by the Lower Snake River Compensation Plan (LSRCP) program office and the Washington Department of Fish and Wildlife (WDFW), the LSRCP hatchery program operator for the Tucannon River steelhead supplementation program. 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.

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

This action will be funded by BPA and implemented by the LSRCP program office and WDFW, the LSRCP hatchery program operator for the Touchet River steelhead supplementation program. In 2008, BPA staff began preliminary implementation planning with USFWS LSRCP staff. Implementation will require coordination among USFWS and co-managers, and some feasibility issues have been identified that will need to be explored further in 2009.

4. *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.*

The Winthrop National Fish Hatchery initiated a pilot program to evaluate longer-term (2-year) rearing of juvenile steelhead as part of a program to transition to a locally adapted steelhead broodstock in the Methow River. The pilot program, which will continue for several more years, involves rearing 25,000 juvenile steelhead for release in spring 2010. There was discussion about where on the Methow River and how to manage returning adult steelhead on the spawning grounds. One option is to intercept adult steelhead at Foghorn Dam. The fish ladder at Foghorn Dam has not been tested, and there are plans to test it for adult steelhead during the spring 2009 run. Foghorn Dam is not a complete barrier to fish passage, and it is relatively easy for adult fish to pass, so a weir or some other type of structure might be required to guide upstream migrating fish for collection.

BPA funded the Hatchery Scientific Review Group (HSRG) process in 2008 to enable the HSRG to complete its comprehensive review and analysis of all Columbia River Basin hatchery programs and its final report with recommendations for hatchery reform.

## Hatchery Strategy 2 (RPA Actions 41–42)

*RPA Action 41 – Implement Safety Net Programs to Preserve Genetic Resources and Reduce Short-term Extinction Risk: The Action Agencies will continue to fund the operation of on-going “safety net” programs that are providing benefits to ESA-listed stocks at high risk of extinction by increasing genetic resources and will identify and plan for additional safety-net programs, as needed.*

1. *For Snake River sockeye: Continue to fund the safety net program to achieve the interim goal of annual releases of 150,000 smolts while also continuing to implement other release strategies in nursery lakes such as fry and parr releases, eyed-egg incubation boxes, and adult releases for volitional spawning (see Action 42 for expansion of the program for building genetic resources and assisting in promoting recovery).*

BPA continued to fund the Snake River Sockeye Salmon Captive Broodstock Program (BPA Project 2007-402-00) to preserve this species. The program has produced hundreds of thousands of progeny from remnants of the wild stock. The progeny are raised in carefully managed hatcheries and released into their natural habitats using multiple release strategies, including smolt, fry, and parr releases; eyed-egg incubation boxes; and adult releases for volitional spawning. The Stanley Basin Technical Oversight Committee continues to provide guidance on the program. Since 1999, 1,005 adults from the program have returned to Redfish Lake. In 2008, 650 adult sockeye salmon returned to the Stanley Basin. This is the largest recorded annual return since 1956.

On September 2, 2008, the new state-of-the-art fish hatchery building was dedicated at the Idaho Department of Fish and Game (IDFG) Eagle Fish hatchery. This is one of three related efforts to increase sockeye salmon smolt production to 150,000 sockeye salmon smolts — and an initial step toward a goal of producing 500,000 to 1 million sockeye salmon smolts. This expanded capacity will accommodate additional sockeye salmon broodstock holding, adult spawning, egg incubation, and juvenile rearing.

2. *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.*

In 2008, BPA continued to fund this safety-net program through BPA Project 2000-019-00, the Tucannon River Spring Chinook Captive Broodstock Program.

3. *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.*

In 2008, BPA continued to fund this safety-net program through BPA Project 2007-404-00, Oregon Spring Chinook Captive Propagation.

4. *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.*

In 2008, BPA continued to fund this safety-net program through BPA Project 1996-043-00, the Johnson Creek Artificial Propagation Enhancement Project.

5. *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).*

In 2008, BPA continued to fund this experimental captive rearing program through BPA Project 2007-403-00, Idaho Snake River Spring Chinook Captive Propagation.

6. *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.*

It is not feasible to implement this action at this time because of a lack of adequate B-run steelhead population viability data. Once sufficient data are available (as determined by NOAA) through the enhanced Snake River B-run steelhead population productivity and abundance monitoring called for in RPA Action 50.5, we will begin to work with NOAA to develop the type of “trigger” described above. We estimate it may be several years before adequate data are available from the enhanced monitoring effort

*RPA Action 42 – Implement Conservation Programs to Build Genetic Resources and Assist in Promoting Recovery: The Action Agencies will implement conservation programs for ESA-listed stocks where the programs assist in recovery.*

1. *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 composed of hatchery origin fish. Re-introduction 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.*

When constructed and fully operational, the BPA-funded Chief Joseph Hatchery is expected to serve as the artificial production facility needed for this reintroduction program. As stated above, this production will initially be contingent on the availability of within-ESU spring Chinook broodstock from the Methow Basin. As of December 2008, the Confederated Colville Tribes’ proposal for the Chief Joseph Hatchery was proceeding through the Council’s Three-Step Review process for major artificial production projects. Chief Joseph Hatchery is expected to be approved in 2009 to move into review Step 3 (final design), and construction is anticipated to begin in 2010.

2. *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.*

In 2008, the Yakama Tribes 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.

3. *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.*

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.

4. *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.*

In 2008, BPA continued to fund this action through a BPA project, Kelt Reconditioning/Reproductive Success.

5. *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.*

In 2008, BPA continued to fund operation and maintenance for this action through the LSRCP Direct Funding Agreement.

6. *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 composed of hatchery origin fish.*

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 in 2008. It could be that the earliest date for NOAA approval of an HGMP will be during the RPA Action 39 ESA consultation process for the Snake River Basin, which is scheduled to start in February 2010 and conclude in August 2010.

7. *For Snake River Sockeye: Fund further expansion of the sockeye program to increase total smolt releases to between 500,000 and 1 million fish.*

On September 2, 2008, BPA signed a Fish Accord with Idaho that will provide funding certainty over a 10-year period. The accord included the commitment to provide funding for a new sockeye salmon fish hatchery (property acquisition and construction). Throughout 2008, BPA worked with IDFG to identify and begin the acquisition process for property meeting the criteria for a facility that will assure propagation of up to 1 million sockeye salmon smolts. Funding will be provided through ongoing BPA projects.

8. *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.*

Development of the study plan to investigate the feasibility of transporting adult sockeye began in 2009.

9. *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.*

In 2008, BPA continued to fund this action through the BPA project Reintroduction of Chum Salmon into Duncan Creek.

10. *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.*

As of December 2008, WDFW was developing a proposal for a BPA-funded project to implement this action.

## Predation Management Implementation Reports, RPA Action 43–49

Table 6. Predation Management RPA Action Requirements

| RPA No.                                | Action   | Annual Report Requirement   |
|--|--|---|
| <b>Predation Management Strategy 1</b> |  |   |
| 43                                     | Northern Pikeminnow Management Program (NPMP)    | Annual progress reports will describe actions taken, including: <ul style="list-style-type: none"> <li>• Number of pikeminnow removals</li> <li>• Estimated reduction of juvenile salmon consumed</li> <li>• Average exploitation rate</li> </ul> Results of periodic program evaluations (including updates on age restructuring and compensatory responses) |
| 44                                     | Develop strategies to reduce non-indigenous fish | Beginning in 2010, annual progress reports will describe actions taken as a result of the workshop.   |
| <b>Predation Management Strategy 2</b> |  |   |
| 45                                     | Caspian Tern                                     | Annual progress reports will describe actions taken toward the implementation of the Caspian Tern Management Plan.  |
| 46                                     | Double-Crested Cormorant                         | Annual progress reports will describe actions taken if warranted.   |
| 47                                     | Inland Avian Predation                           | Annual progress reports will describe actions taken if warranted.   |
| 48                                     | Other Avian Deterrent Actions                    | Annual deterrent actions will not be reported.  |
| <b>Predation Management Strategy 3</b> |  |   |
| 49                                     | Marine Mammal Control Measures                   | Not applicable.   |

### *Predation Management Strategy 1 (RPA Actions 43–44)*

*RPA Action 43 – Northern Pikeminnow Management Program: Action Agencies will continue to annually implement the base program and continue the general increase in the reward structure in the northern pikeminnow sport-reward fishery consistent with the increase starting in 2004. To better evaluate the effects of the NPMP, BPA will increase the number of tagged fish. The Action Agencies will evaluate the effectiveness of focused removals of pikeminnow at The Dalles and John Day dams and implement as warranted. Additional scoping of other mainstem dams will be based upon evaluations and adaptive management principles with input from NOAA Fisheries, and other regional fisheries managers.*

Since 1990, BPA has funded the Northern Pikeminnow Management Program (NPMP) to reduce the numbers of larger pikeminnow and improve survival of juvenile salmon. In 2004, after BPA increased the reward for the catch of this predator, the number of pikeminnow removed increased by 25 percent compared to prior years. The increased reward was made permanent in 2005 to sustain the higher catches. This resulted in the highest harvest rate of pikeminnow observed since the program began. The pikeminnow program has removed more than 3.3 million northern pikeminnow from the Columbia River since 1990. Evaluation indicates that as a result of the program, pikeminnow predation on juvenile salmon has declined 38 percent, saving 5 million juvenile salmon annually that would otherwise have been eaten by this predator.

The 2008 BiOp calls for BPA to increase tagging efforts to boost the number of tagged northern pikeminnow to better inform and increase the statistical significance of the biological evaluation of pikeminnow removals. The evaluation component of the NPMP uses tag recoveries in sponsored fisheries to quantitatively measure the benefit of removals within the year and cumulatively. In 2008, researchers were able to increase cumulative tagging efforts, which resulted in increases in year-over-year application of tags by 75 percent. The biggest gain was in the Snake River system, most notably Lower Granite and Little Goose pools, which increased the number of marks by more than 400 percent compared to 2007. This increase in tagging and resultant improvement in estimation is consistent with the 2008 BiOp and Independent Scientific Advisory Board (ISAB) recommendations (The Northern Pikeminnow Management Program Justification, Performance, and Cost Effectiveness, Hankin, 2001 <http://www.nwcouncil.org/library/2000/2000-16.pdf>). Also in 2008, the exploitation rate on northern pikeminnow was 19.5 percent, which continues to be at the high end of program objectives based on the hypothesis that a 10 to 20 percent exploitation rate (on northern pikeminnow 9 inches or longer) could achieve up to a 50 percent reduction in predation mortality (Rieman and Beamesderfer 1990). The exploitation rate was based on a numerical catch of 163,640 from a sport reward fishery and dam angling fishery. As part of the ongoing annual evaluation of the NPMP, managers determined that continued implementation of the dam angling program component is warranted based on 2008 catches.

*RPA Action 44 – Develop strategies to reduce non-indigenous fish: The Action Agencies will work with NOAA Fisheries, states and tribes to coordinate to review, evaluate, and develop strategies to reduce non-indigenous piscivorous predation. The formation of a workshop will be an initial step in the process.*

In September 2008, BPA sponsored a one-day workshop entitled “Review, Evaluate, and Develop Strategies to Reduce Non-Native Piscivorous Predation on Juvenile Salmonids.” More than 100 people attended, representing states, tribes, federal fish management agencies, Action Agencies and other stakeholders. Results of the facilitated workshop and follow-up topics were compiled and presented to NOAA. Next steps in the development of strategies to reduce non-indigenous fish are to narrow the dozen or so grouped recommendations to two or three through continued collaboration with the regional agencies and tribes. Once the topic areas have been narrowed, basic or applied research can occur by implementing actions to address the focal areas of concern.

#### *Predation Management Strategy 2 (RPA Action 45–48)*

*RPA Action 45 – Reduce Caspian Terns on East Sand Island in the Columbia River Estuary: The FCRPS Action Agencies will implement the Caspian Tern Management Plan. East Sand Island tern habitat will be reduced from 6.5 to 1.5 to 2 acres. It is predicted that the target acreage on East Sand Island will be achieved in approximately 2010.*

In addition to the monitoring conducted at East Sand Island, in 2008 the Corps began implementing the *Caspian Tern Management to Reduce Predation of Juvenile Salmonids in the Columbia River Estuary* plan. The EIS for the plan was published in January 2005 ([https://www.nwp.usace.army.mil/pm/e/en\\_plan\\_avian.asp](https://www.nwp.usace.army.mil/pm/e/en_plan_avian.asp)). The plan, jointly prepared by USFWS (lead), Corps, and NOAA Fisheries, was developed to further reduce Caspian tern predation on juvenile salmon. The preferred alternative in the EIS recommends that available tern nesting habitat on East Sand Island be reduced to 1 to 1.5 acres (from 6 acres) to redistribute approximately two-thirds of the Caspian terns (2,500 to 3,125 breeding pairs). Reduction of East Sand Island habitat cannot occur until Caspian tern habitat is created or improved on alternate sites, mainly in Oregon and California. Two acres of alternative habitat must be created for every acre of habitat reduced on East Sand Island. The USFWS and the Corps signed separate records of decision (RODs) adopting the plan (a modified preferred alternative that excluded the Dungeness, Washington, alternative habitat site) in November 2006. NMFS completed the biological opinion for the proposed action on February 16, 2006.

In 2008, the Corps began implementing the Caspian Tern Management Plan with construction of an island in Fern Ridge Reservoir (Oregon). The 1-acre square island, created from sand and rock, was completed in February. The Corps, in conjunction with OSU researchers, deployed tern decoys and tern colony sounds in order to attract terns to nest on the island as they returned to the Northwest in the spring 2008. Unfortunately, though, these attraction efforts were unsuccessful – no terns nested on the island in 2008. At the end of the breeding season, there were a small number of terns using the island. Those birds may return to the island in 2009 to breed.

While terns have been slow to respond to the newly created island at Fern Ridge Reservoir, the opposite has been true of the other island created in 2008, which was constructed in Crump Lake (Oregon). Construction of the Crump Lake Island was completed in March of 2008. The island also covers 1 acre, but unlike the Fern Ridge island, it is elliptical and built on top of a remnant island. Caspian terns arrived on the island in early May, very soon after construction was completed. Approximately 428 breeding pairs of terns nested on the Crump Lake Island in 2008. In addition to terns, the island attracted breeding ring-billed gulls, California gulls, and double-crested cormorants. American white pelicans also used the island. The Caspian terns' diet primarily included Tui chub, catfish, crappie, and bass. The terns consumed a small number of Warner suckers, which is a listed species. The Corps is currently consulting with USFWS to determine an acceptable level of take.

Finally, the first of three islands was constructed in Oregon's Summer Lake State Wildlife Area. The round half-acre island was built in the East Link Unit. Construction was completed in December 2008. (Social attraction, tern decoys, and tern colony sounds were used in spring 2009 to attract terns to the island. Note that these social attraction cues are being employed at all of the islands constructed or enhanced through the tern management plan.)

Construction of the remaining Summer Lake sites and of the planned California sites is as follows:

- Dutchy Lake half-acre (floating island), February 2009
- Gold Dike half-acre rock island, July/August 2009
- Tule Lake (Klamath Basin), July/August 2009
- Orem Unit (Klamath Basin), September 2009
- Sheepy Lake (Klamath Basin), October/November 2009
- Hayward Regional Shoreline (SF Bay), November 2009

(The second Summer Lake Island—Dutchy Lake—was successfully constructed early in 2009, increasing the total to 3 acres of habitat constructed prior to the 2009 Caspian tern breeding season. This allowed the Corps to reduce the available tern nesting habitat on East Sand Island from 5 acres to 3.5 acres prior to the 2009 breeding season. This reduction was not expected to have a significant impact on terns nesting on East Sand Island because, in 2007 and 2008, the colony on East Sand used only approximately 3.6 acres of the available habitat. Note that, because of the limited colony area, the available habitat was reduced by 1 acre prior to the 2008 breeding season.)

*RPA Action 46 – Double-Crested Cormorants: The FCRPS Action Agencies will develop a cormorant management plan encompassing additional research, development of a conceptual management plan, and implementation of warranted actions in the estuary.*

The double-crested cormorant colony on East Sand Island consisted of about 10,950 breeding pairs in 2008, which represents a 20 percent decline in colony size compared to the previous year (about 13,770 pairs). Since monitoring began in 1997, the size of the cormorant colony has increased by about 120 percent. Nesting success in 2008 (2.26 fledglings per breeding pair) was down slightly from

2007 (2.78 fledglings per breeding pair). As in previous years, salmon made up a small portion (11 percent) of the cormorant diet in 2008, while marine forage fish (i.e., northern anchovy) and estuarine resident fish (i.e., sculpin, flounder, minnows) made up more than 40 percent of the diet.

Despite the lower reliance on salmon as a food source by cormorants compared to terns, total smolt consumption by cormorants was similar to or greater than that by terns. This is because double-crested cormorants are about four times larger than Caspian terns, the cormorant colony produces more young than the tern colony, and until this year, the cormorant colony was 40 percent larger than the tern colony. In 2007, cormorants nesting on East Sand Island consumed an estimated 9.2 million juvenile salmon (95 percent confidence interval = 4.4 to 14.0 million), compared to an estimated 6.7 million juvenile salmon (95 percent confidence interval = 5.8 to 7.5 million) consumed by terns nesting on East Sand Island. (Estimates of cormorant consumption of salmon smolts in 2008 are pending further analyses.)

An analysis of salmon PIT tags detected at the double-crested cormorant colony on East Sand Island indicated that all species of anadromous salmon (Chinook salmon, coho salmon, sockeye salmon, steelhead, and even sea-run cutthroat trout) from all run types (fall, winter, summer and spring) from all tagged ESUs were susceptible to cormorant predation in 2008. The numbers of PIT tags from the various salmon species and run types recovered on the cormorant colony were roughly proportional to the relative availability of PIT-tagged salmon released in the basin, suggesting that cormorant predation on salmon smolts in the estuary was less selective than tern predation. In contrast, PIT-tag recoveries on the East Sand Island tern colony indicated that steelhead were far more vulnerable to Caspian tern predation as compared to other salmon species. An analysis of salmon predation rates, based on the proportion of available PIT-tagged fish deposited on the cormorant colony, indicated that both hatchery and wild smolts were consumed, with rates averaging between 2 and 7 percent for most species and run types of PIT-tagged fish originating upstream of Bonneville Dam. However, predation rates in excess of 10 percent and 30 percent were observed for some groups of hatchery fall Chinook and hatchery coho salmon released downstream of Bonneville Dam. Unfortunately, data on wild migrants originating from downstream of Bonneville Dam are lacking and were not considered in this analysis.

A comparison of per-capita consumption rates of PIT-tagged fish between terns and cormorants nesting on East Sand Island suggests similar levels of take per nesting adult per colony, with an estimate of 2.1 and 1.7 PIT-tagged fish consumed per nesting tern and cormorant, respectively. Given the colonies were approximately the same size in 2008 (10,700 tern pairs and 10,950 cormorant pairs), per-capita PIT-tag consumption estimates suggest that smolt impacts were similar among these two colonies in 2008.

If the cormorant breeding colony on East Sand Island continues to expand and/or the proportion of salmon in cormorant diets increases, cormorant predation rates on juvenile salmon may far exceed those of Caspian terns nesting in the estuary. The discrepancy in predation rates for the two colonies will be even greater if the Caspian tern colony is reduced in size by more than 50 percent by 2015, as intended under the management plan now being implemented. Resource management agencies have not decided whether management of the large and expanding colony of double-crested cormorants on East Sand Island is warranted. Elsewhere in North America, management of double-crested cormorants has consisted primarily of lethal control (i.e., shooting of adults, oiling of eggs, and destruction of nests in trees). Non-lethal management approaches, such as relocating a portion of the colony to alternative colony sites along the coast of Oregon and Washington, seem more appropriate in the context of the cormorant colony on East Sand Island, which constitutes nearly 50 percent of the entire breeding population of the Pacific Coast subspecies *P. auritus albociliatus*.

In 2008, the Action Agencies continued a study to test the feasibility of potential management techniques for reducing losses of juvenile salmon to cormorant predation in the Columbia River estuary. This study sought to determine whether habitat enhancement and social attraction techniques can be used to induce double-crested cormorants to nest in an area outside the Columbia River estuary where they have not previously nested and, if so, whether these techniques can be used to redistribute some of the double-crested cormorants nesting in the Columbia River estuary to alternative colony sites outside the estuary, if deemed necessary by the resource management agencies. In 2008, the Action Agencies continued to employ habitat enhancement (i.e., placement of old tires filled with nesting material) and social attraction techniques (i.e., decoys and audio playback systems; Kress 2000 and 2002 and Roby et al. 2002) on a floating platform in Fern Ridge Reservoir, near Eugene, Oregon. Fern Ridge Wildlife Area was selected because it supported significant numbers of cormorants during the non-breeding season.

Cormorants did not attempt to nest on the floating platform and were never observed perched on the floating platform during the nesting season in 2008, although small numbers of double-crested cormorants were observed at Fisher Butte. Developing methodologies to enhance the size of existing double-crested cormorant colonies, along with establishing new colonies using habitat enhancement and social attraction techniques, may be necessary to shift cormorants from the large and growing colony on East Sand Island to alternative colony sites where ESA-listed salmon are not as vulnerable to cormorant predation.

In 2008, the Action Agencies investigated two techniques to discourage nesting by double-crested cormorants on East Sand Island. The first technique, human disturbance, was used on a discrete portion of the breeding colony area. The second technique, hazing with a green laser, was used on cormorants that were roosting on beaches adjacent the colony.

Isolated human disturbance was tested as a potential method to discourage double-crested cormorant nesting on East Sand Island. Prior to the initiation of any breeding, a visual barrier (a fence of black plastic fabric about 1.5 meter tall) was erected to isolate a small section of the eastern end of the cormorant colony. Disturbances ceased once there was evidence of egg laying.

In addition to human disturbance, a green laser (LEM50 laser torch) was used to test its efficacy in dispersing targeted double-crested cormorants from roosting locations on the island. The laser was used in the first week of May, after the cormorants had initiated egg laying; therefore, its application was restricted to roosting individuals and flocks that were encountered off-colony. Lasers were not used to cause nest abandonment. Technicians attempted to haze birds daily, varying the time of day and range to target birds and employing the laser under different weather and light conditions. They recorded the response of targeted individuals and flocks. Tests that resulted in flushing response for some or all of the target birds were considered successful.

Both disturbance measures tested were effective at flushing birds, but each was initiated too late in the breeding cycle to adequately determine its effectiveness to deter egg laying. The effects of human disturbance likely were limited because birds had already established a moderate to high level of commitment to nesting territories and pair bonds. Short-duration human disturbances (less than 5 minutes) were not effective at keeping cormorants off the colony for periods that were likely to inhibit nest initiation. However, short disturbances might have been effective if initiated earlier in the breeding cycle.

*RPA Action 47 – Inland Avian Predation: The FCRPS Action Agencies will develop an avian management plan (for Double-Crested Cormorants, Caspian Terns, and other avian species as determined by RME) for Corps-owned lands and associated shallow water habitat.*

The action agencies in 2008 continued to monitor avian predator populations in the Mid-Columbia River and evaluate their impacts on outmigrating juvenile salmon. Research efforts focused on determining whether management of the Crescent Island Caspian tern and Foundation Island double-crested cormorant colonies is warranted and to determine whether potential management techniques would reduce total consumption of fish. Actions in 2008 included determining the diet composition and consumption of juvenile salmon and the effects of operational strategies on avian predation rates on juvenile salmon.

In 2008, approximately 388 pairs of Caspian terns nested on Crescent Island, continuing a downward trend in colony size that began in 2001. Caspian terns also nested at a new colony site on Rock Island in the John Day Pool. This colony included about 100 pairs but only fledged three chicks. The double-crested cormorant colony on Foundation Island increased to approximately 360 pairs in 2008 compared to 2007, when about 330 pairs of cormorants nested on the island.

As in past years, avian predation on Snake River steelhead in 2008 was greater than on other salmon species. Steelhead made up an estimated 19 percent of identifiable salmon smolts consumed by Crescent Island Caspian terns. Similar predation levels occurred on steelhead by Foundation Island cormorants in 2008. Research related to Crescent Island Caspian tern and Foundation Island double-crested cormorant colonies is scheduled to be completed in 2009.

A pilot study was initiated in 2007 to determine how Snake River steelhead smolt morphology, condition, and origin might relate to differences in smolt vulnerability. This study was expanded in 2008 to include Columbia River steelhead and to provide total consumption and predation rates.

A pilot study was also initiated in 2007 to determine whether overwintering cormorants on the Snake River prey on hold-over fall Chinook salmon. The study continued in 2008. Preliminary data suggest some predation on overwintering fall Chinook salmon in the Snake River.

In 2008 the Action Agencies and the USFWS met to begin discussing development of an avian management plan for Corps-owned lands. The development and implementation of avian management plan(s) will continue in collaborative discussions with the USFWS in 2009. The main objective of the Corps-owned lands management plan is to improve ESA-listed anadromous fish survival for fish rearing and migrating through the lower Snake and Columbia rivers.

*RPA Action 48 – Other Avian Deterrent Actions: The Corps will continue to implement and improve avian deterrent programs at all lower Snake and Columbia River dams. This program will be coordinated through the Fish Passage Operations and Maintenance Team and included in the FPP.*

Other avian deterrent actions, such as hazing and wire arrays, were carried out in accordance with the FPP (<http://www.nwd-wc.usace.army.mil/tmt/documents/fpp>) as called for in RPA Action 48.

### *Predation Management Strategy 3 (RPA Action 49)*

*RPA Action 49 – Marine Mammal Control Measures: The Corps will install and improve as needed sea lion excluder gates at all main adult fish ladder entrances at Bonneville dam annually. In addition, the Corps will continue to support land and water based harassment efforts by NOAA Fisheries, Oregon Department of Wildlife (ODFW), Washington Department of Fish and Wildlife (WDFW), and the Tribes to keep sea lions away from the area immediately downstream of Bonneville Dam.*

In 2008, the Corps implemented and evaluated a variety of sea lion deterrents, from physical barriers to non-lethal harassment. Sea lion exclusion devices (SLEDs) were installed at Bonneville Dam's 12 primary fishway entrances to prevent sea lions from entering the fishways; SLEDs were installed in

early 2008 and removed in June 2008. The SLEDs feature 15.38-inch (39.05-centimeter) gaps that are designed to allow fish passage. Floating orifice gates (FOGs) were equipped with stab plates to prevent sea lions from entering the fishway collection channel at the second powerhouse (PH2). In addition to these stab plates, SLED-like FOG barriers were installed at the two FOGs at the north and two FOGs at the south ends of the powerhouse in March 2008. Acoustic deterrent devices, which emit a 205-decibel sound in the 15 kHz range, were installed at fishway entrances in January 2008 and removed in May 2008.

Since 2006, the Corps has contracted with the U.S. Department of Agriculture (USDA) Wildlife Services to harass sea lions away from fishways and other dam structures. Dam-based harassment by USDA agents began in March 2008 and was conducted daily through the end of May 2008. Harassment involved a combination of acoustic, visual, and tactile non-lethal deterrents, including above-water pyrotechnics (cracker shells, screamer shells, or rockets), rubber bullets, rubber buckshot and beanbags.

In part supported by BPA, CRITFC conducted boat-based harassment along with ODFW and WDFW from December 11, 2007, through May 15, 2008. Boats operated from the Bonneville Dam tailrace (RM 146) downstream to navigation marker 85 (RM 139). The Corps granted boats access to the Boat Restricted Zone (BRZ), but given concerns about human and fish safety, harassment was not allowed within 30 meters of dam structures or within 50 meters of fishway entrances. The use of “seal bomb” deterrents was prohibited within 100 meters of fishways, collection channels, or fish outfalls for the second powerhouse corner collector and smolt monitoring facility. Boat crews ceased using seal bombs after adult salmon passage exceeded 1,000 fish per day. Corps biologists coordinated with USDA agents and boat-based crews from ODFW, WDFW, and CRITFC on all sea lion harassment activities at Bonneville Dam to ensure safety and increase the effectiveness of harassment efforts.

In 2006, Oregon, Washington, and Idaho applied to NOAA Fisheries for authorization under Section 120 of the Marine Mammal Protection Act (MMPA) to lethally remove or permanently relocate nuisance sea lions below Bonneville Dam. NOAA Fisheries created a Pinniped-Fishery Interaction Task Force to address this request, and the task force released its report in favor of the states’ request in late 2007. In early 2008, NOAA Fisheries announced its approval of the three states’ request for authority to remove these California sea lions. This decision was challenged in U.S. District Court, and the states were unable to lethally remove California sea lions in 2008.

Also supported in part by BPA, personnel from ODFW and WDFW operated four floating sea lion traps along the PH2 corner collector from March through May 2008. In accordance with their MMPA Section 120 authority, in 2008 ODFW and WDFW either transferred captured animals to holding facilities or released captured animals. Captured California sea lions that did not meet removal criteria were either tagged and released onsite or transported to Astoria for processing. Corps biologists assisted with the individual identification of captured sea lions and provided information used to determine whether individual California sea lions met removal criteria. The Corps also provided a Bonneville Dam project crane and rigging crew to ensure safe and secure trapping operations.

## **RME Implementation Reports, RPA Action 50–73**

The following section provides information on the Research, Monitoring and Evaluation (RME) actions implemented by the Action Agencies in 2008. In many cases, Action Agency projects identify actions that were funded and initiated prior to the completion of the 2008 BiOp, or were initiated as part of a previous BiOp. This section of the report will highlight examples of how projects contracted in 2008 fulfilled the RPAs, while Section 4 provides the full list of projects.

**Table 7. RME Strategy Requirements**

| <b>RPA No.</b>        | <b>Action</b>   | <b>Annual Report Requirement</b>   |
|-----------------------|---|--|
| <b>RME Strategy 1</b> |   |  |
| 50                    | Fish Population Status Monitoring   | Status of project implementation (including project milestones) through December of the previous year for all actions identified in Attachment B.2.6-1 or subsequent implementation plans.   |
| 51                    | Collaboration Regarding Fish Population Status Monitoring                   | Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans.  |
| <b>RME Strategy 2</b> |   |  |
| 52                    | Monitor and Evaluate Fish Performance within the FCRPS                      | Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans.  |
| 53                    | Monitor and Evaluate Migration Characteristics and River Condition          | Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans.  |
| 54                    | Monitor and Evaluate Effects of Configuration and Operation Actions         | Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans.  |
| 55                    | Investigate Hydro Critical Uncertainties and Investigate New Technologies   | Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans.  |
| <b>RME Strategy 3</b> |   |  |
| 56                    | Monitor and Evaluate Tributary Habitat Conditions and Limiting Factors      | Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans.  |
| 57                    | Evaluate the Effectiveness of Tributary Habitat Actions                     | Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans.  |
| <b>RME Strategy 4</b> |   |  |
| 58                    | Monitor and Evaluate Fish Performance in the Estuary and Plume              | Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans.  |
| 59                    | Monitor and Evaluate Migration Characteristics and Estuary/Ocean Conditions | <ul style="list-style-type: none"> <li>• Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans.</li> <li>• Tabulate the amount of absolute acreage by habitat type that is restored or protected every year. (Initiate in FY 2007-2009 Projects.)</li> <li>• Report annually on indices of productivity for the estuary and ocean (i.e., Pacific Decadal Oscillation, primary productivity indices).</li> </ul> |

**Table 7. RME Strategy Requirements**

| <b>RPA No.</b>        | <b>Action</b>  | <b>Annual Report Requirement</b>  |
|-----------------------|--|---|
| 60                    | Monitor and Evaluate Habitat Actions in the Estuary  | Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans.   |
| 61                    | Investigate Estuary/Ocean Critical Uncertainties   | Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans.   |
| <b>RME Strategy 5</b> |  |   |
| 62                    | Fund Selected Harvest Investigations   | Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans.   |
| <b>RME Strategy 6</b> |  |   |
| 63                    | Monitor Hatchery Effectiveness   | Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans.   |
| 64                    | Investigate Hatchery Critical Uncertainties  | Status of project implementation (including project milestones) through December of previous year for all actions identified in implementation plans.   |
| 65                    | Investigate Hatchery Critical Uncertainties  | Status of project implementation (including project milestones) and analysis of new information through December of the previous year.  |
| <b>RME Strategy 7</b> |  |   |
| 66                    | Monitor and Evaluate the Caspian Tern Population in the Columbia River Estuary             | Status of project implementation (including project milestones) through December of the previous year for all actions (habitat actions are population response) identified in implementation plans. |
| 67                    | Monitor and Evaluate the Double-Crested Cormorant Population in the Columbia River Estuary | Status of project implementation (including project milestones) through December of the previous year for all actions (habitat actions are population response) identified in implementation plans. |
| 68                    | Monitor and Evaluate Inland Avian Predators  | Status of project implementation (including project milestones) through December of the previous year for all actions (habitat actions are population response) identified in implementation plans. |
| 69                    | Monitoring Related to Marine Mammal Predation  | Status of project implementation (including project milestones) through December of the previous year for all actions (habitat actions are population response) identified in implementation plans. |
| 70                    | Monitoring Related to Piscivorous (Fish) Predation   | Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans.   |
| <b>RME Strategy 8</b> |  |   |
| 71                    | Coordination   | Status of coordination of RME projects through December of the previous year will be provided.  |

**Table 7. RME Strategy Requirements**

| <b>RPA No.</b>        | <b>Action</b>                            | <b>Annual Report Requirement</b>   |
|-----------------------|--|--|
| 72                    | Data Management                          | Status of data management projects through December of the previous year will be provided.   |
| <b>RME Strategy 9</b> |  |  |
| 73                    | Implementation and Compliance Monitoring | The Action Agencies will use the project-level detail contained in the Action Agencies' Biological Assessments databases to track results and assess our progress in meeting programmatic-level performance targets. This performance tracking will be reported through annual progress reports and the 2013 and 2016 comprehensive reports. |

*RME Strategy 1 (RPA Actions 50–51)*

A comprehensive list of all actions implemented by the Action Agencies for RPAs 50 and 51 is included in Section 4.

*RPA Action 50 – Fish Population Status Monitoring: The Action Agencies will enhance existing fish population status monitoring performed by fish management agencies through the specific actions listed below. In addition, ancillary population status and trend information is being obtained through several ongoing habitat and hatchery improvement projects.*

1. *Implement and maintain the Columbia River Basin passive integrated transponder (PIT)-Tag Information System. (Annually)*

The Columbia Basin Pit-Tag Information (PTAGIS), BPA project number 1990-080-00, continued in 2008 and fully covers the needs of this subaction. The project supported research that requires the selection or diversion of specific PIT-tagged fish at any of the mainstem juvenile or adult fish facilities. PTAGIS provides coordination, set-up, operations, and maintenance for about a dozen NPCC Fish and Wildlife Program (FWP) or AFEP projects throughout the fish migration season. The existing database will be revised to include information from interrogation systems that are being installed in tributaries to measure population-scale abundance and survival.

2. *Monitor adult returns at mainstem hydroelectric dams using both visual counts and the PIT-tag detection system (see Hydrosystem section). (Annually)*

In 2008 the Corps of Engineers again implemented its adult fish count program as laid out in the Fish Passage Plan. Results are available in the *2008 Annual Fish Passage Report: Columbia and Snake Rivers*, available at <http://www.nwp.usace.army.mil/op/fishdata/docs/20080afpr.pdf>.

The Lower Granite Dam Adult Trap Operations project, BPA project number 2001-003-00, continued in 2008. This project continues daily operation of the Lower Granite Dam (LGR) adult trap to sample steelhead, spring/summer Chinook, and PIT-tagged fall Chinook (scales and length measurement) for run-reconstruction and transportation and life history studies. For example, fish with coded-wire-tags or PIT tags (if targeted) were diverted into the adult trap holding area for collection of timed samples (a percentage of all passing adults) for run reconstructions. Operation information was included in the adult trap annual report provided to BPA. This RPA is fully covered through BPA project 2001-003-00 and the Corps adult fish count program.

3. *Monitor juvenile fish migrations at mainstem hydroelectric dams using smolt monitoring and the PIT-tag detection system (see Hydrosystem section). (Annually)*

BPA continued implementation of two projects (1987-127-00 and 1994-033-00) and initiated one new project in 2008 to address the RPA subaction's requirement to monitor smolts. For example, the Smolt Monitoring by Non-Federal Entities project (BPA project number 1994-033-00) collected species, condition, and external mark detail from all sampled fish; condition and length data from a subsample of the smolts; and all incidental species caught in the samples. This RPA will be expanded and fully addressed in 2010 with additional PIT tagging of juvenile fish guided by a Hydro tagging plan.

4. *Fund status and trend monitoring as a component of the pilot studies in the Wenatchee, Methow, and Entiat river basins in the Upper Columbia River, the Lemhi and South Fork Salmon river basins, and the John Day River Basin to further advance the methods and information needed for assessing the status of fish populations. (Initiate in FY 2007-2009 Project Funding, review and modify annually to ensure that these projects continue to provide a means of evaluating the effectiveness of tributary mitigation actions).*

In 2008, 38 projects continued to be implemented and one was initiated to support ongoing pilot studies. For example, the Integrated Status and Effectiveness program projects (BPA project numbers 2003-010-00 and 2003-017-00) conducted monitoring to evaluate food web and life history responses to habitat change. The projects also conducted juvenile snorkel surveys in winter (30) and summer (42) sampling sites to evaluate population dynamics at restoration sites compared to unrestored sites. The John Day, Lemhi and South Fork salmon populations currently have sufficient status and trend monitoring, while the Wenatchee, Entiat, and Methow have some additional needs that will be addressed with BPA projects in 2009.

5. *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)*

Sixteen projects were continued and one was initiated in 2008 to assess B-run steelhead abundance and productivity. For example, the Idaho Monitoring and Evaluation Studies Project (BPA project number 1990-055-00) PIT-tagged juveniles in streams of the Middle Fork Salmon, South Fork Salmon, and Little Salmon rivers 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. The Action Agencies plan to use BPA placeholder funds in BPA project number 2008-748-00 to support additional monitoring projects identified in a regional collaboration effort with state and tribal entities.

6. *Review and modify existing Action Agencies' fish population status monitoring projects to improve their compliance with regional standards and protocols, and ensure they are prioritized and effectively focused on critical performance measures and populations. (Initiate in FY 2008, develop proposed modification in FY 2009, and implement modifications in FY 2010)*

Regional fish population status monitoring standards and protocol documentation tools were advanced through PNAMP in 2008 under project 2004-002-00. The RME work groups were initiated in 2008 to start work on evaluations to ensure appropriate prioritization and coverage of performance measures.

7. *Fund marking of hatchery releases from Action Agencies funded facilities to enable monitoring of hatchery-origin fish in natural spawning areas and the assessment of status of wild populations. (Annually)*

Twenty-seven BPA projects were continued and one was initiated in 2008 that supported hatchery marking monitoring and research. For example, the Okanogan Basin Monitoring and Evaluation Program (OBMEP) project (BPA project number 2003-022-00) collected data on the abundance of out-migrating juvenile summer steelhead and summer/fall Chinook smolts and installed and tested

the operation of a smolt trap in one location on the Okanogan River. The Grande Ronde Supplementation Operations and Maintenance (O&M) and Monitoring and Evaluation (M&E) on Lostine River project (BPA project number 1998-007-02) provided summary data in an annual report on the number of conventional and captive rearing program fish tagged, the average length (mm), weight (g), and condition factors (Fultons), with standard errors and minimum and maximum values observed for each attribute. BPA project number 2008-740-00 was initiated to support additional marking under BPA-funded hatchery programs. Additional work may occur in the future under this RPA.

8. *Report available information on population viability metrics in annual and comprehensive evaluation reports. (Initiate in FY 2008)*

All Action Agency population viability information was gathered and stored for future viability assessments. BPA identified placeholder project funds to support the synthesis of fish population data for annual and comprehensive reports, and the Action Agencies and NOAA Fisheries agreed to support a process where NOAA Fisheries would provide population viability information for future reports. Also, the RME Work Group recommended finalizing the NOAA viable salmonid population (VSP) data dictionary in coordination with Northwest Environmental Information Sharing Executive Forum (NWEIS) and PNAMP and integrate those results into Action Agency project requirements. Current information on population abundance is provided in earlier sections of this report.

#### *RPA Action 51 – Collaboration Regarding Fish Population Status Monitoring*

*The Action Agencies will enhance existing fish populations status monitoring performed by fish management agencies through the following collaboration commitments:*

1. *Support the coordination, data management, and annual synthesis of fish population metrics through Regional Data Repositories and reports (Annually)*

Eight projects were continued and one was initiated to fully support annual synthesis of fish population data for reports. For example, the StreamNet Library Project (BPA project number 2008-505-00) supported participation in planning, development, and/or coordination meetings with regional projects and programs under the Northwest Power and Conservation Council's Fish and Wildlife Program to help develop a regional data management framework, to establish data type and data service priorities, and to provide advice in the area of data management, as requested.

2. *Facilitate and participate in an ongoing collaboration process to develop a regional strategy for status and trend monitoring for key ESA fish populations (Initiate in FY 2008)*

In collaboration with NOAA Fisheries, the Action Agencies and the Northwest Power and Conservation Council (NPCC) implemented the FCRPS BiOp RME work groups. They developed a process to engage state and tribal fish managers in identifying existing status and trend monitoring, gaps in federal monitoring programs, a process to collaborate with non-federal entities in the future to support the annual and comprehensive BiOp reports, and viability and listing factor status assessments. The Action Agencies supported the ongoing PNAMP coordination process through funding of project 2004-002-00 and contracted and staff support in the PNAMP steering committee and fish population work group.

3. *Provide cost-shared funding support and staff participation in regional coordination forums such as the Pacific Northwest Aquatic Monitoring Partnership (PNAMP) fish population monitoring workgroup and the Northwest Environmental Data Network to advance regional standards and coordination for more efficient and robust monitoring and information management. (Annually)*

Seven BPA projects were continued in 2008 to fully provide cost sharing for staff support in regional monitoring and evaluation coordination. For example, the Pacific Northwest Aquatic

Monitoring Partnership (PNAMP) Support Project, BPA project number 2004-002-00, facilitated coordination work at the program, subbasin, and regional level by providing personnel to serve as the lead staff, liaison, and point of contact for PNAMP. This project supports coordination of PNAMP efforts to integrate resource monitoring programs of state, federal, tribal, local, and private organizations in the Pacific Northwest. This project also facilitates the transfer of information within PNAMP and across relevant organizations to establish and maintain strong relationships between science and management, and to promote and facilitate communication among organizations and disciplines. In 2008, BPA also provided contract support for facilitation of the Northwest Environmental Data (NED) Network forum to advance coordinated data management strategies. In addition to internal Action Agency staff support, technical experts were funded for participation in PNAMP and NED work group products. Action Agency staff also were active in the formation of the Northwest Information Sharing Executive Forum, which pulled together executives from multiple entities across the Pacific Northwest to advance the common goal of more efficient and robust monitoring and information sharing.

### *RME Strategy 2 – Hydrosystem RME (RPA Actions 52–55)*

A comprehensive list of all actions implemented by the Action Agencies for RPAs 52 through 55 is included in Section 4. All but two RPA subactions are met by projects that either currently or soon will be in place. RPA subactions 52.6 and 55.3 are expected to involve additional action.

#### *RPA Action 52 Monitor and Evaluate Fish Performance within the FCRPS*

1. *Monitor and evaluate salmonid dam survival rates for a subset of FCRPS projects.*

The Action Agencies addressed this RPA's subaction through implementation of two projects that have successfully demonstrated that acquiring survival estimates is feasible using strategically located releases of smolts tagged with active tags (Juvenile Salmonid Acoustic Tags, or JSATs, in these applications). However, the preferred experimental design has not yet been selected. There are two options being considered, a single-dam format and a multi-dam format. The region is in the process of determining which experimental design is most appropriate. (In 2009, under the AFEP program a new multi-dam experimental design was developed [SPE-06-2] that could substantially reduce costs and provide statistically sound dam survival estimates). In the Snake River the single-dam method is moving forward under projects SPE-W-08 and SPE-W-05 and may soon be applied in dam survival standard tests.

2. *Monitor and evaluate juvenile salmonid in-river and system survival through the FCRPS, including estimates of differential post-Bonneville survival of transported fish relative to in-river fish (D-value) as needed.*

Eight projects were continued that addressed this RPA's subaction. Tagged smolts entering and migrating through the FCRPS (Lower Granite through Bonneville Dam) were used in 2008 to estimate survival and have been produced annually since 1994. NOAA Fisheries conducts the analysis under BPA project 1993-029-00 using fish PIT-tagged under the Smolt Monitoring Program (BPA project number 1987-127-00) and Comparative Survival Study (CSS) (BPA project number 1996-020-00).

3. *Monitor and evaluate adult salmonid system survival upstream through the FCRPS.*

Four projects were continued to fulfill this subaction. For example, the PTAGIS system, BPA project 1990-080-00, provides data on returning adults of known origin. In addition, NOAA biologists conducted analyses and reported upstream passage survival for 2008.

4. *Provide additional PIT-tag marking of Upper Columbia River populations to provide ESU specific estimates of juvenile and adult survival through the Federal mainstem dams.*

One project was continued and one project's funds have been allocated to initiate and fully address this effort as early as 2009 (BPA project number 2008-724-00). Planning is ongoing for the extent of tagging and stock coverage required and will be specified in the tagging plan being developed under RPA Action 52.6. But the extent of tagging and stock coverage has not yet been specified. These populations would be incorporated into the annual system smolt and adult survival monitoring. Efforts being undertaken by public utility districts may supplement the federal effort.

5. *Assess the feasibility of PIT-tag marking of juvenile Snake River Sockeye Salmon for specific survival tracking of this ESU from the Stanley Basin to Lower Granite Dam and through the mainstem FCRPS projects.*

One ongoing project (BPA project number 1987-127-00) was continued and two projects (BPA project number 2008-724-00 and 2008-735-00) were initiated to address this subaction. This work is a pilot study in 2009 to assess long-term needs with respect to precision levels and sample sizes for future work.

6. *Develop an action plan for conducting hydrosystem status monitoring (analytical approaches, tagging needs, methods, and protocols) in ongoing collaboration with the State and Federal fishery agencies and Tribes. This will be done in coordination with status monitoring needs and strategies being developed for estuary/ocean, habitat, hatcheries, and harvest. (Initiate in FY2009)*

Two existing projects were continued to support the baseline monitoring needs of this RPA. This RPA action will be addressed in FY2009 and 2010 through development of a regional PIT-tagging plan, including input from the Action Agencies, NOAA, other federal agencies, and state and tribal agencies.

7. *Cooperate with NOAA Fisheries, US v Oregon parties, Confederated Tribes of the Colville Reservation, and other co-managers to 1) review relevant information and identify factors (migration timing, spatial distribution, etc.) that might explain the differential conversion rates (BON to MCN) observed for UCR steelhead and spring Chinook salmon compared to SR steelhead and spring/summer Chinook salmon (see RPA Table 7 and \*\*SCA - Adult Survival Estimates Appendix); 2) develop a monitoring plan to determine the most likely cause of these differential losses (considering the potential use of flat plate PIT-tag detectors in tributaries or fishery areas, additional adult detectors at The 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.*

The feasibility of using a tributary PIT antenna to detect adult salmon in the John Day River (see RPA Action 52) was evaluated. The PIT antenna withstood spring freshet flows and has been detecting PIT-tagged adult fish. (Effectiveness monitoring will be carried out in 2009 to determine the detection efficiency of the system.)

#### *RPA Action 53 Monitor and Evaluate Migration Characteristics and River Condition*

1. *Monitor and estimate the abundance of smolts passing index dams.*

Four BPA projects were continued and one new one was initiated to address this subaction. For example, in 2008, the Fish Passage Center project (BPA project 1994-030-00) calculated passage indices at all collector dams, as well population estimates at Lower Granite Dam. NOAA seeks improved smolt abundance estimates and expanded coverage at more dam monitoring sites.

2. *Monitor and describe the migration timing of smolts at index dams, identify potential problems, and evaluate implemented solutions.*

Nine BPA projects were continued and two new ones were initiated to fully address this subaction. For example, in 2008, this was addressed by the Smolt Monitoring Program, BPA project 1987-127-00. Data provided by this program were analyzed by the Fish Passage Center (BPA project number 1994-030-00) and NOAA Fisheries, as well as a host of other regional fish management

agencies. Additional evaluation of the Smolt Monitoring Program data is expected to determine the extent to which population-specific (PIT tagged) data are needed to describe timing.

3. *Monitor and document the condition (e.g., descaling and injury) of smolts at all dams with JBS systems, identify potential problems, and evaluate implemented solutions.*

Seven projects were continued to fully address this subaction. As in RPA Action 53.2, the Smolt Monitoring Program monitored and documented fish condition in 2008. The Fish Passage Center and other management agencies provided analysis and implementation recommendations. The reduction in handling was the only potential problem identified that may be addressed in future operations.

4. *Monitor and enumerate adult salmonids passing through fishways in the FCRPS, identify potential problems, and evaluate implemented solutions.*

In 2008 the Corps of Engineers again implemented its adult fish count program as laid out in the Fish Passage Plan. Results are available in the *2008 Annual Fish Passage Report: Columbia and Snake Rivers*, available at <http://www.nwp.usace.army.mil/op/fishdata/docs/2008afpr.pdf>

Fishways were monitored on a regular basis, as per Fish Passage Plan requirements. Results are discussed in an annual Fishway Inspection Report prepared for each project. Fishways were also inspected by representatives from NOAA Fisheries and other agencies. Results of those inspections are available at [http://www.fpc.org/documents/Fishway\\_Inspection\\_Reports.html](http://www.fpc.org/documents/Fishway_Inspection_Reports.html).

See also the discussion of adult passage improvements under RPA 28 above.

5. *In addition to current operations (generally April 10 – August 31), evaluate operation of the Bonneville PH2 corner collector from March 1 through start of spill as a potential means to provide a safer downstream passage route for steelhead kelts, and implement if warranted.*

A second year was completed for evaluating 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. The corner collector was estimated to have passed 107 steelhead kelts in 2007 and 223 in 2008 during this period. Discussions on future operation and evaluations are ongoing.

#### *RPA Action 54 – Monitor and Evaluate Effects of Configuration and Operation Actions*

1. *Monitor and evaluate the effects of existing spillways, modifications, and operations on smolt survival.*

In 2008, four Corps projects were continued to fully address this subaction. The effects of configuration and operation changes on juvenile fish passage were evaluated at John Day and Bonneville dams. Route-specific passage and survival rates were estimated at Lower Monumental, Ice Harbor, and McNary dams. Studies of passage conditions were conducted at the McNary and Lower Monumental spillway weirs and Ice Harbor spillway. See the entries for RPA Action 18 through 25 for specific studies and results.

2. *Monitor and evaluate the effectiveness of traditional juvenile bypass systems and modifications to such, on smolt survival and condition.*

Five projects were continued and one new project was initiated to fully address this subaction. AFEP regularly evaluates bypass performance as new systems are built, or upgrades occur to existing systems. The passage and survival studies above also estimated the proportions collected by the bypass system and the resulting survival rates.

3. *Monitor and evaluate the effectiveness of surface bypass structures and modifications on smolt survival and condition.*

Six projects were continued to support the estimated route-specific passage, and survival rates were estimated at John Day, Lower Monumental, Ice Harbor, and McNary dams to fully meet the

requirements of this subaction. (Copies of draft reports are under review and are available from the Corps.)

4. *Monitor and evaluate the effectiveness of turbine operations and modifications on smolt survival and condition.*

There were no changes to monitor or evaluate in 2008.

5. *Monitor and evaluate overall dam passage with respect to modifications at projects (including forebay delay and survival).*

Four Corps AFEP projects were continued to fully address this subaction through passage and survival studies, which estimate forebay and tailrace passage times and survival rates in the forebay.

6. *Monitor and evaluate the effectiveness of the juvenile fish transportation program and modifications to operations.*

Eight projects were continued and one was initiated to fully address this subaction. In 2008, the Action Agencies continued to make progress on monitoring and evaluating the effectiveness of the juvenile fish transportation program. Information resulting from 2008 RME will enable further progress in identifying the benefits of transportation and supporting adaptive management actions. Significant 2008 RME is as follows:

- **Spring Migrants:** The Action Agencies continued research to determine the potential of transportation to increase adult returns of anadromous salmon in 2008. A PIT tag study to evaluate weekly smolt-to-adult returns (SARs) for natural spring Chinook and steelhead transported from Lower Granite Dam continued in 2008. More precise transportation data in the April time frame should help clarify effects of transportation on early migrating fish. More precise data in the May time frame should allow for correlation of physical and environmental factors to guide Action Agencies on appropriate triggers of how to operate transportation on an annual basis to maximize adult returns.
- **Summer Migrants:** In 2008, the Action Agencies continued implementing the 2007 fall Chinook salmon consensus transportation proposal and long-term framework developed collaboratively with regional fish management agencies and tribes. This intensive research, monitoring, and evaluation effort for subyearling fall Chinook salmon will help determine the appropriate management strategy to optimize adult returns.

In 2008, intensive RME efforts were conducted on Snake River fall Chinook salmon. These efforts are expected to provide information to evaluate early life history and migration behavior, the performance of hatchery fish as surrogates for wild fish, and the benefits of late season transportation, as well as to compare production fish groups' performance to wild and surrogate fish.

7. *Monitor and evaluate the effects of environmental conditions affecting juvenile fish survival.*

Six projects were continued to fully address this subaction. Total dissolved gas, temperature, turbidity, and flow are considered key factors, and they are regularly monitored throughout the FCRPS. Many PIT-tagged fish migrating through the system from assorted projects provide response units for analyzing effects on smolt survival or migration characteristics. The Fish Passage Center (FPC), NOAA, and the Comparative Survival Study (CSS) have conducted these types of probative analyses. The Corps funds the collection and recording of temperature and TDG data and index flow at dams. Data Access Real Time (DART) compiles and displays these and other environmental and fish data, as does the FPC.

8. *Monitor and evaluate the effectiveness of reducing predation toward improving juvenile fish survival.*

Nine projects were continued to fully address this subaction. In 2008, 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), dam angling, and estimates of annual exploitation of pikeminnow (modeling), in conjunction with juvenile dam survival studies.

9. *Investigate, evaluate and deploy alternative technologies and methodologies for fish passage and the RME Action.*

Eight projects were continued and one was initiated to address this subaction. New passage technologies have been and will continue to be prototyped, tested, and ultimately deployed as part of AFEP and CRFM. In 2008, two prototype TSWs were deployed at John Day Dam (see RPA 20 for details), and a new RSW was installed at Lower Monumental Dam (see RPA 23 for details).

10. *Determine if actions directed at benefiting juveniles have an unintended effect on migrating adults (e.g., certain spill operations).*

Six projects were continued to fully address this subaction. This issue is addressed at each project as need arises. The AFEP forum addresses this matter. As an example, in 2008, radio tags were used to determine whether spill patterns at Little Goose Dam were having a negative effect on adult passage (see RPA 28 for more detail).

11. *Install and maintain adult PIT-tag detectors in fish ladders at key dams in the FCRPS and evaluate adult survival (conversion rates).*

PIT-tag detectors are now installed in all key FCRPS ladders. However, currently there are no detectors at The Dalles and John Day dams. Tributary turn-off and straying between Bonneville and McNary dams is of concern when calculating conversion rates or upstream passage survival. If stream-based PIT detectors successfully function in the major tributaries in this reach, then the need for additional ladder coverage could be circumvented. (Those systems were tested in 2008 and will continue in 2009).

12. *Monitor and evaluate the effects of fish ladder operations and configurations on adult passage rates.*

Seven projects were continued and one was initiated to fully address this subaction. This issue is addressed at each project as needed through the AFEP process.

13. *In addition to the current sluiceway operation (generally April 1–November 30), evaluate operation of The Dalles Dam sluiceway from March 1–March 31 and from December–December 15 as a potential means to provide a safer fallback passage route for overwintering steelhead and kelts, implement if warranted.*

Two projects were continued to fully address the requirements of this subaction. From the winter of 2008 to the spring of 2009, an evaluation was conducted of operating The Dalles Dam sluiceway from March 1–March 31 and from December 1–December 15 as a potential means to provide a safer fallback passage route for overwintering steelhead and kelts.

14. *Investigate surface-flow outlets during wintertime to provide safer fallback opportunity for over wintering steelhead (need will be determined by results of further research).*

See RPA Action 54.13 above.

*RPA Action 55 – Investigate Hydro Critical Uncertainties and Investigate New Technologies: The Action Agencies will fund selected research directed at resolving critical uncertainties that are pivotal in lifecycle model analyses.*

1. *Investigate and quantify delayed differential effects (D-value) associated with the transportation of smolts in the FCRPS as needed. (Initiate in FY 2007–2009 Projects)*

Ten projects were continued and two were initiated to fully address this subaction. Species coverage is expected to expand in 2009 and beyond because sockeye and fall Chinook are

proposed for research. Other species will continue at some level, but the frequency of and sample size for acquiring estimates needs clarification for future years. This complements RPA 52.2, which calls for D-estimates to be incorporated into system survival evaluations. See discussion of RPA Action 31 for further details.

2. *Investigate the post-Bonneville mortality effect of changes in fish arrival timing and transportation to below Bonneville. (Initiate in FY 2007–2009)*

Twelve projects were continued and two were initiated to fully address this subaction through review in AFEP, with focus on SARs from BON-BON. Recent NOAA transport studies treat this issue with the expectation that the regional PIT Tagging Plan will fully address the requirements of this RPA. See discussion of RPA Action 31 for further details.

3. *Conduct a workshop every other year with members of the Independent Scientific Advisory Board (ISAB) to review current research and monitoring approaches on post Bonneville mortality for transported and non-transported fish. (Initiate in FY 2009).*

BPA and the Corps initiated a research project in 2008 to fully support this subaction. The workshop is in the early planning stages and is expected to be held in 2010. The workshop will synthesize research results and analyses, identify further needs, and plan the direction of future research.

4. *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).*

Six projects were continued to fully address this subaction. Studies have been funded by BPA for more than a decade, and complementary projects (such as radio tag investigations in Snake reservoirs) have been funded by the Corps under AFEP. Additionally, proposed transport studies have important life history implications. This has been a complex, multi-faceted set of investigations that have taken place over years.

5. *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.*

One project was continued and one was initiated to fully address this subaction. A multi-year research study has been conducted by the University of Idaho. Research was presented in draft form in 2008 and will be finalized in 2009.

6. *Continue development of state-of-the-art turbine units to obtain improved fish passage survival through turbines with the goal of using these new units in all future turbine rehabilitation or replacement programs.*

One Corps project was continued to fully address this subaction. (The contract was advertised in spring 2009 and included design, manufacture, and delivery of a fixed blade for Unit 2 as a base contract item, with an option to manufacture and deliver an adjustable blade runner for Unit 3).

In 2008, plans and specifications for a new Ice Harbor Dam turbine design and runner were completed. Turbine Survival Program activities related to this project that have been incorporated into the specifications include studies of the effects of pressure on fish traveling through the turbine. The Corps' observational model at its Engineer Research and Development Center (ERDC) has aided in narrowing the stay vane/wicket gate and draft tube modification alternatives to be considered during model testing under the contract.

7. *Investigate feasibility of developing PIT-tag detectors for spillways and turbines.*

One project was continued and one was initiated to fully address this subaction. For example, BPA project number 1983-319-00 continued to address new detectors for spillways and turbines. Work

in 2008 involved determining the feasibility of installing a PIT detector in the spillway at Bonneville Dam, as well as the feasibility of installing detectors in the various surface spill weirs that are currently installed throughout the system.

8. *Evaluate new tagging technologies for use in improving the accuracy and assessing delayed or indirect hydro effects on juvenile or adult fish.*

Two projects were continued and one was initiated to fully address this subaction. JSATS (AFEP Program) and the Pacific Ocean Survival Tracking Project (POST) (BPA project number 2003-114-00) project both continued the development of tags and methods in 2008 to determine delayed or indirect effects of hydro passage by looking in the estuary below Bonneville Dam and the ocean environment off the Pacific Coast. Data from these efforts are presented in a variety of government reports and peer-reviewed journal articles.

9. *Assess the feasibility of developing PIT-tag detectors for use in natal streams and tributaries, or other locations, as appropriate to support more comprehensive and integrated All-H monitoring designs and assessments of stray rates.*

The feasibility of using a tributary PIT antenna to detect adult salmon in the John Day River was evaluated (see also RPA Action 52, Bullet 7). The PIT antenna withstood spring freshet flows and has been detecting PIT-tagged adult fish. (Effectiveness monitoring will be carried out in 2009 and 2010 to determine the detection efficiency of the system.)

The Corps supported efforts by NOAA Fisheries to develop a spillway PIT antenna design for Bonneville Dam. Dry tests were run on an existing spillway gate housed in the spillway repair pit. (Work in 2009 will include assessing vibration and electro-magnetic fields on an operating gate.)

Tagging Technologies: A comprehensive multi-year study to evaluate the short and long-term effects of acoustic tagging and tags was begun in 2007. The study was designed to compare behavior and survival of acoustic tagged fish to PIT-tagged fish as they migrate downstream through the Snake and Columbia rivers. In addition, in 2008, the 2007 objectives were repeated with a laboratory study designed to evaluate the effects of the tagging and acoustic tag processes on yearling and subyearling Chinook salmon. Results are pending.

### *RME Strategy 3 (RPA Actions 56–57)*

A comprehensive list of all actions implemented by the Action Agencies for RPAs 56 and 57 is included in Section 4. For RPA 56 and 57, the RME Work Group identified additional monitoring to supplement this ongoing monitoring.

#### *RPA Action 56 – Monitor and Evaluate Tributary Habitat Conditions and Limiting Factors: The Action Agencies will:*

1. *Implement research in select areas of the pilot study basins (Wenatchee, Methow and Entiat river basins in the Upper Columbia River, the Lemhi and South Fork Salmon river basins, and the John Day River Basin) to quantify the relationships between habitat conditions and fish productivity (limiting factors) to improve the development and parameterization of models used in the planning and implementation of habitat projects. These studies will be coordinated with the influence of hatchery programs in these habitat areas.*

Fifty-four BPA projects were continued and three projects were initiated by BPA and Reclamation that have elements that support research in select areas of the pilot study basins (Wenatchee, Methow, and Entiat River basins in the upper Columbia River, the Lemhi and South Fork Salmon River basins, and the John Day River basin) to quantify the relationships between habitat conditions and fish productivity (limiting factors) and improve the development and parameterization of models used in the planning and implementation of habitat projects. These studies provide a means of evaluating the effectiveness of tributary mitigation actions. One of the

new projects was a funding placeholder to support additional intensively monitored watershed (IMW) studies.

In the Methow Basin, Reclamation has planned an intensive effectiveness monitoring program that will address the effects of actions intended to address the primary limiting factors there (lack of riparian/off-channel habitat and obstructions). This program will begin in 2009. Reclamation also conducted a series of meetings in 2007–2008 to finalize the Methow Study Plan. The study plan includes research on habitat limiting factors to fish production, and a Before, After, Control, Impact (BACI)-design study of a large channel rehabilitation project. An extensive PIT-tag array system will be constructed on all major tributaries and the main river of the Methow. Finally, Reclamation will provide PIT tags to the USFWS at the Winthrop National Fish Hatchery to tag and release large groups of hatchery fish, both to understand the potential effects of hatchery juveniles on stream-reared juvenile fish production and to use the releases to help estimate trap and detection efficiencies.

In addition, monitoring needed to infer relationships based on correlation among limiting factors, habitat actions, and productivity in support of RPA 3 (comprehensive evaluations) will also be addressed under RPAs 50.6 and 56.3.

2. *Implement habitat status and trend monitoring as a component of the pilot studies in the Wenatchee, Methow and Entiat river basins in the Upper Columbia 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.)*

Fourteen projects were continued and three were initiated that have elements that supported the implementation of habitat status and trend monitoring as a component of the pilot basin studies. For example, BPA project number 2000-031-00 documented changes resulting from restoration activities. Examples included changes in channel morphology, native plant communities, and floodplain function. This information will then be used to guide the project toward restoration strategies that provide the best opportunity for project success. All pilot basins except the Methow appear to have sufficient habitat status and trend monitoring, with no significant gaps. Habitat monitoring in the Lemhi, South Fork Salmon, and John Day focuses on specific limiting habitat factors. In contrast, habitat monitoring in the Wenatchee and Entiat focuses on a large suite of physical/environmental factors (64 indicators) that address water quality, habitat access, habitat quality, channel condition, riparian habitat condition, watershed condition, and flows. The Methow Basin level of habitat monitoring will be improved to address this RPA subaction.

3. *Facilitate and participate in an ongoing collaboration process to develop a regional strategy for limited habitat status and trend monitoring for key ESA fish populations. This monitoring strategy will be coordinated with the status monitoring needs and strategies being developed for hydropower, habitat, hatchery, harvest, and estuary/ocean.*

Collaboration work groups for fish population and tributary habitat monitoring were formed in late 2008 and continue to make progress in 2009 on a regional monitoring strategy that includes fish population and habitat monitoring for at least one population per major population group.

#### *RPA Action 57 – Evaluate the Effectiveness of Tributary Habitat Actions*

*The Action Agencies will evaluate the effectiveness of habitat actions through RME 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.*

1. *Action effectiveness pilot studies in the Entiat River Basin to study treatments to improve channel complexity and fish productivity.*

BPA project numbers 2002-061-00 and 2003-017-00 were continued to support action effectiveness pilot studies in the Entiat River basin to study treatments to improve channel complexity and fish productivity. The RME Work Group recommended several habitat actions identified for implementation in the Entiat to support the RME projects.

2. *Pilot study in the Lemhi River Basin to study treatments to reduce entrainment and provide better fish passage flow conditions.*

Six BPA projects were continued to fully address the pilot study in the Lemhi River basin to study treatments to reduce entrainment and provide better fish passage flow conditions. For example, BPA project number 1989-098-00 provided point estimates of adult escapement based on redd counts in nine study streams without weirs: Brushy Fork Creek, Marsh Creek, Alturas Lake Creek, White Cap Creek, the American River, Big Flat Creek, Colt Killed Creek, the North Fork Salmon River, and the Lemhi River. Also provided were bounded estimates of adult escapement to spawning areas in streams with weirs based on mark recapture estimates, and estimates of redd production attributable to natural, supplementation, and general production hatchery strays in six streams with weirs: Crooked Fork Creek and the South Fork Salmon, Pahsimeroi River, Red, Crooked, and upper Salmon rivers. Point estimates of general production hatchery stray rates into study streams were based on carcass recoveries in 13 streams where ground surveys were conducted, in Big Flat Creek, Brushy Fork Creek, Crooked Fork Creek, Marsh Creek, the Pahsimeroi River, the upper Salmon River, Colt Killed Creek, and the North Fork Salmon, Lemhi, South Fork Salmon, American, Crooked, and the Red rivers. These data are incorporated into annual progress reports and maintained in program databases. Adult escapement data into the East Fork Salmon River is analyzed jointly with Shoshone-Bannock Tribe cooperators and IDFG personnel from BPA project number 1997-001-00.

3. *Action effectiveness pilot studies in Bridge Creek of the John Day River Basin to study treatments of channel incision and its effects on passage, channel complexity, and consequentially fish productivity.*

Six BPA projects were continued to fully 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 consequentially fish productivity. For example, BPA project number 2002-074-00 collected habitat data to help evaluate project effectiveness and whether all implementation goals have been met. Protocols for data collection follow monitoring plans developed by the Clearwater National Forest and the Nez Perce Tribe (Department of Fisheries Resources Management, Watershed Division). Raw data on culverts are available through spatial links on the Nez Perce website. Data collected included channel grade in and out of the culvert, percent substrate colonization inside the structures, channel cross-sections inside and outside the culvert, and redd counts above culverts for fluvial bull trout and spring Chinook. Culverts are monitored before installation, immediately after installation, and then during the first, second, and fifth year after replacement.

4. *Project and watershed level assessments of habitat, habitat restoration and fish productivity in the Wenatchee, Methow and John Day basins.*

Eleven BPA projects were continued and four were initiated to support project- and watershed-level assessments of habitat, habitat restoration, and fish productivity in the Wenatchee, Methow, and John Day basins. For example, BPA project number 1994-042-00 analyzed data to determine the timing and size of adult summer steelhead escapement, hatchery/wild component. The study also used data from PIT tags and smolt data to analyze out-migrant population estimates, travel

time and survival rates to Bonneville Dam, and timing and ocean survival for returning adults. BPA project number 2007-397-00 collected data for use in environmental compliance documents, the matrix of pathways, and biological objectives.

Reclamation continued its work through an interagency agreement with USGS to evaluate listed *O. mykiss* population changes in response to barrier removals in Beaver, Libby, and Gold creeks, which are tributaries in the Lower Methow River.

Reclamation's Methow RME Study Plan under an interagency agreement with USGS (see RPA 56 above) is aimed at evaluating the effectiveness of the M2 Reach habitat improvement actions in the mainstem Methow River. Reclamation's 2008 BiOp habitat program provides technical assistance to a suite of partners to help implement habitat improvement projects as defined by RPA Actions 34 and 35.

In 2008, Reclamation and USGS developed the pretreatment phase of the project; this is designed to address specific questions about the response of target fish species (Chinook salmon, steelhead, and bull trout) to the restoration actions, including the pretreatment phase, which will begin in the summer of 2009. Meanwhile, Reclamation and USGS worked on models to predict the response to treatment.

5. *Action Agencies will convene a regional technical group to develop an initial set of relationships in FY 2008, and 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.*

The Tributary Habitat and Fish Population Work Group met several times beginning in early 2008 to evaluate survival models. The technical group will build on current habitat capacity/population productivity life-cycle modeling methods to develop a systematic approach to estimating the freshwater survival benefit of basinwide restoration actions.

Reclamation funded NWFSC IA 1425-06-AA-1C-4806 to develop a landscape analysis model in 2004 using satellite imagery. Following the results of that work, in 2007 Reclamation provided technical leadership through PNAMP to help develop and fund a major regional effort to classify past and present salmon habitat using satellite imagery through an interagency agreement with the NOAA Fisheries Northwest Fisheries Science Center (NWFSC). In 2008, project staff developed geographical information system (GIS) data layers for several natural landscape characteristics associated with salmon production, for the 8,438 subwatersheds (12-digit HUCs) in the Pacific Northwest. They developed metrics of these landscape features for each subwatershed, eventually settling on eight variables.

#### *RME Strategy 4 (RPA Actions 58–61)*

A comprehensive list of all actions implemented by the Action Agencies for RPAs 58 through 61 is included in Section 4. Most of these RPAs' requirements either were fully covered by ongoing projects or would be fully covered with some additional work elements. Included after the RPA 61 description, below, is a synopsis of 2008 estuary and ocean RME results.

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

*The Action Agencies will monitor biological responses and/or environmental attributes, and report in the following areas:*

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

Two Corps AFEP projects were continued to support the requirements of this subaction. For example, the AFEP Project EST-02-01, A Study of Salmonid Survival and Behavior through the

Columbia River Estuary Using Acoustic Tags, directly addressed this RPA. During 2008, more than 15,000 juvenile salmon 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 at locations ranging from the Bonneville Dam tailrace to the jetties at the mouth of the Columbia River. 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 during 2008. To fully address this subaction, the RME Work Group recommended assessing the applicability and the feasibility of measuring the fitness of juvenile salmon at select locations in the lower Columbia River and estuary under AFEP project EST-09-P-0, or a new project.

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

Four projects were continued by the Action Agencies to fully address this subaction. For example, planning within the AFEP process was initiated during 2008 for Project EST-09-P-NEW, Evaluation of Life History Diversity, Habitat Connectivity, and Survival Benefits Associated with Habitat Restoration Actions in the Lower Columbia River and Estuary. This project was initiated in part to address RPA Action 58.2. The need for and objectives of a project to meet this RPA subaction were included in the fiscal year 2009 AFEP planning process during 2008.

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

In 2008, six projects were continued to fully address the RPA subaction. For example, in BPA projects 1998-014-00, Ocean Survival of Salmonids, and 2003-010-00, Historic Habitat Opportunities and Food-Web Linkages, data were collected on juvenile salmon growth and prey resources during cruises along transects in the nearshore ocean and plume, research was conducted in estuarine wetlands. Data from these studies and others were used to assess how environmental effects in the estuary and ocean affect juvenile salmon survival and adult return rates.

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

Two projects were continued to fully support this subaction for foraging rates. For example, BPA project 1998-014-00, Ocean Survival of Salmonids, addressed the plume component of this RPA subaction. The estuary component was addressed through several projects that focused on avian and piscivorous predators. Additional results are presented in the predation RPAs 68-70, below. Annual surveys of predation on juvenile salmon were conducted. Data showed the most common predators and, in some cases, led to estimates of predation rates.

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

*The Action Agencies will monitor and evaluate selected ecological attributes of the estuary, which include the following or equivalent:*

1. *Map bathymetry and topography of the estuary as needed for RME.*

Six projects were continued to fully address this subaction for mapping the channel; however, a gap exists until the bathymetry and topographic mapping are completed for the floodplain. For example, BPA project number 2003-007-00, Lower Columbia River/Estuary Ecosystem Monitoring, was pivotal to work throughout the estuary during 2008 to address this RPA subaction. Numerous other projects collected site-scale elevation data. Light detection and ranging (LIDAR) data for

topography were processed for selected sites under AFEP Project EST-02-P-04, Cumulative Effects of Habitat Restoration. Based on bathymetric data gaps identified and prioritized at a workshop in October 2007, NOAA collected bathymetry data to update nautical charts in the lower river and estuary in 2008 up to the Greater Portland/Vancouver area. Because these data did not cover shallow areas (less than 2 meters), additional measurements were contracted.

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

In 2008, two projects were continued to address this RPA subaction, which was a primary objective of BPA project number 2003-007-00, Lower Columbia River/Estuary Ecosystem Monitoring. Development of the classification system continued during 2008. Expanded work is expected in BPA project number 2003-007-00 to complete the remaining six or more reaches and develop input data for the classification (such as vegetative land cover) through implementation of a new project.

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

Five projects were continued and initiated to fully address this RPA subaction. For example, planning within the AFEP began in 2008 for Project EST-09-P-NEW, Evaluation of Life History Diversity, Habitat Connectivity, and Survival Benefits Associated with Habitat Restoration Actions in the Lower Columbia River and Estuary. This project was initiated in part to address RPA Action 59.3. The need for and objectives of a project to meet this RPA subaction were included in the fiscal year 2009 AFEP planning process during 2008.

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

One Corps project was continued and another one was initiated to fully address this RPA subaction. For example, three projects involved study of juvenile salmon in various shallow-water habitats from Bonneville Dam to Astoria: the AFEP Project EST-02-01 (A Study of Salmonid Survival and Behavior through the Columbia River Estuary Using Acoustic Tags), BPA project number 2003-010-00 (Historic Habitat Opportunities and Food-Web Linkages), and BPA project number 2005-001-00 (Estuary RME Tidal Freshwater). As determined from beach seines and trap nets, juvenile salmon can be found year-round in the shallow waters of the lower river and estuary. The data increased understanding of specific habitat use and the relative importance of these habitats to juvenile salmon.

5. *Monitor habitat conditions periodically, including water surface elevation, vegetation cover, plant community structure, primary and secondary productivity, substrate characteristics, dissolved oxygen, temperature, and conductivity, at representative locations in the estuary as established through RME.*

Nine projects were continued to address this RPA subaction. For example, the BPA project number 2003-007-00, Lower Columbia River/Estuary Ecosystem Monitoring, monitored habitat conditions at four sites in the reach between Bonneville Dam and Washougal, Washington. Monitored indicators included vegetation composition, percent cover, elevation, substrate, channel cross-sections, and water quality. The data characterized relationships among plant communities, elevation, and hydrology that help in understanding the ecological importance of lower river and estuary habitats.

## *RPA Action 60 – Monitor and Evaluate Habitat Actions in the Estuary*

*The Action Agencies will monitor and evaluate the effects of a representative set of habitat projects in the estuary, as follows:*

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

Four projects were continued to fully address this RPA subaction. For example, BPA project number 2003-011-00, Lower Columbia River/Estuary Habitat Restoration, included 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. These will be used to compare restoration and reference sites to determine the effectiveness of habitat restoration (related to RPAs 60.2 and 60.3).

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

Ten projects were continued to fully address this RPA subaction. For example, site-scale restoration effectiveness monitoring took place under multiple projects, such as BPA project number 2003-011-00, Lower Columbia River/Estuary Habitat Restoration. This project 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. This and other projects showed that juvenile salmon typically access the newly restored areas once the opportunity is provided.

3. *Develop and implement a methodology to estimate the cumulative effects of habitat conservation and restoration projects in terms of cause-and-effect relationships between ecosystem and controlling factors, structures, and processes affecting salmon habitats and performance.*

Six projects were continued to fully address this RPA subaction, which was the primary focus of AFEP Project EST-02-P-04, Evaluating Cumulative Ecosystem Response to Habitat Restoration Projects in the Lower Columbia River and Estuary. The goal of this multi-year project (2004-2010) is to develop and apply a methodology to evaluate the cumulative effects of multiple habitat restoration projects. These projects are intended to benefit ecosystems that support juvenile salmon 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 were finalized, and a preliminary analysis of restoration cumulative effects was initiated.

## *RPA Action 61 – Investigate Estuary/Ocean Critical Uncertainties*

*The Action Agencies will fund selected research directed at resolving critical uncertainties that are pivotal in understanding estuary and ocean effects.*

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

Six projects were continued to address this RPA subaction. Implementation of this RPA subaction was organized by water body: tidal freshwater (BPA project number 2005-001-00, Estuary RME Tidal Freshwater), estuary (BPA project number 2003-010-00, Historic Habitat Opportunities and Food-Web Linkages), plume (BPA project number 1998-014-00, Ocean Survival of Salmonids); and nearshore ocean (BPA project number 2003-009-00, Canada-US Shelf Salmon Survival Study). Collectively, these multi-year projects and others investigated the relationships among

juvenile salmon condition, growth, and survival indicators. Data showed the importance of understanding factors affecting salmon populations over the entire salmon life cycle.

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

Three projects were continued to fully address this RPA subaction: AFEP Project EST-02-P-03 (Evaluation of the Relationship among Time of Ocean Entry, Physical, and Biological Characteristics of the Estuary and Plume Environment and Adult Return Rates), BPA project number 1998-014-00 (Ocean Survival of Salmonids), and BPA project number 2003-114-00 (Pacific Ocean Shelf Tracking [POST]). As an example, juvenile salmon were sampled with trawls as the fish moved between riverine and marine waters. Data on species, age class, abundance, stock origin, size, diet, etc. were collected to determine how juvenile salmon change as they move between environments.

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

Seven projects were continued to fully address this RPA subaction. For example, BPA project numbers 2003-010-00, Historic Habitat Opportunities and Food-Web Linkages, and 2005-001-00, Estuary RME Tidal Freshwater, were particularly relevant to this RPA subaction. Monthly beach seine sampling showed that juvenile coho and Chinook salmon were present in shallow, tidal freshwater habitats in the lower Columbia River in the vicinity of the Sandy River delta during all seasons, including winter. Based on genetic analysis of stock of origin, possible source populations for these fish ranged from areas in the lower Columbia River to areas in the middle Columbia River and Snake River.

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

Four projects were continued to address this RPA subaction. For example, the hydrodynamic modeling was conducted under BPA project numbers 1998-014-00, Ocean Survival of Salmonids, and 2003-010-00, Historic Habitat Opportunities and Food-Web Linkages. Modelers worked to develop an advanced observatory for the Pacific Northwest coastal margin, including the Columbia River estuary and plume. CORIE served as the heart of the observatory with its modeling system, observation network, and cyber-infrastructure. Modeling was used to evaluate contemporary and future habitat changes caused by climatic and anthropogenic effects and to describe the temporal and spatial features of the Columbia River estuary and plume that are important for salmon in relation to ocean conditions.

#### *Synopsis of 2008 Estuary and Ocean RME*

*Status and Trends Monitoring.* NMFS (2008a) reported that “during 2008, the trend of cold ocean conditions, which started to become established in 2007, has continued. The fact that cold ocean conditions have now become well established bodes well for marine fish (especially salmon) and bird species, since many of them will almost certainly have a good recruitment year.” NMFS’s ocean ecosystem indicators (<http://www.nwfsc.noaa.gov/research/divisions/fed/oeip/a-ecinhome.cfm>) provide context critical to management decision-making in the Columbia basin.

Magie et al. (2009), operating a newly modified trawl with a “matrix” antenna designed to increase the detection rate of PIT-tagged fish in the Lower Columbia River at River Kilometer (RKM) 61-83, found mean survival rates from Lower Granite to Bonneville Dam during 2008 for yearling Chinook salmon and steelhead were 42 percent (SE = 3.7 percent) and 46 percent (SE = 1.5 percent), respectively. This sampling effort is significant because, since 1998, it has allowed survival estimation between John Day and Bonneville dams using PIT-tag detection data.

McMichael et al. (2008) reported that preliminary 2008 survival estimates from Bonneville Dam tailrace to the mouth of the Columbia River for yearling Chinook salmon averaged 0.785 (range = 0.65 to 0.94) and for subyearling Chinook salmon averaged 0.83 (range = 0.64 to 0.93). The largest loss appeared to occur in the lower 35 km of the river for yearlings and the lower 50 km for subyearling Chinook salmon. These data will support strategic management actions to reduce mortality rates for juvenile salmonids in the Lower Columbia River and estuary.

Jones et al. (2008) examined vegetation and elevation data collected at relatively undisturbed, emergent wetland sites throughout the Lower Columbia River and estuary. They found that vegetation species occurrence and distribution are highly variable between sites, although dominant species are similar; invasive species, such as reed canary grass and Indigo bush, are pervasive; and strong gradients occur along the river between reaches and from the river to off-channel sites. This monitoring provided important information on the condition of habitats supporting juvenile salmonids in the Lower Columbia River and estuary.

NOAA Fisheries analyzed salmonid whole body, stomach content, and bile samples for toxic contaminant concentrations. For juvenile Chinook salmon collected at Campbell Slough and Sandy Island in 2007, measurable concentrations of DDT and polycyclic aromatic hydrocarbons (PAHs) were found in stomach contents, indicating that prey resources are a likely contaminant uptake pathway for salmonids (Jones et al. 2008). Contaminants in the Lower Columbia River and estuary could affect recovery of listed salmonid populations in the Columbia basin.

*Action Effectiveness Research.* Diefenderfer et al. (2009) used a hydrodynamic model to experimentally examine the aggregate effects of establishing hydrological connections between a tidally influenced mainstem river and the floodplain—a prominent form of habitat restoration in the lower Columbia River and estuary. In this case, the yield of inundated floodplain habitat area from dike breaching conformed to a diminishing returns model. Optimization of dike-breach restoration programs can be improved by strategic determination of the spatial configuration and number of breaches.

Roegner et al. (2008) found that breaching caused an immediate return of full semi-diurnal tidal fluctuations to diked pastureland; most importantly, juvenile salmonids quickly expanded into this newly available habitat and used prey items presumably produced within marshes at the restored site. Based on size and the timing of hatchery releases, Roegner et al. concluded that most Chinook, chum, and coho salmon sampled in restored and reference sites were progeny from wild spawners. In addition, genetic data suggested that Chinook salmon originating outside the study area had migrated from the mainstem into shallow tidal freshwater habitats and were using restored wetland habitat. Increasing opportunity for juvenile rearing appears to benefit both wild populations and, for Chinook salmon at least, individuals from other watersheds.

Diefenderfer and Montgomery (2008) documented the role of large wood accumulations in forcing channel morphology in remnant Sitka spruce-dominated tidal freshwater wetlands (swamps) in the floodplain of the Lower Columbia River and estuary. On the basis of pool spacing and observed sequences of log jams and pools, tidal forested wetland channels were classified consistent with a forced step-pool channel type. This new classification for tidal systems provides a basis for restoration project design involving placement of large wood and development of pool habitats for aquatic species.

In summer 2008, the Lower Columbia River Estuary Partnership and its restoration partners implemented action effectiveness research at four sites. As an example, at the Fort Clatsop tidal reconnection project, salmonids were more abundant and diverse following restoration, with salmonid

species richness increasing from two to five (LCREP 2009). At the Sandy River Delta revegetation project, planting survival varied significantly between sites, and may be correlated with the number of site-preparation treatments and the overall duration of site preparation prior to woody plant installation (LCREP 2009). Action effectiveness research is essential to inform decision-makers on habitat restoration in the Lower Columbia River and estuary.

Judd et al. (2009) evaluated the ability to enhance distribution of eelgrass (*Zostera marina*) in the Lower Columbia River and estuary to serve as refuge and feeding habitat for juvenile salmon. They developed the first predictive maps of sites suitable for eelgrass and other submerged aquatic vegetation in the lower estuary of the Columbia River. Restoration and expansion of freshwater submerged aquatic vegetation should be considered in a comprehensive effort to restore habitats supporting juvenile salmonid rearing in the Lower Columbia River and estuary.

*Critical Uncertainties Research.* NMFS (2008b) stated, “to date, the principal focus of salmon recovery efforts in the Columbia River basin has been on habitat changes and passage problems caused by large dams. Recent studies by Center scientists and University of Washington collaborators, however, have shown that salmon recovery will require restoration of shallow, intertidal estuarine habitats that support juvenile salmon. Scientists also found that many juvenile salmon reside, feed, and grow for days or weeks within the same wetland channel and that young salmon feed heavily on insect species produced in wetland habitats.”

During a year-long study of juvenile salmon ecology in shallow, tidal freshwater habitats in the Lower Columbia River and estuary in the vicinity of the Sandy River Delta, Sather et al. (2009) documented that juvenile Chinook and/or coho salmon were present at all types of tidal freshwater habitats sampled and were present during all months of the year. Genetic analysis revealed that unmarked juvenile Chinook salmon were primarily from the upper Columbia River summer/fall stock group, which includes individuals from both above and below Bonneville Dam. Snake River and Deschutes River fall run stock groups also were present in the study area. Regardless of sampling month or site of capture, the diets of juvenile Chinook salmon were generally dominated by aquatic insects. Shallow, tidal freshwater habitats can provide rearing areas for juvenile salmon migrating downstream from above Bonneville Dam.

Casillas (2009), reporting on the multidisciplinary study of juvenile salmon ecology in the Columbia River plume, noted that spring and early summer ocean conditions off the Pacific Northwest likely have a greater impact on the survival and growth of interior spring-run Chinook salmon than conditions later in the summer and fall, when conditions are more likely to affect the survival and growth of fall-run Chinook and coho salmon. The management implication is that ocean conditions during early ocean entry need to be taken into account when interpreting adult return data.

Burla et al. (2009) used simulations to study Columbia River plume variability at multiple temporal scales to address the question of whether the intra-seasonal variability in smolt-to-adult survival rates are related to conditions in the Columbia River plume when the juvenile migrants enter the ocean. Such modeling techniques could be used to inform future management decisions.

From sampling juvenile salmon and zooplankton off the outer coast of Vancouver Island during 2008, Trudel et al. (2009) concluded that “the relative survival of different stocks of salmon in the ocean will depend on where they migrate in the ocean, and that changes at the base of the food chain must be taken into consideration to understand the effects of ocean conditions on salmon growth, and hence, on salmon survival.” Using empirical data as a foundation, preliminary modeling results indicate potential to inform harvest strategies and conservation measures for Columbia River salmon.

Welch et al. (2008) performed an acoustic telemetry study of hatchery spring Chinook salmon, releasing tagged fish in the hydrosystem and sampling on receiving arrays in the Lower Columbia River and estuary and continental shelf up to Alaska. The authors concluded that the data are “inconsistent with the theory that delayed mortality is expressed below Bonneville.” This research could affect management decisions on the smolt transportation program.

### *RME Strategy 5 (RPA Action 62)*

A comprehensive list of all actions implemented by the Action Agencies for RPA 62 is included in Section 4. *For RPA 62, the RME Work Group concluded that many subaction requirements were fully addressed; however, some additional monitoring was recommended to supplement ongoing monitoring.*

### *RPA Action 62 – Fund Selected Harvest Investigations*

*The Action Agencies will fund selected harvest investigations linked to FCRPS interests:*

1. *Evaluate the feasibility of obtaining PIT-tag recoveries between Bonneville and McNary dams to determine whether recoveries can help refine estimates of in-river harvest rates and stray rates used to assess adult survival rates.*

Five projects were continued and two were initiated to fully address this RPA subaction. For example, BPA project number 2008-508-00 evaluated run timing and upstream migration mortality of adult Chinook and sockeye salmon and steelhead through PIT-tagging at Bonneville Dam. A companion project, BPA project number 2008-502-00, Increase Zone 6 Tribal Fishery Monitoring, improved the monitoring and catch sampling of the Zone 6 tribal fisheries by increasing the sample rates and employing additional data collection methods, including PIT tag technology.

2. *Evaluate methods to develop or expand use of selective fishing methods and gear.*

Three projects were continued to fully address this RPA subaction. The Action Agencies support investigations of alternative gear and modifications to existing gear strategies for fisheries in the Columbia Basin. They support development of selective gear methods to reduce hatchery surpluses consistent with HSRG recommendations. BPA project number 2007-249-00, Evaluate Live-Capture Fishing Gear for Salmon, focuses on evaluating the feasibility and efficacy of various live-capture selective fishing gears to harvest hatchery-origin Chinook while protecting natural-origin Chinook. 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. This project has multi-year funding and will further test and evaluate impacts to existing gear in 2009 as well test a modified pontoon fishwheel in the mainstem Columbia.

In addition to gear testing, selective fishing can involve modifications to time and area management. BPA project number 1993-060-00, Select Area Fisheries Enhancement, has 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 even when conventional mainstem fisheries are severely constrained or eliminated because of ESA limitations.

3. *Evaluate post-release mortality rates for selected fisheries.*

One project was continued to address this RPA subaction. BPA project number 2007-249-00, Evaluate Live-Capture Fishing Gear for Salmon project, incorporated monitoring protocols to assess fish condition after capture, holding, and release. Results of these evaluations are presented in the project’s 2008 annual report. This is identified as a high-priority area by the RME Work Group.

4. *Support coded-wire tagging and coded-wire tag recovery operations that inform survival, straying, and harvest rates of hatchery fish by stock, rearing facility, release treatment, and location.*

Nine projects were continued and one was initiated to address this RPA subaction. BPA has funded the recovery and stock identification of coded-wire tags since the early 1980s. In 2008, four BPA-funded projects implemented recovery efforts in ocean and in-river fisheries as well as some limited spawning ground surveys. In addition, many hatchery O&M projects the Action Agencies fund contain resources directed toward the recovery and stock identification of coded wire tags. The RME Work Group encouraged additional sampling effort on the spawning grounds. This may require shifting some effort from the ocean fisheries to in-river monitoring. The RME Work Group also recommends that contracts include language to improve quality assurance/quality control (QA/QC), analysis, and data management.

5. *Investigate the feasibility of genetic stock identification monitoring techniques.*

Sixteen projects were continued and two were initiated to fully address this RPA subaction. For example, for Project 2008-907-00, the Genetic Assessment of Columbia River Stocks work, work began in 2008 to address single nucleotide polymorphism (SNP) discovery, genetic baseline expansion, genetic stock identification (GSI) to evaluate catch, and genetic stock identification of salmon and steelhead passing Bonneville Dam. These four projects are highly related because SNP markers are needed to complete species specific baselines, and these baselines are required to complete GSI for the ESA population diversity requirements to support viability risk assessments and the evaluation of the effects of actions on various populations.

#### *RME Strategy 6 (RPA Actions 63–65)*

A comprehensive list of all actions implemented by the Action Agencies for RPAs 63 through 65 is included in Section 4. For RPAs 63 through 65, the RME Work Group concluded that some subactions requirements were fully addressed; however, additional monitoring was recommended to supplement ongoing monitoring.

#### *RPA Action 63 – Monitor Hatchery Effectiveness*

*The Action Agencies will continue to fund selected monitoring and evaluation of the effectiveness of Hatchery Actions. The evaluation of hatchery projects will be coordinated with the Tributary Habitat monitoring and evaluation program.*

1. *Determine the effect that safety-net and conservation hatchery programs have on the viability and recovery of the targeted populations of salmon and steelhead. (Initiate in FY 2007–2009 Projects)*

Eleven projects were continued to address this RPA subaction. All 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 the viability and recovery of targeted populations. For example, BPA project number 1990-005-00 was implemented to monitor and assess straying of adult summer steelhead and Chinook salmon returns from the Umatilla subbasin hatchery program. In cooperation with the Confederated Tribes of the Umatilla Indian Reservation (CTUIR), life history characteristics of hatchery-reared summer steelhead will be monitored, assessed, and compared to life history characteristics of naturally reared summer steelhead.

2. *Determine the effect that implemented hatchery reform actions have on the recovery of targeted salmon and steelhead populations.*

One project was continued to address this RPA subaction. There are currently no projects that appear to address this RPA for the Tucannon, Touchet, and Winthrop NFH steelhead programs. However, the USFWS is currently evaluating a means of implementing the reform

recommendations at Winthrop NFH, and WDFW is evaluating a means of implementing the reform recommendations for the Tucannon and Touchet programs. BPA project number 1989-098-00, the Salmon Studies Idaho Rivers project, was implemented to complete data analysis of brood year 2007 juvenile production by estimating the outmigration of naturally produced Chinook salmon collected in 2008 and 2009. The interim production comparison was completed, with products incorporated into annual progress reports.

#### *RPA Action 64 – Investigate Hatchery Critical Uncertainties*

1. *Continue to estimate the relative reproductive success 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.*

Six projects were continued to fully address this RPA subaction. In 2008, BPA continued to fund 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. For example, BPA project number 1988-053-04 funded the installation of five downstream migrant screw traps in the Hood River subbasin, and a mark and recapture program was implemented at the traps. The mark and recapture program is used to estimate numbers of pre-smolt and smolt steelhead and Chinook salmon moving past pre-defined locations in the subbasin. The program recorded numbers of non-supplemented species of anadromous and resident salmon caught at five downstream migrant screw traps located in this subbasin.

The numbers are used to monitor the relative abundance of each species in the trap catch. BPA project number 1989-096-00 was implemented to collect tissues for genetic analysis. Data collection includes microsatellite genotyping, DNA sequencing, and other methods of examining and characterizing genetic variation within and among groups of salmon and steelhead. Data analyses included descriptive population genetic characterization for Tier 2 sites (gene-frequency monitoring), levels of variability, relative relationships among hatchery and wild populations, and changes in those parameters over time. Experimental design at other sites involves parentage analysis to document differences in reproductive success among hatchery fish, wild fish, and the progeny of captive parents.

2. *Determine if properly designed intervention programs using artificial production make a net positive contribution to recovery of listed populations.*

Thirty-four projects were continued to fully address this RPA subaction. BPA project number 2003-060-00 conducted comparative genetic data analyses between and among all project samples by brood year. Temporal genetic variability within Snake River populations will be evaluated. Wild-origin adults from spawning grounds and other previous samples were sorted into single brood year samples (based on scale ages) and compared to same brood year wild juvenile samples and other brood year-specific project samples. 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. The estimates for origins and relative abundance of potential natural spawners were made from data collected annually at the Lower Granite Dam adult trap.

3. *In collaboration with the other entities responsible for steelhead mitigation in the Methow River, BPA will fund a new RRS study for ESA-listed steelhead in the Methow River. BPA will also fund a new RRS 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.*

Four projects were implemented in 2008 to fully support Subaction 3 of RPA 64. For example, BPA project number 1989-098-00, the Salmon Studies in Idaho Rivers project, estimated overall survival to Lower Granite Dam using the SURPH model by life stage for juvenile Chinook salmon from ISS treatment and control streams based on PIT-tag detections at Lower Granite, Little Goose, and Lower Monumental dams on the Snake River and McNary Dam on the Columbia River. A video-type weir was installed and operated in Lake Creek. Net daily and maximum movements were analyzed to determine adult numbers. BPA project number 2007-403-00, the Idaho Spring Chinook Captive Propagation project, conducted research and collected data to evaluate behavioral characteristics of captively reared Chinook salmon and monitor anadromous Chinook salmon returns and redd development on the East Fork Salmon River and West Fork Yankee Fork. Genetic samples of juvenile Chinook salmon were collected to evaluate the spawning success of captively reared adults. Weirs were maintained to monitor anadromous Chinook migration in the East Fork of the Salmon River and to monitor spawning behavior of captively reared adults released to the study area in the East Fork of the Snake River.

NOAA Fisheries is expected to provide technical assistance to BPA in 2009 during development of targeted solicitations for the new RRS studies for listed Methow River steelhead and listed Snake River fall Chinook salmon.

#### *RPA Action 65 – Investigate Hatchery Critical Uncertainties*

*The Action Agencies will fund research directed at resolving critical uncertainties:*

1. *In the mainstem Snake River above the Lower Granite Dam, estimate the effectiveness/fitness in nature of hatchery-origin fall Chinook salmon from federally funded Snake River hatchery programs relative to natural origin Snake River fall Chinook.*

Three projects were continued and one was initiated to address this RPA subaction. For example, BPA project number 1998-010-03 funded PIT-tagging of hatchery spring Chinook salmon (brood year 2008) produced by the Lostine River Conventional Program to estimate the survival and arrival timing of the conventional stock of Lostine River hatchery Chinook salmon for migration year 2010. The project also documented the distribution of fall Chinook salmon redds in the 100-mile reach of the Snake River, between Asotin, Washington, and Hells Canyon Dam. Redd surveys were conducted from a helicopter at weekly intervals, between mid-October and mid-December. Also during this time period, submersible cameras were used to locate redds in waters too deep to be effectively searched from the air. BPA project number 1998-010-04, the Snake River Fall Chinook Spawning project, organized and implemented expanded spring Chinook redd counts and assessments in the Grande Ronde subbasin (Lostine, Catherine Creek, and upper Grande Ronde) and analyzed length and weight data for each Fall Chinook Acclimation Program (FCAP) release group. The RME Work Group identified this as a high-priority area to address in the future.

2. *Estimate fall Chinook hatchery program effects on the productivity of the fall Chinook salmon ESU.*

Three projects were continued and one was initiated to fully address this RPA subaction. In addition, the BPA projects associated with Subaction 1 of RPA 65 were implemented to support Subaction 2 by evaluating fall Chinook salmon productivity.

3. *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.*

NOAA is expected to provide this technical assistance to BPA in 2009 during development of targeted solicitations for the new Snake River fall Chinook RRS study and any additional study or studies needed to estimate the effects of the fall Chinook hatchery program on productivity of the ESU.

4. *In the Methow River BPA will also fund a new RRS 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.*

This action is contingent upon completion of a federal RME work group analysis that is due in fall 2009.

### *RME Strategy 7 (RPA Actions 66–69)*

A comprehensive list of all actions implemented by the Action Agencies for RPAs 66 through 69 is included in Section 4. For these RPAs, the RME Work Group concluded that most subactions were fully addressed; however, additional monitoring was recommended to supplement ongoing monitoring.

#### *RPA Action 66 – Monitor and Evaluate the Caspian Tern Population in the Columbia River Estuary*

One project was continued to fully address this RPA subaction. The Avian Predation on Juvenile Salmonids project, BPA project number 1997-024-00, provided for the monitoring of the Caspian tern colony on East Sand Island. Colony size, reproduction rates, diet composition, and predation rates were monitored to determine the effect of the colony on juvenile salmon. Results are discussed under RPA 45, above, and further reported at <http://www.birdresearchnw.org>. The Action Agencies also funded Caspian tern monitoring at the alternate habitat sites identified in the Caspian Tern Management Plan.

#### *RPA Action 67 – Monitor and Evaluate the Double-Crested Cormorant Population in the Columbia River Estuary*

One project was continued to fully address this RPA subaction. BPA project number 1997-024-00, the Avian Predation on Juvenile Salmonids project, provided for the monitoring of the double-crested cormorant colony on East Sand Island. Colony size, reproduction rates, diet composition, and predation rates are monitored in order to determine the effect of the colony on juvenile salmon. Results are discussed under RPA 45, above, and further reported at <http://www.birdresearchnw.org>.

The Action Agencies also are funding assessments of the population status of Pacific Coast double-crested cormorants, the availability of suitable alternative nesting habitat outside the Columbia River basin, and potential management approaches to decrease cormorant depredation of juvenile salmon in the Columbia River basin should management of cormorants be determined to be warranted.

#### *RPA Action 68 – Monitor and Evaluate Inland Avian Predators*

*The Action Agencies will monitor avian predator populations in the Mid-Columbia River and evaluate their impacts on outmigrating juvenile salmonids and develop and implement a management plan to decrease predations rates, if warranted.*

One project was continued to fully address this RPA subaction. BPA project number 1997-024-00, Avian Predation on Juvenile Salmonids, provided aerial surveys to identify any significant avian colonies located in the mid-Columbia. This includes colonies like the Caspian tern colony on Crescent Island and the double-crested cormorant colony on Foundation Island, which are monitored to determine their effects on juvenile salmon. Results are discussed under RPA 45, above, and further

reported at <http://www.birdresearchnw.org>. Research related to the Crescent Island Caspian tern and Foundation Island double-crested cormorant colonies is scheduled to be completed in 2009.

A meeting between the Action Agencies and the USFWS in 2008 addressed the development of an avian management plan for Corps-owned lands. The main objective of this management plan is to improve ESA-listed anadromous fish survival for fish rearing and migrating through the Lower Snake and Columbia rivers. (The development and implementation of avian management plan[s] continued in 2009.)

#### *RPA Action 69 – Monitoring Related to Marine Mammal Predation*

As part of RPA 69, the Corps continued to monitor sea lion predation at Bonneville Dam in 2008. For a more comprehensive summary of 2008 monitoring efforts, refer to the field report by Tackley et al. (2008).

1. *Estimate overall sea lion abundance immediately below Bonneville Dam. (Initiate in FY 2007-2009 Projects)*

Two projects were continued to fully address this RPA subaction. From January 11 to May 31, 2008, the Corps continued to visually monitor the abundance of California sea lions below Bonneville Dam (Figure 17). In addition, a BPA-funded CRITFC project (BPA project number 2008-004-00) estimated general sea lion abundance while conducting in-river hazing on sea lions.

2. *Monitor the spatial and temporal distribution of sea lion predation attempts and estimate predation rates. (Initiate in FY 2007-2009 Projects)*

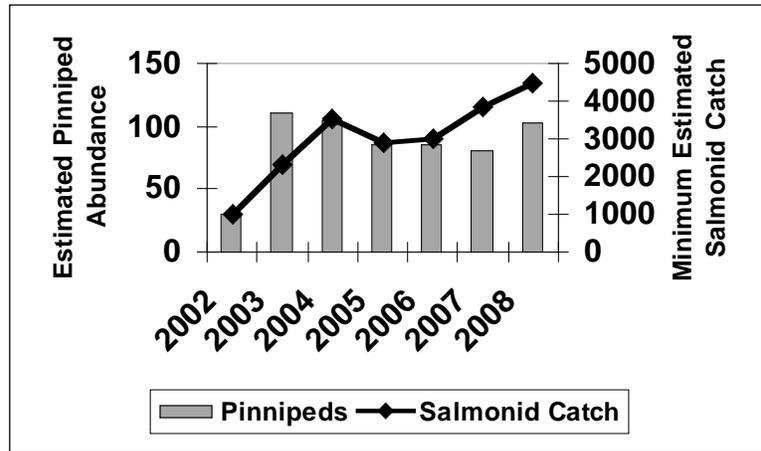
Two projects were continued to fully address this RPA subaction. In 2008, the Corps continued land-based visual observations to monitor the expanded adult salmon catch estimate for the Bonneville Dam tailrace observation area. The Corps also monitored the date and location of individual sea lion predation attempts. The BPA-funded CRITFC project observed the total number of sea lion predation attempts and recorded their location and time.

The expanded adult salmon catch estimate for the Bonneville Dam tailrace observation area was 2.9 percent (n=4,466) of the adult salmon run at Bonneville Dam from January 1 through May 31, 2008. The adjusted estimated catch was 3.2 percent of the run (n=4,927). California sea lions were the primary salmon predator, accounting for 96 percent (n=4,081) of the 4,243 observed catches. This percentage was lower than was seen in previous years, as observed salmon catch by Steller sea lions increased from 0.3 percent (n=12) in 2007 to 3.8 percent (n=162) of total take in 2008 (see Table 8).

Chinook salmon were the most commonly identified prey species, making up about 93 percent (n=3,955) of observed adult salmon catch in 2008. The expanded Chinook catch estimate for the Bonneville Dam tailrace observation area was 2.3 percent (n=4,115) of the Chinook run through June 15, 2008. Note that this time period differs from the passage season used for total salmon estimates. This period includes the Columbia River spring Chinook passage season at Bonneville Dam, which extends beyond the period during which sea lions are present. Steelhead made up about 6.8 percent (n=288) of observed adult salmon catch during the same period. Steelhead, which are present in the Bonneville Dam tailrace throughout the winter and spring, made up the majority of salmon catches the spring Chinook salmon run began. Of the total pinniped catch for 2008, California sea lions took 96.1 percent of the Chinook and 96.9 percent of the steelhead (see Table 9).

Physical barriers, including SLEDs and floating orifice gate (FOG) barriers, apparently prevented sea lions from entering the fishways, but acoustic deterrents installed near fishway entrances continued to have no visible effect on sea lions. During daylight hours, dam-based USDA Wildlife

Services agents contracted by the Corps, and boat-based crews from ODFW, WDFW, and CRITFC used non-lethal pyrotechnics and rubber bullets to harass sea lions in the dam tailrace. Harassment appeared to temporarily alter the behavior of some sea lions but did not reverse the upward trend in predation estimates.



**Figure 9. Estimated Minimum Number of Adult Salmonids Consumed by Pinnipeds and Estimated Total Number of Pinnipeds Observed at Bonneville Dam, January 1–May 31, from 2002 to 2008.**

*Note: In 2005, regular observations did not start until March 18. Pinnipeds observed included California sea lions, Steller sea lions, and harbor seals.*

**Table 8. Bonneville Dam Salmonid Passage Catch Summary (2002–2008).**

| Year | Bonneville Dam Salmonid Passage (Jan. 1–May 31) | Observed Salmonid Catch |                        | Expanded Salmonid Catch Estimate |                        | Adjusted Salmonid Catch Estimate |                        |
|------|---|-------------------------|------------------------|----------------------------------|------------------------|----------------------------------|------------------------|
|      |   | Observed Catch          | % of Run (1/1 to 5/31) | Estimated Catch                  | % of Run (1/1 to 5/31) | Estimated Catch                  | % of Run (1/1 to 5/31) |
| 2002 | 284,733   | 448                     | 0.2%                   | 1,010                            | 0.4%                   | —                                | —                      |
| 2003 | 217,185   | 1,538                   | 0.7%                   | 2,329                            | 1.1%                   | —                                | —                      |
| 2004 | 186,804   | 1,324                   | 0.7%                   | 3,533                            | 1.9%                   | —                                | —                      |
| 2005 | 82,006  | 2,659                   | 3.1%                   | 2,920                            | 3.4%                   | —                                | —                      |
| 2006 | 105,063   | 2,718                   | 2.5%                   | 3,023                            | 2.8%                   | 3,401                            | 3.1%                   |
| 2007 | 88,474  | 3,569                   | 3.9%                   | 3,859                            | 4.2%                   | 4,355                            | 4.7%                   |
| 2008 | 147,543   | 4,243                   | 2.8%                   | 4,466                            | 2.9%                   | 4,927                            | 3.2%                   |

*Note: Total salmonid passage counts include all adult salmonids that passed Bonneville Dam January 1–May 31. Expanded catch estimates account for hours and days not observed. Adjusted catch estimates include expanded catch estimates and some unidentified catches, which were allocated based on the distribution of identified catches. Observed catch is raw actual observed catch/consumed and excludes about 2 percent of catch and subsequent lost fish (swimming away alive). Estimated catch is the expanded catch for hours and days not observed.*

**Table 9. California Sea Lion 2008 Catch Estimates: Chinook vs. Steelhead.**

|                  | <b>Percent of Total Pinniped Catch Taken by California Sea Lions</b> | <b>Expanded Catch Estimate (California sea lions)</b> |
|------------------|--|---|
| <b>Chinook</b>   | 96.1%  | 3955  |
| <b>Steelhead</b> | 96.9%  | 340   |

With funding from BPA, ODFW and WDFW used four floating sea lion traps deployed along the PH2 corner collector to capture California sea lions. The sea lions were then weighed, branded and released, or transferred to aquariums. Of the 11 California sea lions trapped in 2008, six were sent to aquariums, four were processed (measured, weighed, and marked with a three-digit brand) and released; one died under anesthesia before it could be sent to an aquarium. In May 2008, four California sea lions and two Steller sea lions died on traps; this halted trapping operations for the 2008 season.

### *RME Strategy 7 (RPA Action 70)*

A comprehensive list of all actions implemented by the Action Agencies for RPA 70 is included in Section 4. For RPA 70, the RME Work Group concluded that the subactions were fully addressed.

#### *RPA Action 70 – Monitoring Related to Piscivorous (Fish) Predation*

1. *Continue to update and estimate the cumulative benefits of sustained removals of northern pikeminnow since 1990.*

One project was continued to fully address this RPA subaction. The Northern Pikeminnow Management Program (NPMP), BPA project number 1990-07-700, contains an extensive biological evaluation component implemented primarily by the Oregon Department of Fish and Wildlife. This program component annually collects and validates biological field data and updates the benefit model with the latest year's data.

2. *Continue to evaluate if inter and intra compensation is occurring.*

One project was continued to fully address this RPA subaction. The evaluation of the NPMP annually assesses whether compensation is occurring as a result of cumulative removals to date. The program evaluation showed no indication of compensation by smallmouth bass, walleye or channel catfish.

3. *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.*

One project was continued to fully address this RPA subaction. Exploitation rates since the implementation of the monetary incentive increase in 2004 have significantly exceeded the average exploitation rate of the previous 14 years. A significant increase and resultant benefit have been observed since the monetary incentive program was increased in 2004. Some of this may be a result of additional tagging research and the validation of annual tag loss estimates.

4. *Develop a study plan to review, evaluate, and develop strategies to reduce non-indigenous piscivorous predation.*

BPA sponsored project number 2008-720-00, Workshop Non-Indigenous Fishes, that supported a one-day workshop entitled "Review, Evaluate, and Develop Strategies to Reduce Non-Native Piscivorous Predation on Juvenile Salmonids" on September 24, 2008. Results and follow-up topic areas were compiled and presented to NOAA Fisheries. Additional work on development of strategies will continue in 2009 and beyond.

## *RME Strategy 8 (RPA Actions 71–72)*

A comprehensive list of all actions implemented by the Action Agencies for RPAs 71 and 72 is included in Section 4. For these RPAs, the RME Work Group concluded that most subaction requirements were fully addressed; however, additional monitoring coordination and data management were recommended to supplement ongoing monitoring in the future.

### *RPA Action 71 – Coordination*

*The Action Agencies will coordinate RME activities with other Federal, State and Tribal agencies on an ongoing annual basis.*

#### *1. Organizing and supporting the Corps AFEP.*

The Corps of Engineers has, since 1952, sponsored biological studies in an integrated, applied research program. These monitoring, research, and evaluation studies are managed under the Anadromous Fish Evaluation Program (AFEP).

In 2008, the Corps again implemented the AFEP program. As usual, one of the major activities was the selection and development of experimental design and methodology of research projects to be carried out in 2009. This process 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. In December 2008, a 4-day annual review, open to all interested parties, was held to present the results of AFEP research carried out during the year.

The AFEP program also includes the Fish Facility Design Review Work Group (FFDRWG) and the Fish Passage Operations and Maintenance (FPOM) work group. The FFDRWG provides ongoing review of fish facility design activities. The FPOM work group provides ongoing review of operational activities related to fish passage. All federal, state, and tribal fishery agencies are invited to participate in FFDRWG meetings and FPOM meetings, both of which generally occur monthly.

Further information on the AFEP program, and on the research carried out in 2008 and planned for 2009, is available at <http://www.nww.usace.army.mil/planning/ep/fishres/afep-default.htm> and [http://www.nwp.usace.army.mil/pm/e/afep\\_docs.asp](http://www.nwp.usace.army.mil/pm/e/afep_docs.asp)

#### *2. Supporting and participating in the Council's Columbia River Basin Fish and Wildlife Program project planning and review efforts.*

BPA continued to work with Northwest Power and Conservation Council staff in coordinating its Fish and Wildlife Program's project planning and review efforts.

#### *3. Supporting the standardization and coordination of tagging and monitoring efforts through participation and leadership in regional coordination forums such as PNAMP.*

Five projects were continued to fully support this subaction. For example, BPA project numbers 1994-033-00, 1996-020-00, 1996-043-00, and 2004-002-00 were implemented to support RPA Action 71.3. The PNAMP funding (BPA project number 2004-002-00) supported this RPA action by coordinating the PNAMP Tagging and Telemetry Monitoring project to evaluate tagging and telemetry work and make recommendations on field protocols and methods for fish tagging and telemetry field data collection techniques. The Fish Passage Center (Project 1994-033-00) supported the evaluation and synthesis of fish passage of tagged fish through the hydropower system.

Reclamation directly participated in PNAMP by providing full-time equivalents (FTE) for the PNAMP steering committee, and by continuing to provide funding for its two coordinators and database expert. Reclamation provided technical expertise for two major PNAMP tasks issued by the Northwest Environmental Information Sharing (NWEIS) executive forum, including development of a white paper on high-level indicators and planning for a regionwide data dictionary.

4. *Working with regional monitoring agencies to develop, cooperatively fund, and implement standard metrics, business practices, and information collection and reporting tools needed to cooperatively track and report on the status of regional fish improvement and fish monitoring projects.*

Eleven BPA projects were continued and two were initiated to address this subaction. For example, BPA project number 2003-007-00, the Lower Columbia River Estuary Ecosystem Monitoring project, compiled data essential for coordination of efforts from entities that are systematically monitoring the lower Columbia River estuary. This project also supported regional and scientific expert participation in a monitoring subcommittee of the Science Work Group that will meet regularly to discuss ongoing monitoring programs. The work group is working to coordinate data collection efforts and data comparability for data collection gaps, eliminate duplication of efforts, and promote the comparability of methods, data management, and improvement of existing monitoring.

The information collected through these meetings and from the staff of the Lower Columbia River Estuary Partnership and Pacific Northwest National Laboratory (PNNL) was compiled into a central database and then mapped by the Estuary Partnership. The Okanogan Basin Monitoring and Evaluation Program, BPA project number 2003-022-00, was developed under a regional M&E scheme involving coordination with multiple entities to ensure that all M&E efforts are compatible throughout the Columbia Basin and the region. The Okanogan Basin Monitoring and Evaluation Program uses a GRTS EMAP sampling design provided by the EPA to assess habitat conditions. Under this sampling design, 150 sampling sites (90 U.S., 60 Canadian) were randomly selected throughout the Okanogan watershed. The RME Work Group identified multiple areas where monitoring coordination and data sharing could be improved.

5. *Coordinating the further development and implementation of Hydrosystem, Tributary Habitat, Estuary/Ocean, Harvest, Hatchery, and Predation RME through leadership and participation in ongoing collaboration and review processes and workgroups.*

Five BPA projects were continued to fully support this RPA subaction. For example, the Bioanalyst Technical Support project (BPA project number 1996-017-00) provided technical and analytical support to BPA and other federal agencies for compliance under the ESA, National Environmental Policy Act (NEPA), and Northwest Power Act by conducting quantitative analyses, participating in regional technical/analytical forums, assisting in development of biological models, performing QA/QC for data sets, and preparing technical reports on selected topics.

The Estuary and Ocean RME Support project (BPA project number 2002-077-00) continued facilitation and coordination of the RME estuary and ocean subgroup (EOS), provided staff time, developed monitoring inventories for the RME gap assessment, and coordinated the estuary RME work with the developing data management effort for the basinwide RME.

6. *Coordinating implementation with other appropriate regional collaboration processes. This includes coordination related to statutory provisions for the Federal government (BPA/Council), voluntary coordination among Federal agencies (Federal Caucus), and coordination with regional processes for Federal/non-Federal engagement (Technical Management Team (TMT), System Configuration Team (SCT), PNAMP, Northwest Environmental Data- Network (NED), and others.*

Four BPA projects were continued and two were initiated to fully support this subaction. For example, BPA project numbers 2004-002-00, 2002-077-00 and 2003-072-00 were implemented to support regional collaboration processes. The PNAMP Funding project (BPA project number 2004-002-00) provided funds for full-time staff support at PNAMP to facilitate and organize regional collaboration efforts on monitoring techniques and data management. The Estuary and Ocean RME Support project (BPA project number 2002-077-00) continued facilitation and coordination of the RME EOS subgroup to participate in regional monitoring collaboration with PNAMP. The Action Agencies plan to continue to participate in and support these processes and products, including the current Action Agency, NOAA, and NPCC work group collaboration on implementation planning, annual/comprehensive progress reporting, and adaptive management of RME strategies.

## RPA Action 72 – Data Management

The Action Agencies will ensure that the information obtained under the auspices of the FCRPS RME Program is archived in appropriate data management systems.

1. Continue to work with regional Federal, State and Tribal agencies to establish a coordinated and standardized information system network to support the RME 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 RME pilot studies in the Wenatchee River, John Day River, Upper Salmon River, and Columbia River Estuary. (Initiate in FY 2007- 2009 Projects)

Nine BPA projects were continued and three were initiated to fully support this subaction. For example, BPA project numbers 1982-013-01, 1988-108-04, 1998-031-00, 2003-036-00, and 2008-505-00 were implemented to support development of a coordinated and standardized information management network. The StreamNet (CIS/NED) project (BPA project number 1988-108-04) supported participation in planning, development, and/or coordination meetings with regional projects and programs under the Northwest Power and Conservation Council's Fish and Wildlife Program to help develop a regional data management framework, to establish data type and data service priorities, and to provide advice in the area of data management, as requested. The StreamNet project also supported participation in coordination groups (the Columbia Basin Fish and Wildlife Authority, for example), advisory groups, task forces, and other groups (such as PNAMP, NED, and CSMEP) whose purpose is to enhance the effectiveness of the Fish and Wildlife Program relative to its data development activities.

Reclamation supported ongoing regional RME coordination through the PNAMP (see [www.pnamp.org](http://www.pnamp.org) for information on PNAMP's 2008 accomplishments), completion of a major database to catalog monitoring protocols (Protocol Manager), and the transfer of that technology to a NOAA contractor to integrate protocols into a regionwide data dictionary that is being coordinated through PNAMP.

2. Contribute funding for data system components that support the information management needs of individual Hydrosystem, Tributary Habitat, Estuary/Ocean, Harvest, Hatchery, and Predation RME. (Initiate in FY 2007-2009 Projects)

One project was continued and two were initiated to address this subaction. The StreamNet project (BPA project number 1988-108-04) coordinated the maintenance of the database portion of the Pacific Northwest Hydropower Database and Analysis System (NWHS). This task provided for communication and functional coordination and maintenance with, and assistance to, the Northwest Power and Conservation Council, BPA, Corps, and other federal agencies for NWHS-related development, maintenance, and review activities. This project also coordinated and performed the NWHS Database review, which involved retrieval, data item review and analysis, data record update, and completion to improve the quantity and quality of hydro site or project information. In addition, the project provided staff support to answer inquiries and assist users of NWHS. Additional recommendations for data stewards and technical support were identified by the RME Work Group.

3. 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).

Five BPA projects were continued and three were initiated to fully support this subaction. For example, BPA project numbers 1988-108-04, 2004-002-00, and 1996-017-00 were implemented to support participation in coordination efforts to implement a regional data management strategy. For example, the PNAMP funding for BPA project number 2004-002-00 supported staff for

coordination or work sessions and regional collaboration discussion by the PNAMP Data Management Work Group to continue implementation of NED recommendations.

## *RME Strategy 9 (RPA Action 73)*

### *RPA Action 73 – Implementation and Compliance Monitoring*

*The Action Agencies will use the project-level detail contained in the Action Agencies' Biological Opinion databases to track results and assess our progress in meeting programmatic level performance targets. This performance tracking will be reported through annual progress reports and the comprehensive reports scheduled for 2013 and 2016.*

1. *Annually monitor the successful implementation of projects through standard procedures and requirements of contract oversight and management, and review of project deliverables and final reports.*

The Action Agencies successfully implemented programs following government contracting requirements with quarterly and/or annual project implementation reporting. BPA implemented the Pisces program to track project implementation to support compliance and evaluations of project effectiveness.

2. *Maintain project and action level details for planning and reporting purposes. This approach will provide the most up-to-date information about the status of actions and projects being implemented.*

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. Reclamation continued to assess and plan for the inclusion of its implementation data into a coordinated Action Agency database.

3. *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 metadata for RME 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)*

In addition to implementing the Pisces program on all BPA-funded projects, BPA implemented nine projects that tracked and compiled standardized environmental resource project tracking data that could support effectiveness monitoring evaluation efforts. In 2008, the implementation of Katz et al. (2006) metrics was initiated for Pisces but was delayed in order to ensure consistency with other NOAA Fisheries regional database tracking systems, which were in the process of validating Katz et al. metrics in the PCSRF program. For BPA, the Katz et al. metrics will be tracked for fiscal year 2010, with the exception of those metrics that NOAA is in the process of updating. Additional work to further align tracking systems will continue in 2009.

The Action Agencies have recorded project implementation and associated metric information for tributary habitat actions since implementation of tributary habitat actions became part of the FCRPS BiOp RPA in 2000. Examples of these data are presented in Section 4. These data currently are stored in the Pisces database for actions for which BPA provides funding and in a separate database for actions for which Reclamation provides technical assistance. Because these databases were developed in the early 2000s, they currently include only a subset of the metrics contained in Katz et al. (2006); however, most of these projects have already been integrated into the NOAA Pacific Northwest Salmon Habitat Restoration Project Tracking (PNSHP) database that is based on Katz et al. Further regional coordination by the Action Agencies on habitat implementation metrics is being pursued through PNAMP work groups.

## References, Citations, and Sources of Data

The “Action Agencies” are the Army Corps of Engineers Northwestern Division, Bonneville Power Administration, and the Bureau of Reclamation Pacific Northwest Region.

| In Text               | Complete Title   |
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## Acronyms, Abbreviations, and Glossary

The “Action Agencies” refers to Bonneville Power Administration, the U.S. Army Corps of Engineers, and the U.S. Bureau of Reclamation.

|        |  |
|--------|--|
| AFEP   | Anadromous Fish Evaluation Program   |
| AWS    | auxiliary water system   |
| BA     | Biological Assessment  |
| BACI   | Before, After, Control, Impact   |
| BGS    | behavioral guidance screen   |
| BiOp   | Biological Opinion   |
| BPA    | Bonneville Power Administration  |
| BRZ    | Boat Restricted Zone   |
| cfs    | cubic feet per second  |
| CIG    | Climate Impacts Group, University of Washington; is developing climate change streamflows for the Columbia River basin |
| COP    | Configuration and Operational Plan   |
| Corps  | U.S. Army Corps of Engineers   |
| CREST  | Columbia River Estuary Study Taskforce   |
| CRFG   | Columbia River Forecast Group, formed by the Action Agencies and Fish Accord partners                                  |
| CRFM   | Columbia River Fish Mitigation   |
| CSS    | Comparative Survival Study   |
| CTUIR  | Confederated Tribes of the Umatilla Indian Reservation   |
| DART   | Data Access Real Time  |
| EOS    | estuary and ocean subgroup   |
| EPA    | U.S. Environmental Protection Agency   |
| ERDC   | Engineer Research and Development Center   |
| ESA    | Endangered Species Act   |
| FCAP   | Fall Chinook Acclimation Program   |
| FCRPS  | Federal Columbia River Power System  |
| FFDRWG | Fish Facility Design Review Work Group   |
| FGE    | fish guidance efficiency   |
| FOG    | floating orifice gate  |
| FOP    | Fish Operations Plan   |
| FPC    | Fish Passage Center  |
| FPOM   | Fish Passage Operations and Maintenance  |
| FPP    | Fish Passage Plan  |
| FTE    | full-time equivalent   |
| FWP    | Fish and Wildlife Program  |
| GBT    | gas bubble trauma  |
| GIS    | geographical information system  |
| GSI    | genetic stock identification   |
| HGMP   | Hatchery Genetic Management Plan   |
| HSRG   | Hatchery Scientific Review Group   |
| IDFG   | Idaho Department of Fish and Game  |
| IMW    | intensively monitored watershed  |
| ISAB   | Independent Scientific Advisory Board  |
| JBS    | juvenile bypass system   |
| JFF    | juvenile fish facility   |

|             |  |
|-------------|--|
| JSAT        | Juvenile Salmonid Acoustic Tag   |
| kaf         | thousand acre-feet   |
| kcfs        | thousand cubic feet per second   |
| ksfd        | thousand second foot per day; k = kilo = thousand; ksfd = 1,000 cfs (cubic feet per second) per day. ksfd * 1.98347 = thousand acre-feet |
| LCREP       | Lower Columbia River Estuary Partnership   |
| LGR         | Lower Granite Dam  |
| LIDAR       | light detection and ranging  |
| LSRCP       | Lower Snake River Compensation Plan  |
| M&E         | monitoring and evaluation  |
| MAF         | million acre-feet  |
| MCE         | minimum control elevation  |
| MMPA        | Marine Mammal Protection Act   |
| MOP         | minimum operating pool   |
| NED         | Northwest Environmental Data   |
| NEPA        | National Environmental Policy Act  |
| NFH         | National Fish Hatchery   |
| NOS         | natural-origin spawner   |
| NPCC        | Northwest Power and Conservation Council   |
| NPMP        | Northern Pikeminnow Management Plan  |
| NTS         | non-treaty storage   |
| NWEIS       | Northwest Environmental Information Sharing  |
| NWFSC       | Northwest Fisheries Science Center   |
| NWH         | Northwest Hydropower Database and Analysis System  |
| O&M         | operations and maintenance   |
| ODFW        | Oregon Department of Fish and Wildlife   |
| PAHs        | polycyclic aromatic hydrocarbons   |
| PH2         | second powerhouse  |
| PNAMP       | Pacific Northwest Aquatic Monitoring Partnership   |
| PNSHIP      | Pacific Northwest Salmon Habitat Restoration Project Tracking  |
| POST        | Pacific Ocean Survival Tracking Project  |
| PS          | performance standard   |
| PTAGIS      | PIT-Tag Information System   |
| QA/QC       | quality assurance/quality control  |
| Reclamation | U.S. Bureau of Reclamation   |
| RKM         | river kilometer  |
| RM          | river mile   |
| RME         | research, monitoring, and evaluation   |
| ROD         | Record of Decision   |
| RPA         | Reasonable and Prudent Alternative   |
| RRS         | relative reproductive success  |
| RSW         | removable spillway weir  |
| SAR         | smolt-to-adult return  |
| SLED        | sea lion exclusion device  |
| SNP         | single nucleotide polymorphism   |
| SOS         | System Operation Request   |
| SRWG        | Studies Review Work Group  |
| STS         | submersible traveling screen   |

|       |  |
|-------|--|
| TDG   | total dissolved gas                        |
| TIE   | turbine intake extension                   |
| TMDL  | total maximum daily load                   |
| TMT   | Technical Management Team                  |
| TSW   | top-spill weir                             |
| USDA  | U.S. Department of Agriculture             |
| USFWS | U.S. Fish and Wildlife Service             |
| USGS  | U.S. Geological Survey                     |
| VARQ  | variable outflow flood control procedures  |
| VBS   | vertical barrier screen                    |
| VSP   | viable salmonid population                 |
| WDFW  | Washington Department of Fish and Wildlife |
| WDOE  | Washington Department of Ecology           |
| WMP   | Water Management Plan                      |
| YN    | Yakama Nation                              |

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## **Project Tables for Reasonable and Prudent Alternative (RPA) Action Implementation**

### **Attachment 1: Habitat, Hatchery, Predation Management, and RM&E Projects Completed or in Progress in 2008**

|         |                          |
|---------|--------------------------|
| Table 1 | BPA Project List         |
| Table 2 | Reclamation Project List |
| Table 3 | Corps Project List       |

### **Attachment 2: Summary of FY07 and FY08 Accomplishments, by Population**

### **Attachment 3: FY07–FY08 Progress of Projects and Actions Identified for 2007-2009 Implementation in the FCRPS Biological Assessment, Attachment B.2.2-2, Tables 1-6**

|           |   |
|-----------|---|
| Table 1   | Tributary Habitat Actions Identified for 2007-2009 Implementation in FCRPS BA, Attachment B.2.2-2, Tables 1a & b: Upper Columbia Spring Chinook & Steelhead         |
| Table 2   | Actions Identified for 2007-2009 Implementation in FCRPS BA, Attachment B.2.2-2, Table 2: Middle Columbia Steelhead   |
| Table 3.1 | Actions Identified for 2007-2009 Implementation in FCRPS BA, Attachment B.2.2-2, Table 3a: Snake River Steelhead  |
| Table 3.2 | Actions Identified for 2007-2009 Implementation in FCRPS BA, Attachment B.2.2-2, Table 3b: Snake River Spring/Summer Chinook  |
| Table 4.1 | Actions Identified for 2007-2009 Implementation in FCRPS BA, Attachment B.2.2-2, Table 4a: Snake River Spring/Summer Chinook  |
| Table 4.2 | Actions Identified for 2007-2009 Implementation in FCRPS BA, Attachment B.2.2-2, Table 4b: Snake River summer/winter steelhead                                      |
| Table 4.3 | Actions Identified for 2007-2009 Implementation in FCRPS BA, Attachment B.2.2-2, Table 4c: Upper Columbia River summer/winter steelhead                             |
| Table 5.1 | Status of Completed and Ongoing 2007 FCRPS Biological Assessment Table 5a Tributary Habitat Actions Performed with Reclamation Technical Assistance                 |
| Table 5.2 | Status of Completed and Ongoing 2007 FCRPS Biological Assessment Table 5b Tributary Habitat Actions Performed with Reclamation Technical Assistance                 |
| Table 5.3 | Status of Completed and Ongoing 2007 FCRPS Biological Assessment Table 5a and 5b Replacement and Additional Actions Performed with Reclamation Technical Assistance |
| Table 6   | Actions Identified for 2007-2009 Implementation in FCRPS BA, Attachment B.2.2-2, Table 6: Lower Columbia ESUs/DPSs  |

### **Attachment 4: Tributary Habitat Reports by the Bureau of Reclamation**

### **Attachment 5: Action Agency 2008 Estuary Habitat Projects**



## Attachment 1: Habitat, Hatchery, Predation Management, and RM&E Projects Completed or in Progress in 2008

Table 1. BPA Project List

| H-Section | BiOp Strategy                         | RPA # | RPA Subaction | Agency | Project #   | Project Title   | Start Date | Action Information Link   |
|-----------|---------------------------------------|-------|---------------|--------|-------------|---|------------|---|
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 1983-436-00 | Umatilla Passage O&M  | 10/1/1983  | <a href="http://www.cbfish.org/Project.mvc/Display/1983-436-00">http://www.cbfish.org/Project.mvc/Display/1983-436-00</a> |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 1984-021-00 | Mainstem, Middle Fork, John Day Rivers Fish Habitat Enhancement Project | 3/1/1984   | <a href="http://www.cbfish.org/Project.mvc/Display/1984-021-00">http://www.cbfish.org/Project.mvc/Display/1984-021-00</a> |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 1984-025-00 | ODFW Blue Mountain Oregon Fish Habitat Improvement                      | 3/1/1984   | <a href="http://www.cbfish.org/Project.mvc/Display/1984-025-00">http://www.cbfish.org/Project.mvc/Display/1984-025-00</a> |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 1987-100-01 | Umatilla Anad Fish Hab – CTUIR  | 2/1/1987   | <a href="http://www.cbfish.org/Project.mvc/Display/1987-100-01">http://www.cbfish.org/Project.mvc/Display/1987-100-01</a> |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 1987-100-02 | Umatilla Subbasin Fish Habitat Improvement Project                      | 10/1/1987  | <a href="http://www.cbfish.org/Project.mvc/Display/1987-100-02">http://www.cbfish.org/Project.mvc/Display/1987-100-02</a> |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 1988-022-00 | Umatilla Fish Passage Operations  | 1/1/1988   | <a href="http://www.cbfish.org/Project.mvc/Display/1988-022-00">http://www.cbfish.org/Project.mvc/Display/1988-022-00</a> |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 1988-120-25 | YKFP Management, Data, Habitat  | 10/1/1988  | <a href="http://www.cbfish.org/Project.mvc/Display/1988-120-25">http://www.cbfish.org/Project.mvc/Display/1988-120-25</a> |

**Table 1. BPA Project List**

| <b>H-Section</b> | <b>BiOp Strategy</b>                  | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>  | <b>Start Date</b> | <b>Action Information Link</b>  |
|------------------|---------------------------------------|--------------|----------------------|---------------|------------------|---|-------------------|---|
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 1988-120-35      | YKFP Klickitat Management, Data, and Habitat  | 5/1/1988          | <a href="http://www.cbfish.org/Project.mvc/Display/1988-120-35">http://www.cbfish.org/Project.mvc/Display/1988-120-35</a> |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 1989-027-00      | Power Repay Umatilla Basin Project  | 10/1/1989         | <a href="http://www.cbfish.org/Project.mvc/Display/1989-027-00">http://www.cbfish.org/Project.mvc/Display/1989-027-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 1992-009-00      | Yakima Phase II/Huntsville Screen Operation & Maintenance   | 5/1/1992          | <a href="http://www.cbfish.org/Project.mvc/Display/1992-009-00">http://www.cbfish.org/Project.mvc/Display/1992-009-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 1992-026-01      | Grand Ronde Model Watershed Program Habitat Restoration - Planning, Coordination and Implementation | 5/1/1992          | <a href="http://www.cbfish.org/Project.mvc/Display/1992-026-01">http://www.cbfish.org/Project.mvc/Display/1992-026-01</a> |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 1992-062-00      | Yakama Nation - Riparian/Wetlands Restoration   | 4/1/1992          | <a href="http://www.cbfish.org/Project.mvc/Display/1992-062-00">http://www.cbfish.org/Project.mvc/Display/1992-062-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 1993-040-00      | Fifteenmile Creek Habitat Restoration and Monitoring Project  | 10/1/1993         | <a href="http://www.cbfish.org/Project.mvc/Display/1993-040-00">http://www.cbfish.org/Project.mvc/Display/1993-040-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 1993-066-00      | Oregon Fish Screens Project   | 1/1/1993          | <a href="http://www.cbfish.org/Project.mvc/Display/1993-066-00">http://www.cbfish.org/Project.mvc/Display/1993-066-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 1994-015-00      | Idaho Fish Screening and Passage Improvements   | 7/1/1994          | <a href="http://www.cbfish.org/Project.mvc/Display/1994-015-00">http://www.cbfish.org/Project.mvc/Display/1994-015-00</a> |

**Table 1. BPA Project List**

| H-Section | BiOp Strategy                         | RPA # | RPA Subaction | Agency | Project #   | Project Title   | Start Date | Action Information Link   |
|-----------|---------------------------------------|-------|---------------|--------|-------------|---|------------|---|
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 1994-018-05 | Continued Implementation of Prioritized Asotin Creek Watershed Habitat Projects         | 1/1/1994   | <a href="http://www.cbfish.org/Project.mvc/Display/1994-018-05">http://www.cbfish.org/Project.mvc/Display/1994-018-05</a> |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 1994-018-06 | Tucannon Stream and Riparian Protection, Enhancement, and Restoration                   | 10/1/1994  | <a href="http://www.cbfish.org/Project.mvc/Display/1994-018-06">http://www.cbfish.org/Project.mvc/Display/1994-018-06</a> |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 1994-018-07 | Improve Habitat For Fall Chinook, Steelhead in the Lower Snake and Tucannon Sub basins. | 6/1/1994   | <a href="http://www.cbfish.org/Project.mvc/Display/1994-018-07">http://www.cbfish.org/Project.mvc/Display/1994-018-07</a> |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 1994-042-00 | Trout Creek Fish Habitat Restoration Project  | 2/1/1994   | <a href="http://www.cbfish.org/Project.mvc/Display/1994-042-00">http://www.cbfish.org/Project.mvc/Display/1994-042-00</a> |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 1995-033-00 | O&M Yakima Basin Fish Screens   | 5/1/1995   | <a href="http://www.cbfish.org/Project.mvc/Display/1995-033-00">http://www.cbfish.org/Project.mvc/Display/1995-033-00</a> |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 1996-011-00 | Walla Walla Juvenile and Adult Passage Improvements                                     | 9/1/2009   | <a href="http://www.cbfish.org/Project.mvc/Display/1996-011-00">http://www.cbfish.org/Project.mvc/Display/1996-011-00</a> |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 1996-035-01 | Yakama Reservation Watersheds Project   | 10/1/1996  | <a href="http://www.cbfish.org/Project.mvc/Display/1996-035-01">http://www.cbfish.org/Project.mvc/Display/1996-035-01</a> |

**Table 1. BPA Project List**

| H-Section | BiOp Strategy                         | RPA # | RPA Subaction | Agency | Project #   | Project Title   | Start Date | Action Information Link   |
|-----------|---------------------------------------|-------|---------------|--------|-------------|---|------------|---|
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 1996-042-00 | Restore and Enhance Anadromous Fish Populations and Habitat in Salmon Creek | 8/1/1996   | <a href="http://www.cbfish.org/Project.mvc/Display/1996-042-00">http://www.cbfish.org/Project.mvc/Display/1996-042-00</a> |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 1996-046-01 | Walla Walla River Basin Fish Habitat Enhancement                            | 4/1/1996   | <a href="http://www.cbfish.org/Project.mvc/Display/1996-046-01">http://www.cbfish.org/Project.mvc/Display/1996-046-01</a> |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 1996-077-02 | Protect and Restore Lolo Creek Watershed                                    | 3/1/1996   | <a href="http://www.cbfish.org/Project.mvc/Display/1996-077-02">http://www.cbfish.org/Project.mvc/Display/1996-077-02</a> |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 1996-077-05 | Restore McComas Meadows/ Meadow Creek Watershed                             | 3/1/1996   | <a href="http://www.cbfish.org/Project.mvc/Display/1996-077-05">http://www.cbfish.org/Project.mvc/Display/1996-077-05</a> |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 1996-083-00 | CTUIR Grande Ronde Subbasin Restoration Project                             | 4/1/1996   | <a href="http://www.cbfish.org/Project.mvc/Display/1996-083-00">http://www.cbfish.org/Project.mvc/Display/1996-083-00</a> |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 1997-051-00 | Yakima Basin Side Channels  | 4/1/2001   | <a href="http://www.cbfish.org/Project.mvc/Display/1997-051-00">http://www.cbfish.org/Project.mvc/Display/1997-051-00</a> |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 1997-056-00 | Klickitat Watershed Enhancement   | 10/1/1997  | <a href="http://www.cbfish.org/Project.mvc/Display/1997-056-00">http://www.cbfish.org/Project.mvc/Display/1997-056-00</a> |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 1998-021-00 | Hood River Fish Habitat   | 10/1/1998  | <a href="http://www.cbfish.org/Project.mvc/Display/1998-021-00">http://www.cbfish.org/Project.mvc/Display/1998-021-00</a> |

**Table 1. BPA Project List**

| <b>H-Section</b> | <b>BiOp Strategy</b>                  | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>  | <b>Start Date</b> | <b>Action Information Link</b>  |
|------------------|---------------------------------------|--------------|----------------------|---------------|------------------|---|-------------------|---|
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 1998-028-00      | Trout Creek Watershed Restoration Project                             | 4/1/1998          | <a href="http://www.cbfish.org/Project.mvc/Display/1998-028-00">http://www.cbfish.org/Project.mvc/Display/1998-028-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 1999-010-00      | Pine Hollow/Jackknife Habitat   | 11/1/1999         | <a href="http://www.cbfish.org/Project.mvc/Display/1999-010-00">http://www.cbfish.org/Project.mvc/Display/1999-010-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 1999-016-00      | Protect & Restore the Big Canyon Creek Watershed                      | 5/1/1999          | <a href="http://www.cbfish.org/Project.mvc/Display/1999-016-00">http://www.cbfish.org/Project.mvc/Display/1999-016-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 1999-017-00      | Protect and Restore Lapwai Creek Watershed                            | 5/1/1999          | <a href="http://www.cbfish.org/Project.mvc/Display/1999-017-00">http://www.cbfish.org/Project.mvc/Display/1999-017-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 1999-019-00      | Restore Salmon River (Challis, Idaho)                                 | 5/1/1999          | <a href="http://www.cbfish.org/Project.mvc/Display/1999-019-00">http://www.cbfish.org/Project.mvc/Display/1999-019-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 2000-001-00      | Anadromous Fish Habitat & Pass  | 2/1/2000          | <a href="http://www.cbfish.org/Project.mvc/Display/2000-001-00">http://www.cbfish.org/Project.mvc/Display/2000-001-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 2000-015-00      | Oxbow Conservation Area Management                                    | 4/28/2000         | <a href="http://www.cbfish.org/Project.mvc/Display/2000-015-00">http://www.cbfish.org/Project.mvc/Display/2000-015-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 2000-031-00      | North Fork John Day Basin Anadromous Fish Habitat Enhancement Project | 4/1/2000          | <a href="http://www.cbfish.org/Project.mvc/Display/2000-031-00">http://www.cbfish.org/Project.mvc/Display/2000-031-00</a> |

**Table 1. BPA Project List**

| <b>H-Section</b> | <b>BiOp Strategy</b>                  | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>  | <b>Start Date</b> | <b>Action Information Link</b>  |
|------------------|---------------------------------------|--------------|----------------------|---------------|------------------|---|-------------------|---|
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 2000-033-00      | Walla Walla River Fish Passage Operations   | 1/1/2000          | <a href="http://www.cbfish.org/Project.mvc/Display/2000-033-00">http://www.cbfish.org/Project.mvc/Display/2000-033-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 2000-035-00      | Rehabilitate Newsome Creek - S  | 12/1/2000         | <a href="http://www.cbfish.org/Project.mvc/Display/2000-035-00">http://www.cbfish.org/Project.mvc/Display/2000-035-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 2000-036-00      | Protect And Restore Mill Creek  | 3/1/2000          | <a href="http://www.cbfish.org/Project.mvc/Display/2000-036-00">http://www.cbfish.org/Project.mvc/Display/2000-036-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 2001-021-00      | 15 Mile Creek Riparian Buffers  | 4/1/2001          | <a href="http://www.cbfish.org/Project.mvc/Display/2001-021-00">http://www.cbfish.org/Project.mvc/Display/2001-021-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 2001-041-01      | Forrest Conservation Area Management  | 12/1/2001         | <a href="http://www.cbfish.org/Project.mvc/Display/2001-041-01">http://www.cbfish.org/Project.mvc/Display/2001-041-01</a> |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 2002-013-01      | Water Entity (RPA 151) NWPCC - Anadromous   | 10/1/2002         | <a href="http://www.cbfish.org/Project.mvc/Display/2002-013-01">http://www.cbfish.org/Project.mvc/Display/2002-013-01</a> |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 2002-015-00      | Provide Coordination and Technical Assistance to Watershed Councils and Individuals in Sherman County, Oregon | 7/1/2002          | <a href="http://www.cbfish.org/Project.mvc/Display/2002-015-00">http://www.cbfish.org/Project.mvc/Display/2002-015-00</a> |

**Table 1. BPA Project List**

| <b>H-Section</b> | <b>BiOp Strategy</b>                  | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>   | <b>Start Date</b> | <b>Action Information Link</b>  |
|------------------|---------------------------------------|--------------|----------------------|---------------|------------------|--|-------------------|---|
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 2002-019-00      | Wasco Riparian Buffers   | 5/1/2002          | <a href="http://www.cbfish.org/Project.mvc/Display/2002-019-00">http://www.cbfish.org/Project.mvc/Display/2002-019-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 2002-034-00      | Wheeler Co Riparian Buffers  | 5/1/2002          | <a href="http://www.cbfish.org/Project.mvc/Display/2002-034-00">http://www.cbfish.org/Project.mvc/Display/2002-034-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 2002-035-00      | Gilliam Co Riparian Buffers  | 7/1/2002          | <a href="http://www.cbfish.org/Project.mvc/Display/2002-035-00">http://www.cbfish.org/Project.mvc/Display/2002-035-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 2002-050-00      | Continued Riparian Buffer Projects on Couse/Tenmile and other Salmonid Bearing Streams in Asotin County. | 1/1/2002          | <a href="http://www.cbfish.org/Project.mvc/Display/2002-050-00">http://www.cbfish.org/Project.mvc/Display/2002-050-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 2002-059-00      | Yankee Fork Salmon River Dredge Tailings Restoration Project   | 6/15/2002         | <a href="http://www.cbfish.org/Project.mvc/Display/2002-059-00">http://www.cbfish.org/Project.mvc/Display/2002-059-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 2002-061-00      | Restore Potlatch R Watershed   | 9/1/2002          | <a href="http://www.cbfish.org/Project.mvc/Display/2002-061-00">http://www.cbfish.org/Project.mvc/Display/2002-061-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 2002-070-00      | Lapwai Cr Anadromous Habitat   | 5/1/2002          | <a href="http://www.cbfish.org/Project.mvc/Display/2002-070-00">http://www.cbfish.org/Project.mvc/Display/2002-070-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 2002-072-00      | Protect & Restore Red River Watershed  | 12/1/2002         | <a href="http://www.cbfish.org/Project.mvc/Display/2002-072-00">http://www.cbfish.org/Project.mvc/Display/2002-072-00</a> |

**Table 1. BPA Project List**

| <b>H-Section</b> | <b>BiOp Strategy</b>                  | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>   | <b>Start Date</b> | <b>Action Information Link</b>  |
|------------------|---------------------------------------|--------------|----------------------|---------------|------------------|--|-------------------|---|
| Reporting        | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 2003-022-00      | CCT OBMEP  | 3/1/2003          | <a href="http://www.cbfish.org/Project.mvc/Display/2003-022-00">http://www.cbfish.org/Project.mvc/Display/2003-022-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 2007-034-00      | Columbia Cascade Pump Screen Correction  | 8/15/2007         | <a href="http://www.cbfish.org/Project.mvc/Display/2007-034-00">http://www.cbfish.org/Project.mvc/Display/2007-034-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 2007-035-00      | UPA Project - Methow Basin Riparian Enhancement  | 8/20/2007         | <a href="http://www.cbfish.org/Project.mvc/Display/2007-035-00">http://www.cbfish.org/Project.mvc/Display/2007-035-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 2007-055-00      | Entiat River - UPA - Lower Entiat River Off-Channel Restoration Project  | 10/1/2006         | <a href="http://www.cbfish.org/Project.mvc/Display/2007-055-00">http://www.cbfish.org/Project.mvc/Display/2007-055-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 2007-064-00      | Protect and Restore Slate Creek  | 9/1/2007          | <a href="http://www.cbfish.org/Project.mvc/Display/2007-064-00">http://www.cbfish.org/Project.mvc/Display/2007-064-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 2007-065-00      | Coordinate and implement tributary habitat restoration in the Little Salmon River and lower Salmon River Idaho | 5/1/2007          | <a href="http://www.cbfish.org/Project.mvc/Display/2007-065-00">http://www.cbfish.org/Project.mvc/Display/2007-065-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 2007-077-00      | Hemlock Dam Removal  | 6/15/2007         | <a href="http://www.cbfish.org/Project.mvc/Display/2007-077-00">http://www.cbfish.org/Project.mvc/Display/2007-077-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 2007-086-00      | UPA Wenatchee Subbasin Riparian Enhancement Proposal   | 9/27/2007         | <a href="http://www.cbfish.org/Project.mvc/Display/2007-086-00">http://www.cbfish.org/Project.mvc/Display/2007-086-00</a> |

**Table 1. BPA Project List**

| H-Section | BiOp Strategy                         | RPA # | RPA Subaction | Agency | Project #   | Project Title   | Start Date | Action Information Link   |
|-----------|---------------------------------------|-------|---------------|--------|-------------|---|------------|---|
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 2007-092-00 | Clearwater B Run Steelhead  | 10/1/2007  | <a href="http://www.cbfish.org/Project.mvc/Display/2007-092-00">http://www.cbfish.org/Project.mvc/Display/2007-092-00</a> |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 2007-112-00 | Teanaway Watershed - Protect critical habitat from development, reduce water temperatures and increase instream flows, restore habitat forming processes in the floodplain. | 1/7/2007   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-112-00">http://www.cbfish.org/Project.mvc/Display/2007-112-00</a> |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 2007-113-00 | Cowiche Restoration and Protection Project (Easement/Fee Simple Acquisition)  | 9/30/2007  | <a href="http://www.cbfish.org/Project.mvc/Display/2007-113-00">http://www.cbfish.org/Project.mvc/Display/2007-113-00</a> |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 2007-127-00 | Reestablish Connectivity and Restore Fish Habitat in the East Fork of the South Fork Salmon River Watershed   | 7/1/2007   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-127-00">http://www.cbfish.org/Project.mvc/Display/2007-127-00</a> |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 2007-145-00 | Okanogan Livestock and Water  | 9/1/2007   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-145-00">http://www.cbfish.org/Project.mvc/Display/2007-145-00</a> |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 2007-172-00 | UPA Project - MVID West Canal Diversion and Headworks   | 10/1/2006  | <a href="http://www.cbfish.org/Project.mvc/Display/2007-172-00">http://www.cbfish.org/Project.mvc/Display/2007-172-00</a> |

**Table 1. BPA Project List**

| H-Section | BiOp Strategy                         | RPA # | RPA Subaction | Agency | Project #   | Project Title   | Start Date | Action Information Link   |
|-----------|---------------------------------------|-------|---------------|--------|-------------|---|------------|---|
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 2007-194-00 | Oak Flats Acquisition and Habitat Enhancement   | 10/1/2007  | <a href="http://www.cbfish.org/Project.mvc/Display/2007-194-00">http://www.cbfish.org/Project.mvc/Display/2007-194-00</a> |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 2007-214-00 | UPA Project - Fender Mill Floodplain Restoration – Phase 1  | 8/20/2007  | <a href="http://www.cbfish.org/Project.mvc/Display/2007-214-00">http://www.cbfish.org/Project.mvc/Display/2007-214-00</a> |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 2007-217-00 | Operation and Maintenance for Walla Walla Basin Passage Projects  | 1/1/2007   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-217-00">http://www.cbfish.org/Project.mvc/Display/2007-217-00</a> |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 2007-224-00 | Implementation of the Okanogan Subbasin Plan. Initiate a Programmatic and Sequenced set of Key Habitat Restoration and Protection Actions | 2/1/2007   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-224-00">http://www.cbfish.org/Project.mvc/Display/2007-224-00</a> |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 2007-231-00 | UPA Entiat Subbasin Riparian Enhancement Program  | 9/17/2007  | <a href="http://www.cbfish.org/Project.mvc/Display/2007-231-00">http://www.cbfish.org/Project.mvc/Display/2007-231-00</a> |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 2007-237-00 | UPA Project - Elbow Coulee Floodplain Restoration   | 6/1/2007   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-237-00">http://www.cbfish.org/Project.mvc/Display/2007-237-00</a> |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 2007-251-00 | UPA Project - Methow Valley Irrigation District East Diversion Dam Replacement  | 10/1/2006  | <a href="http://www.cbfish.org/Project.mvc/Display/2007-251-00">http://www.cbfish.org/Project.mvc/Display/2007-251-00</a> |

**Table 1. BPA Project List**

| H-Section | BiOp Strategy                         | RPA # | RPA Subaction | Agency | Project #   | Project Title   | Start Date | Action Information Link   |
|-----------|---------------------------------------|-------|---------------|--------|-------------|---|------------|---|
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 2007-264-00 | UPA Project - Programmatic Habitat Complexity Projects in the Methow River Subbasin         | 9/24/2007  | <a href="http://www.cbfish.org/Project.mvc/Display/2007-264-00">http://www.cbfish.org/Project.mvc/Display/2007-264-00</a> |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 2007-268-00 | Idaho Watershed Habitat Restoration Project via Custer Soil and Water Conservation District | 6/1/2007   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-268-00">http://www.cbfish.org/Project.mvc/Display/2007-268-00</a> |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 2007-318-00 | Entiat River - UPA - Knapp-Wham Hanan Detwiler Irrigation System Consolidation Project.     | 6/8/2007   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-318-00">http://www.cbfish.org/Project.mvc/Display/2007-318-00</a> |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 2007-325-00 | UPA Wenatchee Subbasin Complexity Proposal  | 9/27/2007  | <a href="http://www.cbfish.org/Project.mvc/Display/2007-325-00">http://www.cbfish.org/Project.mvc/Display/2007-325-00</a> |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 2007-393-00 | NPT Protect and Restore NE OR   | 7/1/2007   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-393-00">http://www.cbfish.org/Project.mvc/Display/2007-393-00</a> |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 2007-394-00 | Idaho Watershed Habitat Restoration Lemhi County  | 8/1/2007   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-394-00">http://www.cbfish.org/Project.mvc/Display/2007-394-00</a> |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | BPA    | 2007-395-00 | Protect and Restore the Upper Lochsa Watershed  | 5/1/2007   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-395-00">http://www.cbfish.org/Project.mvc/Display/2007-395-00</a> |

**Table 1. BPA Project List**

| <b>H-Section</b> | <b>BiOp Strategy</b>                  | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>                                      | <b>Start Date</b> | <b>Action Information Link</b>  |
|------------------|---------------------------------------|--------------|----------------------|---------------|------------------|---|-------------------|---|
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 2007-396-00      | Walla Walla Basinwide Tributary Passage and Instream Flow | 9/1/2007          | <a href="http://www.cbfish.org/Project.mvc/Display/2007-396-00">http://www.cbfish.org/Project.mvc/Display/2007-396-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 2007-397-00      | John Day Tributary/Passage & Flow                         | 2/1/2007          | <a href="http://www.cbfish.org/Project.mvc/Display/2007-397-00">http://www.cbfish.org/Project.mvc/Display/2007-397-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 2007-398-00      | Yakima River Basinwide Tributary/Passage & Flow           | 6/1/2007          | <a href="http://www.cbfish.org/Project.mvc/Display/2007-398-00">http://www.cbfish.org/Project.mvc/Display/2007-398-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 2007-399-00      | Upper Salmon Screen Tributary Passage                     | 6/1/2007          | <a href="http://www.cbfish.org/Project.mvc/Display/2007-399-00">http://www.cbfish.org/Project.mvc/Display/2007-399-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 2007-400-00      | Wenatchee Basinwide Passage                               | 6/1/2007          | <a href="http://www.cbfish.org/Project.mvc/Display/2007-400-00">http://www.cbfish.org/Project.mvc/Display/2007-400-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | BPA           | 2008-748-00      | Additional B-Run Steelhead Work                           | 10/1/2007         | <a href="http://www.cbfish.org/Project.mvc/Display/2008-748-00">http://www.cbfish.org/Project.mvc/Display/2008-748-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 35           | All                  | BPA           | 1990-092-00      | Wanaket Wildlife Area                                     | 1/1/1990          | <a href="http://www.cbfish.org/Project.mvc/Display/1990-092-00">http://www.cbfish.org/Project.mvc/Display/1990-092-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 35           | All                  | BPA           | 1995-060-01      | Iskuulpa Watershed Project                                | 2/1/1995          | <a href="http://www.cbfish.org/Project.mvc/Display/1995-060-01">http://www.cbfish.org/Project.mvc/Display/1995-060-01</a> |

**Table 1. BPA Project List**

| H-Section | BiOp Strategy                         | RPA # | RPA Subaction | Agency | Project #   | Project Title  | Start Date | Action Information Link   |
|-----------|---------------------------------------|-------|---------------|--------|-------------|--|------------|---|
| Habitat   | Protect and Improve Tributary Habitat | 35    | All           | BPA    | 2007-027-00 | Colville Confederated Tribes Acquisition Project   | 9/1/2007   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-027-00">http://www.cbfish.org/Project.mvc/Display/2007-027-00</a> |
| Habitat   | Protect and Improve Tributary Habitat | 35    | All           | BPA    | 2008-102-00 | Okanogan Habitat   | 9/1/2010   | <a href="http://www.cbfish.org/Project.mvc/Display/2008-102-00">http://www.cbfish.org/Project.mvc/Display/2008-102-00</a> |
| Habitat   | Protect and Improve Tributary Habitat | 35    | All           | BPA    | 2008-103-00 | Okanogan River Water Acquisition<br>(Commitment to allocate some water transactions project funding to Okanogan) | 10/1/2007  | <a href="http://www.cbfish.org/Project.mvc/Display/2008-103-00">http://www.cbfish.org/Project.mvc/Display/2008-103-00</a> |
| Habitat   | Protect and Improve Tributary Habitat | 35    | All           | BPA    | 2008-104-00 | Land and Water Acquisition   | 10/1/2007  | <a href="http://www.cbfish.org/Project.mvc/Display/2008-104-00">http://www.cbfish.org/Project.mvc/Display/2008-104-00</a> |
| Habitat   | Protect and Improve Tributary Habitat | 35    | All           | BPA    | 2008-201-00 | CTUIR Ceded Area Tributary Culvert/Passage Assessment, Prioritization and Implementation                         | 10/1/2007  | <a href="http://www.cbfish.org/Project.mvc/Display/2008-201-00">http://www.cbfish.org/Project.mvc/Display/2008-201-00</a> |
| Habitat   | Protect and Improve Tributary Habitat | 35    | All           | BPA    | 2008-202-00 | Protect and Restore Tucannon Watershed   | 10/1/2007  | <a href="http://www.cbfish.org/Project.mvc/Display/2008-202-00">http://www.cbfish.org/Project.mvc/Display/2008-202-00</a> |

**Table 1. BPA Project List**

| H-Section | BiOp Strategy                         | RPA # | RPA Subaction | Agency | Project #   | Project Title  | Start Date | Action Information Link   |
|-----------|---------------------------------------|-------|---------------|--------|-------------|--|------------|---|
| Habitat   | Protect and Improve Tributary Habitat | 35    | All           | BPA    | 2008-204-00 | Inventory and assess habitat status and needs for anadromous reintroductions in Eastern Oregon tributaries above Hells Canyon Dam  | 9/1/2008   | <a href="http://www.cbfish.org/Project.mvc/Display/2008-204-00">http://www.cbfish.org/Project.mvc/Display/2008-204-00</a> |
| Habitat   | Protect and Improve Tributary Habitat | 35    | All           | BPA    | 2008-206-00 | Instream flow restoration projects, including water rights purchase from willing sellers and development and replacement of water sources for agricultural uses in Umatilla tributaries.***  | 10/1/2007  | <a href="http://www.cbfish.org/Project.mvc/Display/2008-206-00">http://www.cbfish.org/Project.mvc/Display/2008-206-00</a> |
| Habitat   | Protect and Improve Tributary Habitat | 35    | All           | BPA    | 2008-207-00 | CTUIR Ceded Area Priority Stream Corridor Conservation and Protection (capital acquisition) (Formerly: Expanded CTUIR Ceded Area Priority Stream Corridor Protection - Conservation Easements and Acquisition (upper Grande Ronde a priority area).) | 9/1/2008   | <a href="http://www.cbfish.org/Project.mvc/Display/2008-207-00">http://www.cbfish.org/Project.mvc/Display/2008-207-00</a> |
| Habitat   | Protect and Improve Tributary Habitat | 35    | All           | BPA    | 2008-301-00 | Deschutes River restoration program  | 10/1/2007  | <a href="http://www.cbfish.org/Project.mvc/Display/2008-301-00">http://www.cbfish.org/Project.mvc/Display/2008-301-00</a> |

**Table 1. BPA Project List**

| <b>H-Section</b> | <b>BiOp Strategy</b>                  | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>   | <b>Start Date</b> | <b>Action Information Link</b>  |
|------------------|---------------------------------------|--------------|----------------------|---------------|------------------|--|-------------------|---|
| Habitat          | Protect and Improve Tributary Habitat | 35           | All                  | BPA           | 2008-471-00      | Upper Columbia Nutrient Supple   | 10/1/2007         | <a href="http://www.cbfish.org/Project.mvc/Display/2008-471-00">http://www.cbfish.org/Project.mvc/Display/2008-471-00</a> |
| Habitat          | #N/A                                  | 35           | All                  | BPA           | 2008-601-00      | Upper Lemhi River Acquisition and Habitat Restoration: Acquisition             | 9/1/2009          | <a href="http://www.cbfish.org/Project.mvc/Display/2008-601-00">http://www.cbfish.org/Project.mvc/Display/2008-601-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 35           | All                  | BPA           | 2008-602-00      | Upper Lemhi River Acquisition and Habitat Restoration: Restoration activities  | 9/1/2012          | <a href="http://www.cbfish.org/Project.mvc/Display/2008-602-00">http://www.cbfish.org/Project.mvc/Display/2008-602-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 35           | All                  | BPA           | 2008-603-00      | Pahsimeroi River Habitat Project   | 1/1/2010          | <a href="http://www.cbfish.org/Project.mvc/Display/2008-603-00">http://www.cbfish.org/Project.mvc/Display/2008-603-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 35           | All                  | BPA           | 2008-604-00      | Lower Clearwater River/Potlatch River Watershed Management Plan Implementation | 1/1/2010          | <a href="http://www.cbfish.org/Project.mvc/Display/2008-604-00">http://www.cbfish.org/Project.mvc/Display/2008-604-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 35           | All                  | BPA           | 2008-605-00      | Lower Lemhi River Habitat Restoration Project: Easements                       | 9/1/2012          | <a href="http://www.cbfish.org/Project.mvc/Display/2008-605-00">http://www.cbfish.org/Project.mvc/Display/2008-605-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 35           | All                  | BPA           | 2008-606-00      | Lower Lemhi River Habitat Restoration Project: Habitat restoration             | 9/1/2010          | <a href="http://www.cbfish.org/Project.mvc/Display/2008-606-00">http://www.cbfish.org/Project.mvc/Display/2008-606-00</a> |
| Habitat          | Protect and Improve Tributary Habitat | 35           | All                  | BPA           | 2008-608-00      | Water Transactions Fund  | 1/1/2010          | <a href="http://www.cbfish.org/Project.mvc/Display/2008-608-00">http://www.cbfish.org/Project.mvc/Display/2008-608-00</a> |

**Table 1. BPA Project List**

| <b>H-Section</b> | <b>BiOp Strategy</b>                                      | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>                      | <b>Start Date</b> | <b>Action Information Link</b>  |
|------------------|---|--------------|----------------------|---------------|------------------|---|-------------------|---|
| Habitat          | Protect and Improve Tributary Habitat                     | 35           | All                  | BPA           | 2008-748-00      | Additional B-Run Steelhead Work           | 10/1/2007         | <a href="http://www.cbfish.org/Project.mvc/Display/2008-748-00">http://www.cbfish.org/Project.mvc/Display/2008-748-00</a> |
| Habitat          | Protect and Improve Tributary Habitat                     | 35           | All                  | BPA           | 2009-003-00      | Upper Columbia Habitat Restoration        | 2/1/2009          | <a href="http://www.cbfish.org/Project.mvc/Display/2009-003-00">http://www.cbfish.org/Project.mvc/Display/2009-003-00</a> |
| Habitat          | Protect and Improve Tributary Habitat                     | 36           | All                  | BPA           | 1999-025-00      | Sandy River Delta Habitat Restoration     | 7/1/1999          | <a href="http://www.cbfish.org/Project.mvc/Display/1999-025-00">http://www.cbfish.org/Project.mvc/Display/1999-025-00</a> |
| Habitat          | Improve Fish Survival in Estuary Habitat                  | 36           | All                  | BPA           | 2003-011-00      | Columbia R/Estuary Habitat                | 5/21/2003         | <a href="http://www.cbfish.org/Project.mvc/Display/2003-011-00">http://www.cbfish.org/Project.mvc/Display/2003-011-00</a> |
| Habitat          | Improve Fish Survival in Estuary Habitat                  | 36           | All                  | BPA           | 2003-013-00      | Grays River Watershed Restoration         | 5/15/2003         | <a href="http://www.cbfish.org/Project.mvc/Display/2003-013-00">http://www.cbfish.org/Project.mvc/Display/2003-013-00</a> |
| Habitat          | Improve Fish Survival in Estuary Habitat                  | 38           | 1, 2                 | BPA           | 2003-011-00      | Columbia R/Estuary Habitat                | 5/21/2003         | <a href="http://www.cbfish.org/Project.mvc/Display/2003-011-00">http://www.cbfish.org/Project.mvc/Display/2003-011-00</a> |
| Hatchery         | Improve Fish Survival in Estuary Habitat                  | 40           | All                  | BPA           | 2008-712-00      | Implement Hatchery Reform Action          | 10/1/2009         | <a href="http://www.cbfish.org/Project.mvc/Display/2008-712-00">http://www.cbfish.org/Project.mvc/Display/2008-712-00</a> |
| Hatchery         | Ensure Funded Hatchery Programs are not Impeding Recovery | 40           | All                  | BPA           | 2008-714-00      | Recondition Upper Columbia Kelt Steelhead | 10/1/2007         | <a href="http://www.cbfish.org/Project.mvc/Display/2008-714-00">http://www.cbfish.org/Project.mvc/Display/2008-714-00</a> |

**Table 1. BPA Project List**

| H-Section | BiOp Strategy   | RPA # | RPA Subaction | Agency | Project #   | Project Title   | Start Date | Action Information Link   |
|-----------|---|-------|---------------|--------|-------------|---|------------|---|
| Hatchery  | Ensure Funded Hatchery Programs are not Impeding Recovery | 40    | All           | BPA    | 2008-716-00 | Transition the Touchet River steelhead supplementation program to local broodstock (hatchery reform)  | 10/1/2009  | <a href="http://www.cbfish.org/Project.mvc/Display/2008-716-00">http://www.cbfish.org/Project.mvc/Display/2008-716-00</a> |
| Hatchery  | Ensure Funded Hatchery Programs are not Impeding Recovery | 40    | All           | BPA    | 2008-717-00 | Transition the Tucannon River steelhead supplementation program to local broodstock (hatchery reform) | 10/1/2009  | <a href="http://www.cbfish.org/Project.mvc/Display/2008-717-00">http://www.cbfish.org/Project.mvc/Display/2008-717-00</a> |
| Hatchery  | Ensure Funded Hatchery Programs are not Impeding Recovery | 41    | All           | BPA    | 1996-043-00 | Johnson Creek Artificial Propagation Enhancement Project  | 1/1/1996   | <a href="http://www.cbfish.org/Project.mvc/Display/1996-043-00">http://www.cbfish.org/Project.mvc/Display/1996-043-00</a> |
| Hatchery  | Execute on Safety Net and Conservation Objectives         | 41    | All           | BPA    | 2000-019-00 | Tucannon River Spring Chinook Captive Broodstock Program  | 10/1/2000  | <a href="http://www.cbfish.org/Project.mvc/Display/2000-019-00">http://www.cbfish.org/Project.mvc/Display/2000-019-00</a> |
| Hatchery  | Execute on Safety Net and Conservation Objectives         | 41    | All           | BPA    | 2007-402-00 | Snake River Sockeye Salmon Captive Propagation  | 7/1/2007   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-402-00">http://www.cbfish.org/Project.mvc/Display/2007-402-00</a> |
| Hatchery  | Execute on Safety Net and Conservation Objectives         | 41    | All           | BPA    | 2007-403-00 | ID Snake River Spr/Summer Chinook Captive Propagation   | 12/1/2007  | <a href="http://www.cbfish.org/Project.mvc/Display/2007-403-00">http://www.cbfish.org/Project.mvc/Display/2007-403-00</a> |
| Hatchery  | Execute on Safety Net and Conservation Objectives         | 41    | All           | BPA    | 2007-404-00 | OR Snake River Spring/Summer Chinook Salmon Captive Propagation                                       | 1/1/2007   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-404-00">http://www.cbfish.org/Project.mvc/Display/2007-404-00</a> |

**Table 1. BPA Project List**

| H-Section | BiOp Strategy                                     | RPA # | RPA Subaction | Agency | Project #   | Project Title   | Start Date | Action Information Link   |
|-----------|---|-------|---------------|--------|-------------|---|------------|---|
| Hatchery  | Execute on Safety Net and Conservation Objectives | 42    | All           | BPA    | 1988-053-01 | Grande Ronde/Imnaha Endemic Spring Chinook Supplementation - Northeast Oregon Hatchery                                  | 1/1/1988   | <a href="http://www.cbfish.org/Project.mvc/Display/1988-053-01">http://www.cbfish.org/Project.mvc/Display/1988-053-01</a> |
| Hatchery  | Execute on Safety Net and Conservation Objectives | 42    | All           | BPA    | 2001-053-00 | Reintroduction of Chum Salmon into Duncan Creek   | 10/1/2001  | <a href="http://www.cbfish.org/Project.mvc/Display/2001-053-00">http://www.cbfish.org/Project.mvc/Display/2001-053-00</a> |
| Hatchery  | Execute on Safety Net and Conservation Objectives | 42    | All           | BPA    | 2003-023-00 | Chief Joseph Hatchery Program   | 7/1/2003   | <a href="http://www.cbfish.org/Project.mvc/Display/2003-023-00">http://www.cbfish.org/Project.mvc/Display/2003-023-00</a> |
| Hatchery  | Execute on Safety Net and Conservation Objectives | 42    | All           | BPA    | 2007-212-00 | Develop a locally-adapted summer steelhead program to supplement natural production throughout the Okanogan River basin | 7/1/2007   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-212-00">http://www.cbfish.org/Project.mvc/Display/2007-212-00</a> |
| Hatchery  | Execute on Safety Net and Conservation Objectives | 42    | All           | BPA    | 2007-401-00 | Kelt Reconditioning/Reproductive Success  | 4/1/2007   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-401-00">http://www.cbfish.org/Project.mvc/Display/2007-401-00</a> |
| Hatchery  | Execute on Safety Net and Conservation Objectives | 42    | All           | BPA    | 2007-402-00 | Snake River Sockeye Salmon Captive Propagation  | 7/1/2007   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-402-00">http://www.cbfish.org/Project.mvc/Display/2007-402-00</a> |
| Hatchery  | Execute on Safety Net and Conservation Objectives | 42    | All           | BPA    | 2008-458-00 | Upper Columbia Steelhead Kelt Reconditioning  | 10/1/2007  | <a href="http://www.cbfish.org/Project.mvc/Display/2008-458-00">http://www.cbfish.org/Project.mvc/Display/2008-458-00</a> |

**Table 1. BPA Project List**

| <b>H-Section</b>     | <b>BiOp Strategy</b>                              | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>  | <b>Start Date</b> | <b>Action Information Link</b>  |
|----------------------|---|--------------|----------------------|---------------|------------------|---|-------------------|---|
| Hatchery             | Execute on Safety Net and Conservation Objectives | 42           | All                  | BPA           | 2008-710-00      | Assess habitat potential for reintroduction of CR chum in tributaries below Bonneville Dam                                | 5/1/2009          | <a href="http://www.cbfish.org/Project.mvc/Display/2008-710-00">http://www.cbfish.org/Project.mvc/Display/2008-710-00</a> |
| Hatchery             | Execute on Safety Net and Conservation Objectives | 42           | All                  | BPA           | 2008-713-00      | Investigate feasibility and potentially develop a plan for ground transport of adult sockeye from LGR dam to Redfish Lake | 10/1/2009         | <a href="http://www.cbfish.org/Project.mvc/Display/2008-713-00">http://www.cbfish.org/Project.mvc/Display/2008-713-00</a> |
| Predation Management | Implement Piscivorous Predation Control Measures  | 43           | All                  | BPA           | 1990-077-00      | Development of Systemwide Predator Control  | 1990              | <a href="http://www.cbfish.org/Project.mvc/Display/1990-077-00">http://www.cbfish.org/Project.mvc/Display/1990-077-00</a> |
| Predation Management | Implement Avian Predation Control Measures        | 45           | All                  | BPA           | 1997-024-00      | Avian Predation on Juvenile Salmonids   | 1997              | <a href="http://www.cbfish.org/Project.mvc/Display/1997-024-00">http://www.cbfish.org/Project.mvc/Display/1997-024-00</a> |
| Predation Management | Implement Avian Predation Control Measures        | 46           | All                  | BPA           | 1997-024-00      | Avian Predation on Juvenile Salmonids   | 1997              | <a href="http://www.cbfish.org/Project.mvc/Display/1997-024-00">http://www.cbfish.org/Project.mvc/Display/1997-024-00</a> |
| Predation Management | Implement Avian Predation Control Measures        | 47           | All                  | BPA           | 1997-024-00      | Avian Predation on Juvenile Salmonids   | 1997              | <a href="http://www.cbfish.org/Project.mvc/Display/1997-024-00">http://www.cbfish.org/Project.mvc/Display/1997-024-00</a> |
| Predation Management | Implement Marine Mammal Control Measures          | 49           | All                  | BPA           | 2008-003-00      | Removal of Sea Lions at Bonneville Dam  | 2008              | <a href="http://www.cbfish.org/Project.mvc/Display/2008-003-00">http://www.cbfish.org/Project.mvc/Display/2008-003-00</a> |

**Table 1. BPA Project List**

| <b>H-Section</b>     | <b>BiOp Strategy</b>                     | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>                     | <b>Start Date</b> | <b>Action Information Link</b>  |
|----------------------|--|--------------|----------------------|---------------|------------------|--|-------------------|---|
| Predation Management | Implement Marine Mammal Control Measures | 49           | All                  | BPA           | 2008-004-00      | Sea Lion Non-Lethal Hazing               | 2008              | <a href="http://www.cbfish.org/Project.mvc/Display/2008-004-00">http://www.cbfish.org/Project.mvc/Display/2008-004-00</a> |
| RM&E                 | Implement Marine Mammal Control Measures | 50           | 1                    | BPA           | 1990-080-00      | Columbia Basin Pit-Tag Informa           | 3/1/1990          | <a href="http://www.cbfish.org/Project.mvc/Display/1990-080-00">http://www.cbfish.org/Project.mvc/Display/1990-080-00</a> |
| RM&E                 | Monitor Fish Populations                 | 50           | 3                    | BPA           | 1991-028-00      | Pit Tagging Wild Chinook                 | 4/1/1991          | <a href="http://www.cbfish.org/Project.mvc/Display/1991-028-00">http://www.cbfish.org/Project.mvc/Display/1991-028-00</a> |
| RM&E                 | Monitor Fish Populations                 | 50           | 3                    | BPA           | 1994-033-00      | Fish Passage Center                      | 12/1/1994         | <a href="http://www.cbfish.org/Project.mvc/Display/1994-033-00">http://www.cbfish.org/Project.mvc/Display/1994-033-00</a> |
| RM&E                 | Monitor Fish Populations                 | 50           | 3                    | BPA           | 2008-724-00      | Pittag Sr Sockeye-Uc Sp.Chnook           | 10/1/2008         | <a href="http://www.cbfish.org/Project.mvc/Display/2008-724-00">http://www.cbfish.org/Project.mvc/Display/2008-724-00</a> |
| RM&E                 | Monitor Fish Populations                 | 50           | 4                    | BPA           | 1983-319-00      | New Marking & Monitoring Technology      |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1983-319-00">http://www.cbfish.org/Project.mvc/Display/1983-319-00</a> |
| RM&E                 | Monitor Fish Populations                 | 50           | 4                    | BPA           | 1996-017-00      | Tech Support Bio Analyst Inc             | 1/1/1996          | <a href="http://www.cbfish.org/Project.mvc/Display/1996-017-00">http://www.cbfish.org/Project.mvc/Display/1996-017-00</a> |
| RM&E                 | Monitor Fish Populations                 | 50           | 4                    | BPA           | 1989-098-00      | Hood River Production M&E - Warm Springs |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1989-098-00">http://www.cbfish.org/Project.mvc/Display/1989-098-00</a> |
| RM&E                 | Monitor Fish Populations                 | 50           | 4                    | BPA           | 1989-107-00      | Statistical Support For Salmon           |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1989-107-00">http://www.cbfish.org/Project.mvc/Display/1989-107-00</a> |
| RM&E                 | Monitor Fish Populations                 | 50           | 4                    | BPA           | 1998-016-00      | Escapement/Productivity Spring           | 9/1/1998          | <a href="http://www.cbfish.org/Project.mvc/Display/1998-016-00">http://www.cbfish.org/Project.mvc/Display/1998-016-00</a> |
| RM&E                 | Monitor Fish Populations                 | 50           | 4                    | BPA           | 1998-022-00      | Pine Creek/Wagner Management             | 2/1/1998          | <a href="http://www.cbfish.org/Project.mvc/Display/1998-022-00">http://www.cbfish.org/Project.mvc/Display/1998-022-00</a> |

**Table 1. BPA Project List**

| <b>H-Section</b> | <b>BiOp Strategy</b>     | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>               | <b>Start Date</b> | <b>Action Information Link</b>  |
|------------------|--------------------------|--------------|----------------------|---------------|------------------|------------------------------------|-------------------|---|
| RM&E             | Monitor Fish Populations | 50           | 4                    | BPA           | 1990-077-00      | Salmon Studies ID Rivers IDFC      |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1990-077-00">http://www.cbfish.org/Project.mvc/Display/1990-077-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 4                    | BPA           | 2008-729-00      | Adult Pop. Status Monitoring       | 10/1/2008         | <a href="http://www.cbfish.org/Project.mvc/Display/2008-729-00">http://www.cbfish.org/Project.mvc/Display/2008-729-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 4                    | BPA           | 1993-066-00      | Oregon Fish Screens Project        |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1993-066-00">http://www.cbfish.org/Project.mvc/Display/1993-066-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 4                    | BPA           | 1994-042-00      | Trout Creek O&M                    |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1994-042-00">http://www.cbfish.org/Project.mvc/Display/1994-042-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 4                    | BPA           | 1996-040-00      | Trout Creek O&M                    |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1996-040-00">http://www.cbfish.org/Project.mvc/Display/1996-040-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 4                    | BPA           | 1999-016-00      | Pine Creek / Wagner Management     |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1999-016-00">http://www.cbfish.org/Project.mvc/Display/1999-016-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 4                    | BPA           | 2002-061-00      | Integrated Status / Effect Program |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2002-061-00">http://www.cbfish.org/Project.mvc/Display/2002-061-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 4                    | BPA           | 2002-074-00      | Integrated Status / Effect Program |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2002-074-00">http://www.cbfish.org/Project.mvc/Display/2002-074-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 4                    | BPA           | 2003-007-00      | Integrated Status / Effect Program |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2003-007-00">http://www.cbfish.org/Project.mvc/Display/2003-007-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 4                    | BPA           | 2003-010-00      | Integrated Status / Effect Program |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2003-010-00">http://www.cbfish.org/Project.mvc/Display/2003-010-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 5                    | BPA           | 1992-062-00      | ID Steelhead M&E Studies           |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1992-062-00">http://www.cbfish.org/Project.mvc/Display/1992-062-00</a> |

**Table 1. BPA Project List**

| <b>H-Section</b> | <b>BiOp Strategy</b>     | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>                     | <b>Start Date</b> | <b>Action Information Link</b>  |
|------------------|--------------------------|--------------|----------------------|---------------|------------------|--|-------------------|---|
| RM&E             | Monitor Fish Populations | 50           | 5                    | BPA           | 1992-068-00      | ID Steelhead M&E Studies                 |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1992-068-00">http://www.cbfish.org/Project.mvc/Display/1992-068-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 5                    | BPA           | 1993-029-00      | ID Steelhead M&E Studies                 |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1993-029-00">http://www.cbfish.org/Project.mvc/Display/1993-029-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 5                    | BPA           | 1993-037-01      | ID Steelhead M&E Studies                 |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1993-037-01">http://www.cbfish.org/Project.mvc/Display/1993-037-01</a> |
| RM&E             | Monitor Fish Populations | 50           | 5                    | BPA           | 1993-056-00      | ID Steelhead M&E Studies                 |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1993-056-00">http://www.cbfish.org/Project.mvc/Display/1993-056-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 5                    | BPA           | 1993-060-00      | ID Steelhead M&E Studies                 |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1993-060-00">http://www.cbfish.org/Project.mvc/Display/1993-060-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 5                    | BPA           | 2008-748-00      | Additional B-Run Steelhead Work          |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2008-748-00">http://www.cbfish.org/Project.mvc/Display/2008-748-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 6                    | BPA           | 1984-025-00      | NE Oregon Habitat Projects               |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1984-025-00">http://www.cbfish.org/Project.mvc/Display/1984-025-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 6                    | BPA           | 1986-050-00      | Umatilla Anadromous Fish Habitat - CTUIR |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1986-050-00">http://www.cbfish.org/Project.mvc/Display/1986-050-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 6                    | BPA           | 1987-100-01      | Umatilla Anadromous Fish Habitat - CTUIR |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1987-100-01">http://www.cbfish.org/Project.mvc/Display/1987-100-01</a> |
| RM&E             | Monitor Fish Populations | 50           | 6                    | BPA           | 1987-100-02      | Umatilla Anadromous Fish Habitat - CTUIR |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1987-100-02">http://www.cbfish.org/Project.mvc/Display/1987-100-02</a> |
| RM&E             | Monitor Fish Populations | 50           | 6                    | BPA           | 1988-022-00      | Umatilla Fish Passage Operations         |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1988-022-00">http://www.cbfish.org/Project.mvc/Display/1988-022-00</a> |

**Table 1. BPA Project List**

| <b>H-Section</b> | <b>BiOp Strategy</b>     | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>                              | <b>Start Date</b> | <b>Action Information Link</b>  |
|------------------|--------------------------|--------------|----------------------|---------------|------------------|---|-------------------|---|
| RM&E             | Monitor Fish Populations | 50           | 6                    | BPA           | 1988-065-00      | Smolt Monitoring By Non - Federal                 |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1988-065-00">http://www.cbfish.org/Project.mvc/Display/1988-065-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 6                    | BPA           | 1989-024-01      | Smolt Monitoring By Non - Federal                 |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1989-024-01">http://www.cbfish.org/Project.mvc/Display/1989-024-01</a> |
| RM&E             | Monitor Fish Populations | 50           | 6                    | BPA           | 1998-007-03      | Grande Ronde Supp. O&M/M&E                        | 1/1/1998          | <a href="http://www.cbfish.org/Project.mvc/Display/1998-007-03">http://www.cbfish.org/Project.mvc/Display/1998-007-03</a> |
| RM&E             | Monitor Fish Populations | 50           | 6                    | BPA           | 1991-073-00      | Idaho Natural Production Monitoring               |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1991-073-00">http://www.cbfish.org/Project.mvc/Display/1991-073-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 6                    | BPA           | 1992-026-04      | Life Studies Of Spring Chinook                    |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1992-026-04">http://www.cbfish.org/Project.mvc/Display/1992-026-04</a> |
| RM&E             | Monitor Fish Populations | 50           | 6                    | BPA           | 2008-736-00      | Tech Sprt Status & Trend Projects                 | 10/1/2008         | <a href="http://www.cbfish.org/Project.mvc/Display/2008-736-00">http://www.cbfish.org/Project.mvc/Display/2008-736-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 6                    | BPA           | 1994-026-00      | PIT Tagging Wild Chinook                          |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1994-026-00">http://www.cbfish.org/Project.mvc/Display/1994-026-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 6                    | BPA           | 1996-035-01      | Yakama Reservation Watershed Project              |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1996-035-01">http://www.cbfish.org/Project.mvc/Display/1996-035-01</a> |
| RM&E             | Monitor Fish Populations | 50           | 6                    | BPA           | 1997-030-00      | Listed Stock Adult Escapement                     |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1997-030-00">http://www.cbfish.org/Project.mvc/Display/1997-030-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 6                    | BPA           | 1998-007-02      | Johnson Creek Artificial Propagation              |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1998-007-02">http://www.cbfish.org/Project.mvc/Display/1998-007-02</a> |
| RM&E             | Monitor Fish Populations | 50           | 6                    | BPA           | 1998-010-03      | Spawning distribution of Snake River fall Chinook |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1998-010-03">http://www.cbfish.org/Project.mvc/Display/1998-010-03</a> |

**Table 1. BPA Project List**

| <b>H-Section</b> | <b>BiOp Strategy</b>     | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>                                | <b>Start Date</b> | <b>Action Information Link</b>  |
|------------------|--------------------------|--------------|----------------------|---------------|------------------|---|-------------------|---|
| RM&E             | Monitor Fish Populations | 50           | 6                    | BPA           | 1998-010-04      | Imnaha River Smolt Monitoring NPT                   |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1998-010-04">http://www.cbfish.org/Project.mvc/Display/1998-010-04</a> |
| RM&E             | Monitor Fish Populations | 50           | 6                    | BPA           | 1998-021-00      | Wind River Watershed                                |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1998-021-00">http://www.cbfish.org/Project.mvc/Display/1998-021-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 6                    | BPA           | 2000-039-00      | Walla Walla River Basin Monitoring                  |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2000-039-00">http://www.cbfish.org/Project.mvc/Display/2000-039-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 6                    | BPA           | 2001-003-00      | Walla Walla River Basin Monitoring                  |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2001-003-00">http://www.cbfish.org/Project.mvc/Display/2001-003-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 6                    | BPA           | 2002-030-00      | Snake River Fall Chinook Life History Investigation |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2002-030-00">http://www.cbfish.org/Project.mvc/Display/2002-030-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 6                    | BPA           | 2002-032-00      | Snake River Fall Chinook Life History Investigation |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2002-032-00">http://www.cbfish.org/Project.mvc/Display/2002-032-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 6                    | BPA           | 2002-053-00      | Assess Salmonids Asotin Creek WS                    |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2002-053-00">http://www.cbfish.org/Project.mvc/Display/2002-053-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 6                    | BPA           | 2003-054-00      | Rock Creek Fish And Habitat Assessment              |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2003-054-00">http://www.cbfish.org/Project.mvc/Display/2003-054-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 6                    | BPA           | 2003-060-00      | Rock Creek Fish And Habitat Assessment              |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2003-060-00">http://www.cbfish.org/Project.mvc/Display/2003-060-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 6                    | BPA           | 2005-001-00      | Rock Creek Fish And Habitat Assessment              |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2005-001-00">http://www.cbfish.org/Project.mvc/Display/2005-001-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 6                    | BPA           | 2007-156-00      | Snake River Sockeye Captive Propagation             |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-156-00">http://www.cbfish.org/Project.mvc/Display/2007-156-00</a> |

**Table 1. BPA Project List**

| <b>H-Section</b> | <b>BiOp Strategy</b>     | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>                                 | <b>Start Date</b> | <b>Action Information Link</b>  |
|------------------|--------------------------|--------------|----------------------|---------------|------------------|--|-------------------|---|
| RM&E             | Monitor Fish Populations | 50           | 6                    | BPA           | 2007-233-00      | ID Spring Chinook Captive Propagation                |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-233-00">http://www.cbfish.org/Project.mvc/Display/2007-233-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 6                    | BPA           | 2007-396-00      | OR Spring Chinook Captive Propagation                |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-396-00">http://www.cbfish.org/Project.mvc/Display/2007-396-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 6                    | BPA           | 2007-400-00      | Deschutes River Fall Chinook Research and Monitoring |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-400-00">http://www.cbfish.org/Project.mvc/Display/2007-400-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 6                    | BPA           | 2007-403-00      | ID Spring Chinook Captive Propagation                |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-403-00">http://www.cbfish.org/Project.mvc/Display/2007-403-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 6                    | BPA           | 2008-311-00      | Natural Production Management & Monitoring           |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2008-311-00">http://www.cbfish.org/Project.mvc/Display/2008-311-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 7                    | BPA           | 1983-350-03      | Nez Perce Tribal Hatchery M&E                        | 1/1/1983          | <a href="http://www.cbfish.org/Project.mvc/Display/1983-350-03">http://www.cbfish.org/Project.mvc/Display/1983-350-03</a> |
| RM&E             | Monitor Fish Populations | 50           | 7                    | BPA           | 1988-053-04      | Hood River Production M&E-ODFW                       | 10/1/1988         | <a href="http://www.cbfish.org/Project.mvc/Display/1988-053-04">http://www.cbfish.org/Project.mvc/Display/1988-053-04</a> |
| RM&E             | Monitor Fish Populations | 50           | 7                    | BPA           | 1990-005-00      | Umatilla Hatchery - M&E                              | 11/1/1990         | <a href="http://www.cbfish.org/Project.mvc/Display/1990-005-00">http://www.cbfish.org/Project.mvc/Display/1990-005-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 7                    | BPA           | 1988-053-07      | Hood River Production O&M - WS / ODFW                |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1988-053-07">http://www.cbfish.org/Project.mvc/Display/1988-053-07</a> |
| RM&E             | Monitor Fish Populations | 50           | 7                    | BPA           | 1998-007-02      | Gd Ronde Supp Lostine O&M/M&E                        | 1/1/1998          | <a href="http://www.cbfish.org/Project.mvc/Display/1998-007-02">http://www.cbfish.org/Project.mvc/Display/1998-007-02</a> |
| RM&E             | Monitor Fish Populations | 50           | 7                    | BPA           | 1998-010-04      | M&E Snake R. Fall Ch Spawning                        | 1/1/1998          | <a href="http://www.cbfish.org/Project.mvc/Display/1998-010-04">http://www.cbfish.org/Project.mvc/Display/1998-010-04</a> |

**Table 1. BPA Project List**

| <b>H-Section</b> | <b>BiOp Strategy</b>     | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>                                 | <b>Start Date</b> | <b>Action Information Link</b>  |
|------------------|--------------------------|--------------|----------------------|---------------|------------------|--|-------------------|---|
| RM&E             | Monitor Fish Populations | 50           | 7                    | BPA           | 2008-740-00      | Addtl Marking Hatchery Fish                          | 10/1/2008         | <a href="http://www.cbfish.org/Project.mvc/Display/2008-740-00">http://www.cbfish.org/Project.mvc/Display/2008-740-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 8                    | BPA           | 2008-734-00      | Technical Spt-Annual Pop Status                      | 10/1/2008         | <a href="http://www.cbfish.org/Project.mvc/Display/2008-734-00">http://www.cbfish.org/Project.mvc/Display/2008-734-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 8                    | BPA           | None Identified  |  |                   | -   |
| RM&E             | Monitor Fish Populations | 50           | 4, 5, 6, 7           | BPA           | 1989-098-00      | Salmon Studies Id Rvrs Idfc                          | 1/1/1989          | <a href="http://www.cbfish.org/Project.mvc/Display/1989-098-00">http://www.cbfish.org/Project.mvc/Display/1989-098-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 2,5                  | BPA           | 2005-002-00      | Lower Granite Dam Adult Trap Operations              |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2005-002-00">http://www.cbfish.org/Project.mvc/Display/2005-002-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 3, 4,6, 7,           | BPA           | 1987-127-00      | Smolt Monitoring By Non-Feder                        | 3/1/1987          | <a href="http://www.cbfish.org/Project.mvc/Display/1987-127-00">http://www.cbfish.org/Project.mvc/Display/1987-127-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 4, 5                 | BPA           | 1991-073-00      | Idaho Natural Production Monit                       | 2/1/1991          | <a href="http://www.cbfish.org/Project.mvc/Display/1991-073-00">http://www.cbfish.org/Project.mvc/Display/1991-073-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 4, 6                 | BPA           | 1990-018-00      | Salmon Studies ID Rivers IDFC                        |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1990-018-00">http://www.cbfish.org/Project.mvc/Display/1990-018-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 4, 6                 | BPA           | 2008-306-00      | Deschutes River Fall Chinook Research and Monitoring |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2008-306-00">http://www.cbfish.org/Project.mvc/Display/2008-306-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 4, 6,7               | BPA           | 1988-053-04      | Smolt Monitoring By Non - Federal                    |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1988-053-04">http://www.cbfish.org/Project.mvc/Display/1988-053-04</a> |
| RM&E             | Monitor Fish Populations | 50           | 4, 7                 | BPA           | 1989-108-00      | Modeling & Evaluate Supplementation / CRISP          |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1989-108-00">http://www.cbfish.org/Project.mvc/Display/1989-108-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 4,5, 6               | BPA           | 1990-055-00      | Salmon Studies ID Rivers IDFC                        |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1990-055-00">http://www.cbfish.org/Project.mvc/Display/1990-055-00</a> |

**Table 1. BPA Project List**

| <b>H-Section</b> | <b>BiOp Strategy</b>     | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>                        | <b>Start Date</b> | <b>Action Information Link</b>  |
|------------------|--------------------------|--------------|----------------------|---------------|------------------|---|-------------------|---|
| RM&E             | Monitor Fish Populations | 50           | 4,5,6                | BPA           | 2003-017-00      | Integrated Status/Effect Progr              | 7/1/2003          | <a href="http://www.cbfish.org/Project.mvc/Display/2003-017-00">http://www.cbfish.org/Project.mvc/Display/2003-017-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 4,5,6                | BPA           | 1994-050-00      | Idaho Natural Production Monitoring         |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1994-050-00">http://www.cbfish.org/Project.mvc/Display/1994-050-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 4,5,6,7              | BPA           | 1982-013-01      | Coded Wire Tag - PSMFC                      |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1982-013-01">http://www.cbfish.org/Project.mvc/Display/1982-013-01</a> |
| RM&E             | Monitor Fish Populations | 50           | 4,6                  | BPA           | 1990-044-00      | Salmon Studies ID Rivers IDFC               |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1990-044-00">http://www.cbfish.org/Project.mvc/Display/1990-044-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 4,6                  | BPA           | 1991-019-01      | Salmon Studies ID Rivers IDFC               |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1991-019-01">http://www.cbfish.org/Project.mvc/Display/1991-019-01</a> |
| RM&E             | Monitor Fish Populations | 50           | 4,6                  | BPA           | 2003-039-00      | Monitor Repro In Wenat/Tuc/Kal              | 4/1/2003          | <a href="http://www.cbfish.org/Project.mvc/Display/2003-039-00">http://www.cbfish.org/Project.mvc/Display/2003-039-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 4,6                  | BPA           | 1994-043-00      | Idaho Natural Production Monitoring         |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1994-043-00">http://www.cbfish.org/Project.mvc/Display/1994-043-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 4,6                  | BPA           | 2002-059-00      | Integrated Status / Effect Program          |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2002-059-00">http://www.cbfish.org/Project.mvc/Display/2002-059-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 4,6                  | BPA           | 1991-028-00      | Modeling & Evaluate Supplementation / CRISP |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1991-028-00">http://www.cbfish.org/Project.mvc/Display/1991-028-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 4,6,7                | BPA           | 1982-013-04      | New Marking & Monitoring Technology         |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1982-013-04">http://www.cbfish.org/Project.mvc/Display/1982-013-04</a> |
| RM&E             | Monitor Fish Populations | 50           | 4,6,7                | BPA           | 1988-053-03      | Hood River Production M&E - Ws              | 10/1/1988         | <a href="http://www.cbfish.org/Project.mvc/Display/1988-053-03">http://www.cbfish.org/Project.mvc/Display/1988-053-03</a> |

**Table 1. BPA Project List**

| <b>H-Section</b> | <b>BiOp Strategy</b>     | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>                                 | <b>Start Date</b> | <b>Action Information Link</b>  |
|------------------|--------------------------|--------------|----------------------|---------------|------------------|--|-------------------|---|
| RM&E             | Monitor Fish Populations | 50           | 4,6,7                | BPA           | 1995-063-35      | Klickitat Fishery Ykfp M & E                         | 5/1/1995          | <a href="http://www.cbfish.org/Project.mvc/Display/1995-063-35">http://www.cbfish.org/Project.mvc/Display/1995-063-35</a> |
| RM&E             | Monitor Fish Populations | 50           | 4,6,7                | BPA           | 1998-019-00      | Escapement / Productivity Spring                     |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1998-019-00">http://www.cbfish.org/Project.mvc/Display/1998-019-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 4,6,7                | BPA           | 2007-402-00      | Deschutes River Fall Chinook Research and Monitoring |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-402-00">http://www.cbfish.org/Project.mvc/Display/2007-402-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 5,6                  | BPA           | 1993-040-00      | ID Steelhead M&E Studies                             |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1993-040-00">http://www.cbfish.org/Project.mvc/Display/1993-040-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 5,6,7                | BPA           | 1996-020-00      | Pit Tagging Spring/Summer Chin                       | 3/1/1996          | <a href="http://www.cbfish.org/Project.mvc/Display/1996-020-00">http://www.cbfish.org/Project.mvc/Display/1996-020-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 5,6,7                | BPA           | 1996-046-01      | PIT Tagging Spring / Summer Chinook                  |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1996-046-01">http://www.cbfish.org/Project.mvc/Display/1996-046-01</a> |
| RM&E             | Monitor Fish Populations | 50           | 6, 7                 | BPA           | 1983-350-00      | Nez Perce Tribal Hatchery O&M                        | 1/1/1983          | <a href="http://www.cbfish.org/Project.mvc/Display/1983-350-00">http://www.cbfish.org/Project.mvc/Display/1983-350-00</a> |
| RM&E             | Monitor Fish Populations | 50           | 6, 7                 | BPA           | 1988-053-08      | Hood R Powerdale/Oak Springs                         | 10/1/1988         | <a href="http://www.cbfish.org/Project.mvc/Display/1988-053-08">http://www.cbfish.org/Project.mvc/Display/1988-053-08</a> |
| RM&E             | Monitor Fish Populations | 50           | 6, 7                 | BPA           | 1995-063-25      | Ykfp - Monitoring And Evaluati                       | 5/1/1995          | <a href="http://www.cbfish.org/Project.mvc/Display/1995-063-25">http://www.cbfish.org/Project.mvc/Display/1995-063-25</a> |
| RM&E             | Monitor Fish Populations | 50           | 6, 7                 | BPA           | 1997-015-01      | Imnaha R Smolt Monitoring Npt                        | 1/1/1997          | <a href="http://www.cbfish.org/Project.mvc/Display/1997-015-01">http://www.cbfish.org/Project.mvc/Display/1997-015-01</a> |
| RM&E             | Monitor Fish Populations | 50           | 6, 7                 | BPA           | 2007-083-00      | Grande Ronde Suppmentation M&E                       | 1/1/2007          | <a href="http://www.cbfish.org/Project.mvc/Display/2007-083-00">http://www.cbfish.org/Project.mvc/Display/2007-083-00</a> |

**Table 1. BPA Project List**

| H-Section | BiOp Strategy            | RPA # | RPA Subaction | Agency | Project #   | Project Title                         | Start Date | Action Information Link   |
|-----------|--------------------------|-------|---------------|--------|-------------|---------------------------------------|------------|---|
| RM&E      | Monitor Fish Populations | 50    | 6,7           | BPA    | 1982-013-02 | Coded Wire Tag - ODFW                 |            | <a href="http://www.cbfish.org/Project.mvc/Display/1982-013-02">http://www.cbfish.org/Project.mvc/Display/1982-013-02</a> |
| RM&E      | Monitor Fish Populations | 50    | 6,7           | BPA    | 1982-013-03 | Coded Wire Tag - USFWS                |            | <a href="http://www.cbfish.org/Project.mvc/Display/1982-013-03">http://www.cbfish.org/Project.mvc/Display/1982-013-03</a> |
| RM&E      | Monitor Fish Populations | 50    | 6,7           | BPA    | 1983-350-03 | Nez Perce Tribal Hatchery M&E         |            | <a href="http://www.cbfish.org/Project.mvc/Display/1983-350-03">http://www.cbfish.org/Project.mvc/Display/1983-350-03</a> |
| RM&E      | Monitor Fish Populations | 50    | 6,7           | BPA    | 1996-043-00 | Johnson Creek Artificial Propagation  |            | <a href="http://www.cbfish.org/Project.mvc/Display/1996-043-00">http://www.cbfish.org/Project.mvc/Display/1996-043-00</a> |
| RM&E      | Monitor Fish Populations | 50    | 6,7           | BPA    | 1996-077-02 | PIT Tagging Spring / Summer Chinook   |            | <a href="http://www.cbfish.org/Project.mvc/Display/1996-077-02">http://www.cbfish.org/Project.mvc/Display/1996-077-02</a> |
| RM&E      | Monitor Fish Populations | 50    | 6,7           | BPA    | 1996-077-05 | PIT Tagging Spring / Summer Chinook   |            | <a href="http://www.cbfish.org/Project.mvc/Display/1996-077-05">http://www.cbfish.org/Project.mvc/Display/1996-077-05</a> |
| RM&E      | Monitor Fish Populations | 50    | 6,7           | BPA    | 2003-022-00 | Grande Ronde Supplementation M&E      |            | <a href="http://www.cbfish.org/Project.mvc/Display/2003-022-00">http://www.cbfish.org/Project.mvc/Display/2003-022-00</a> |
| RM&E      | Monitor Fish Populations | 50    | 6,7           | BPA    | 2007-404-00 | OR Spring Chinook Captive Propagation |            | <a href="http://www.cbfish.org/Project.mvc/Display/2007-404-00">http://www.cbfish.org/Project.mvc/Display/2007-404-00</a> |
| RM&E      | Monitor Fish Populations | 51    | 1             | BPA    | 1982-013-04 | New Marking & Monitoring Technology   |            | <a href="http://www.cbfish.org/Project.mvc/Display/1982-013-04">http://www.cbfish.org/Project.mvc/Display/1982-013-04</a> |
| RM&E      | Monitor Fish Populations | 51    | 1             | BPA    | 2008-734-00 | Technical Spt-Annual Pop Status       | 10/1/2008  | <a href="http://www.cbfish.org/Project.mvc/Display/2008-734-00">http://www.cbfish.org/Project.mvc/Display/2008-734-00</a> |
| RM&E      | Monitor Fish Populations | 51    | 1             | BPA    | 1997-038-00 | Listed Stock Chinook Salmon Gamete    |            | <a href="http://www.cbfish.org/Project.mvc/Display/1997-038-00">http://www.cbfish.org/Project.mvc/Display/1997-038-00</a> |

**Table 1. BPA Project List**

| <b>H-Section</b> | <b>BiOp Strategy</b>     | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>                    | <b>Start Date</b> | <b>Action Information Link</b>  |
|------------------|--------------------------|--------------|----------------------|---------------|------------------|---|-------------------|---|
| RM&E             | Monitor Fish Populations | 51           | 1                    | BPA           | 2007-407-00      | Upper Snake River Tribes Regional Coord |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-407-00">http://www.cbfish.org/Project.mvc/Display/2007-407-00</a> |
| RM&E             | Monitor Fish Populations | 51           | 2                    | BPA           | 2008-729-00      | Adult Pop. Status Monitoring            | 10/1/2008         | <a href="http://www.cbfish.org/Project.mvc/Display/2008-729-00">http://www.cbfish.org/Project.mvc/Display/2008-729-00</a> |
| RM&E             | Monitor Fish Populations | 51           | 2                    | BPA           | 2008-733-00      | Regional Strategy-Status/Trend          | 10/1/2008         | <a href="http://www.cbfish.org/Project.mvc/Display/2008-733-00">http://www.cbfish.org/Project.mvc/Display/2008-733-00</a> |
| RM&E             | Monitor Fish Populations | 51           | 2                    | BPA           | 2008-739-00      | Tech Spt Fish Pop Status Monit          | 10/1/2008         | <a href="http://www.cbfish.org/Project.mvc/Display/2008-739-00">http://www.cbfish.org/Project.mvc/Display/2008-739-00</a> |
| RM&E             | Monitor Fish Populations | 51           | 2                    | BPA           | None Identified  |   |                   | -   |
| RM&E             | Monitor Fish Populations | 51           | 3                    | BPA           | 2004-002-00      | PNAMP Funding                           | 10/1/2004         | <a href="http://www.cbfish.org/Project.mvc/Display/2004-002-00">http://www.cbfish.org/Project.mvc/Display/2004-002-00</a> |
| RM&E             | Monitor Fish Populations | 51           | 1, 3                 | BPA           | 1988-108-04      | Streamnet (Cis/Ned)                     | 10/1/1988         | <a href="http://www.cbfish.org/Project.mvc/Display/1988-108-04">http://www.cbfish.org/Project.mvc/Display/1988-108-04</a> |
| RM&E             | Monitor Fish Populations | 51           | 1,3                  | BPA           | 1982-013-01      | Coded Wire Tag - PSMFC                  |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1982-013-01">http://www.cbfish.org/Project.mvc/Display/1982-013-01</a> |
| RM&E             | Monitor Fish Populations | 51           | 1,3                  | BPA           | 1994-033-00      | Fish Passage Center                     |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1994-033-00">http://www.cbfish.org/Project.mvc/Display/1994-033-00</a> |
| RM&E             | Monitor Fish Populations | 51           | 1,3                  | BPA           | 1996-043-00      | Johnson Creek Artificial Propagation    |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1996-043-00">http://www.cbfish.org/Project.mvc/Display/1996-043-00</a> |
| RM&E             | Monitor Fish Populations | 51           | 1,3                  | BPA           | 1998-031-00      | Implement Wy - Kan - Ush - Mi Wa - Kis  |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1998-031-00">http://www.cbfish.org/Project.mvc/Display/1998-031-00</a> |
| RM&E             | Monitor Fish Populations | 51           | 1,3                  | BPA           | 2008-505-00      | Streamnet Library                       |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2008-505-00">http://www.cbfish.org/Project.mvc/Display/2008-505-00</a> |

**Table 1. BPA Project List**

| H-Section | BiOp Strategy    | RPA # | RPA Subaction  | Agency | Project #   | Project Title                                 | Start Date | Action Information Link   |
|-----------|------------------|-------|----------------|--------|-------------|---|------------|---|
| RM&E      | Hydrosystem RM&E | 52    | 2              | BPA    | 1983-319-00 | New Marking & Monitoring Technology           |            | <a href="http://www.cbfish.org/Project.mvc/Display/1983-319-00">http://www.cbfish.org/Project.mvc/Display/1983-319-00</a> |
| RM&E      | Hydrosystem RM&E | 52    | 2              | BPA    | 1989-098-00 | Salmon Studies Id Rvrs Idfc                   |            | <a href="http://www.cbfish.org/Project.mvc/Display/1989-098-00">http://www.cbfish.org/Project.mvc/Display/1989-098-00</a> |
| RM&E      | Hydrosystem RM&E | 52    | 2              | BPA    | 1991-028-00 | Pit Tagging Wild Chinook                      |            | <a href="http://www.cbfish.org/Project.mvc/Display/1991-028-00">http://www.cbfish.org/Project.mvc/Display/1991-028-00</a> |
| RM&E      | Hydrosystem RM&E | 52    | 2              | BPA    | 1993-029-00 | Survival Est For Passage Throu                | 4/11/1993  | <a href="http://www.cbfish.org/Project.mvc/Display/1993-029-00">http://www.cbfish.org/Project.mvc/Display/1993-029-00</a> |
| RM&E      | Hydrosystem RM&E | 52    | 2              | BPA    | 1993-040-00 | Fifteenmile Creek Habitat Impr                | 4/11/1993  | <a href="http://www.cbfish.org/Project.mvc/Display/1993-040-00">http://www.cbfish.org/Project.mvc/Display/1993-040-00</a> |
| RM&E      | Hydrosystem RM&E | 52    | 2              | BPA    | 1996-020-00 | Pit Tagging Spring / Summer Chin              |            | <a href="http://www.cbfish.org/Project.mvc/Display/1996-020-00">http://www.cbfish.org/Project.mvc/Display/1996-020-00</a> |
| RM&E      | Hydrosystem RM&E | 52    | 6              | BPA    | 1994-033-00 | Fish Passage Center                           |            | <a href="http://www.cbfish.org/Project.mvc/Display/1994-033-00">http://www.cbfish.org/Project.mvc/Display/1994-033-00</a> |
| RM&E      | Hydrosystem RM&E | 52    | 6              | BPA    | 2008-738-00 | Tech Spt Hydro Tagging/Marking                | 10/1/2008  | <a href="http://www.cbfish.org/Project.mvc/Display/2008-738-00">http://www.cbfish.org/Project.mvc/Display/2008-738-00</a> |
| RM&E      | Hydrosystem RM&E | 52    | 1, 2           | BPA    | 2003-041-00 | Eval Salmon Thru Snake R Dams                 | 4/1/2003   | <a href="http://www.cbfish.org/Project.mvc/Display/2003-041-00">http://www.cbfish.org/Project.mvc/Display/2003-041-00</a> |
| RM&E      | Hydrosystem RM&E | 52    | 1, 2, 3        | BPA    | 1991-051-00 | M&E Statistical Support For Life Cycle Models |            | <a href="http://www.cbfish.org/Project.mvc/Display/1991-051-00">http://www.cbfish.org/Project.mvc/Display/1991-051-00</a> |
| RM&E      | Hydrosystem RM&E | 52    | 1, 2,3, 4,5, 7 | BPA    | 1987-127-00 | Smolt Monitoring By Non-Feder                 | 3/1/1987   | <a href="http://www.cbfish.org/Project.mvc/Display/1987-127-00">http://www.cbfish.org/Project.mvc/Display/1987-127-00</a> |

**Table 1. BPA Project List**

| H-Section | BiOp Strategy    | RPA # | RPA Subaction | Agency | Project #   | Project Title  | Start Date | Action Information Link   |
|-----------|------------------|-------|---------------|--------|-------------|--|------------|---|
| RM&E      | Hydrosystem RM&E | 52    | 2, 5          | BPA    | NEW         | Pilot study of Snake River Sockeye survival to Lower Granite Dam and SAR of in - river and transported smolts. |            | -   |
| RM&E      | Hydrosystem RM&E | 52    | 3,7           | BPA    | 2005-002-00 | Lower Granite Dam Adult Trap Operations  |            | <a href="http://www.cbfish.org/Project.mvc/Display/2005-002-00">http://www.cbfish.org/Project.mvc/Display/2005-002-00</a> |
| RM&E      | Hydrosystem RM&E | 52    | 4, 5          | BPA    | 2008-724-00 | Pittag Sr Sockeye-Uc Sp.Chnook   | 10/1/2008  | <a href="http://www.cbfish.org/Project.mvc/Display/2008-724-00">http://www.cbfish.org/Project.mvc/Display/2008-724-00</a> |
| RM&E      | Hydrosystem RM&E | 53    | 2             | BPA    | 1996-021-00 | Gas Bubble Disease Mon & Resea   | 10/1/1996  | <a href="http://www.cbfish.org/Project.mvc/Display/1996-021-00">http://www.cbfish.org/Project.mvc/Display/1996-021-00</a> |
| RM&E      | Hydrosystem RM&E | 53    | 1, 2          | BPA    | 1994-033-00 | Fish Passage Center  |            | <a href="http://www.cbfish.org/Project.mvc/Display/1994-033-00">http://www.cbfish.org/Project.mvc/Display/1994-033-00</a> |
| RM&E      | Hydrosystem RM&E | 53    | 1, 2,3, 4     | BPA    | 1987-127-00 | Smolt Monitoring By Non-Feder  | 3/1/1987   | <a href="http://www.cbfish.org/Project.mvc/Display/1987-127-00">http://www.cbfish.org/Project.mvc/Display/1987-127-00</a> |
| RM&E      | Hydrosystem RM&E | 53    | 1,2           | BPA    | 1991-029-00 | Flow Augmentation On S.R. Fall Chinook   |            | <a href="http://www.cbfish.org/Project.mvc/Display/1991-029-00">http://www.cbfish.org/Project.mvc/Display/1991-029-00</a> |
| RM&E      | Hydrosystem RM&E | 53    | 1,2           | BPA    | 1991-051-00 | M&E Statistical Support For Life Cycle Models  |            | <a href="http://www.cbfish.org/Project.mvc/Display/1991-051-00">http://www.cbfish.org/Project.mvc/Display/1991-051-00</a> |
| RM&E      | Hydrosystem RM&E | 53    | 1,2,3         | BPA    | 2008-506-00 | PSMFC - Smolt Monitoring   |            | <a href="http://www.cbfish.org/Project.mvc/Display/2008-506-00">http://www.cbfish.org/Project.mvc/Display/2008-506-00</a> |
| RM&E      | Hydrosystem RM&E | 53    | 2, 3          | BPA    | 1989-098-00 | Hood River Production M&E - Warm Springs   |            | <a href="http://www.cbfish.org/Project.mvc/Display/1989-098-00">http://www.cbfish.org/Project.mvc/Display/1989-098-00</a> |

**Table 1. BPA Project List**

| H-Section | BiOp Strategy    | RPA # | RPA Subaction           | Agency | Project #   | Project Title  | Start Date | Action Information Link   |
|-----------|------------------|-------|-------------------------|--------|-------------|--|------------|---|
| RM&E      | Hydrosystem RM&E | 53    | 2,3                     | BPA    | 1991-028-00 | Modeling & Evaluate Supplementation / CRISP  |            | <a href="http://www.cbfish.org/Project.mvc/Display/1991-028-00">http://www.cbfish.org/Project.mvc/Display/1991-028-00</a> |
| RM&E      | Hydrosystem RM&E | 53    | 2,3                     | BPA    | 1993-040-00 | ID Steelhead M&E Studies   |            | <a href="http://www.cbfish.org/Project.mvc/Display/1993-040-00">http://www.cbfish.org/Project.mvc/Display/1993-040-00</a> |
| RM&E      | Hydrosystem RM&E | 53    | 2,3                     | BPA    | 1996-020-00 | PIT Tagging Spring / Summer Chinook  |            | <a href="http://www.cbfish.org/Project.mvc/Display/1996-020-00">http://www.cbfish.org/Project.mvc/Display/1996-020-00</a> |
| RM&E      | Hydrosystem RM&E | 53    | 2,3                     | BPA    | 2003-041-00 | Evaluate Salmon Through Snake River Dams   |            | <a href="http://www.cbfish.org/Project.mvc/Display/2003-041-00">http://www.cbfish.org/Project.mvc/Display/2003-041-00</a> |
| RM&E      | Hydrosystem RM&E | 53    | 4, 5                    | BPA    | 1983-319-00 | New Marking & Monitoring Technology  |            | <a href="http://www.cbfish.org/Project.mvc/Display/1983-319-00">http://www.cbfish.org/Project.mvc/Display/1983-319-00</a> |
| RM&E      | Hydrosystem RM&E | 54    | 6                       | BPA    | NEW         | Pilot study of Snake River Sockeye survival to Lower Granite Dam and SAR of in - river and transported smolts. |            | -   |
| RM&E      | Hydrosystem RM&E | 54    | 8                       | BPA    | 1990-077-00 | Dev Of Sytemwide Pred Control  | 4/1/1990   | <a href="http://www.cbfish.org/Project.mvc/Display/1990-077-00">http://www.cbfish.org/Project.mvc/Display/1990-077-00</a> |
| RM&E      | Hydrosystem RM&E | 54    | 8                       | BPA    | 1997-024-00 | Avian Predation On Juvenile Sa   | 2/1/1997   | <a href="http://www.cbfish.org/Project.mvc/Display/1997-024-00">http://www.cbfish.org/Project.mvc/Display/1997-024-00</a> |
| RM&E      | Hydrosystem RM&E | 54    | 12                      | BPA    | 2008-742-00 | Pit Detectors In Natal Streams   | 10/1/2008  | <a href="http://www.cbfish.org/Project.mvc/Display/2008-742-00">http://www.cbfish.org/Project.mvc/Display/2008-742-00</a> |
| RM&E      | Hydrosystem RM&E | 54    | 1, 2, 9, 11, 12, 13, 14 | BPA    | 1983-319-00 | New Marking & Monitoring Technology  |            | <a href="http://www.cbfish.org/Project.mvc/Display/1983-319-00">http://www.cbfish.org/Project.mvc/Display/1983-319-00</a> |

**Table 1. BPA Project List**

| H-Section | BiOp Strategy    | RPA # | RPA Subaction | Agency | Project #   | Project Title  | Start Date | Action Information Link   |
|-----------|------------------|-------|---------------|--------|-------------|--|------------|---|
| RM&E      | Hydrosystem RM&E | 54    | 2, 13         | BPA    | 1994-033-00 | Fish Passage Center  | 12/1/1994  | <a href="http://www.cbfish.org/Project.mvc/Display/1994-033-00">http://www.cbfish.org/Project.mvc/Display/1994-033-00</a> |
| RM&E      | Hydrosystem RM&E | 54    | 2, 6,7        | BPA    | 1987-127-00 | Smolt Monitoring By Non - Federal  |            | <a href="http://www.cbfish.org/Project.mvc/Display/1987-127-00">http://www.cbfish.org/Project.mvc/Display/1987-127-00</a> |
| RM&E      | Hydrosystem RM&E | 54    | 6,7,8, 10, 12 | BPA    | 1989-098-00 | Hood River Production M&E - Warm Springs   |            | <a href="http://www.cbfish.org/Project.mvc/Display/1989-098-00">http://www.cbfish.org/Project.mvc/Display/1989-098-00</a> |
| RM&E      | Hydrosystem RM&E | 54    | 6,7,8, 10, 12 | BPA    | 1993-040-00 | ID Steelhead M&E Studies   |            | <a href="http://www.cbfish.org/Project.mvc/Display/1993-040-00">http://www.cbfish.org/Project.mvc/Display/1993-040-00</a> |
| RM&E      | Hydrosystem RM&E | 54    | 6,7,8, 10, 12 | BPA    | 1996-020-00 | PIT Tagging Spring / Summer Chinook  |            | <a href="http://www.cbfish.org/Project.mvc/Display/1996-020-00">http://www.cbfish.org/Project.mvc/Display/1996-020-00</a> |
| RM&E      | Hydrosystem RM&E | 54    | 6,7,8, 10, 12 | BPA    | 1991-028-00 | Pit Tagging Wild Chinook   | 4/1/1991   | <a href="http://www.cbfish.org/Project.mvc/Display/1991-028-00">http://www.cbfish.org/Project.mvc/Display/1991-028-00</a> |
| RM&E      | Hydrosystem RM&E | 54    | 6,7,8,10, 12  | BPA    | 2003-041-00 | Evaluate Salmon Through Snake River Dams   |            | <a href="http://www.cbfish.org/Project.mvc/Display/2003-041-00">http://www.cbfish.org/Project.mvc/Display/2003-041-00</a> |
| RM&E      | Hydrosystem RM&E | 55    | 1             | BPA    | NEW         | Pilot study of Snake River Sockeye survival to Lower Granite Dam and SAR of in - river and transported smolts. |            | -   |
| RM&E      | Hydrosystem RM&E | 55    | 2             | BPA    | 1994-033-00 | Fish Passage Center  |            | <a href="http://www.cbfish.org/Project.mvc/Display/1994-033-00">http://www.cbfish.org/Project.mvc/Display/1994-033-00</a> |
| RM&E      | Hydrosystem RM&E | 55    | 2             | BPA    | 2003-114-00 | Acoustic Tracking For Survival   | 12/1/2003  | <a href="http://www.cbfish.org/Project.mvc/Display/2003-114-00">http://www.cbfish.org/Project.mvc/Display/2003-114-00</a> |

**Table 1. BPA Project List**

| <b>H-Section</b> | <b>BiOp Strategy</b> | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>                        | <b>Start Date</b> | <b>Action Information Link</b>  |
|------------------|----------------------|--------------|----------------------|---------------|------------------|---|-------------------|---|
| RM&E             | Hydrosystem RM&E     | 55           | 3                    | BPA           | 2008-725-00      | Post Bonneville Mortality Wkshp             | 10/1/2008         | <a href="http://www.cbfish.org/Project.mvc/Display/2008-725-00">http://www.cbfish.org/Project.mvc/Display/2008-725-00</a> |
| RM&E             | Hydrosystem RM&E     | 55           | 4                    | BPA           | 1991-029-00      | Flow Aug On S.R. Fall Chinook               | 6/1/1991          | <a href="http://www.cbfish.org/Project.mvc/Display/1991-029-00">http://www.cbfish.org/Project.mvc/Display/1991-029-00</a> |
| RM&E             | Hydrosystem RM&E     | 55           | 4                    | BPA           | 2002-032-00      | Fall Chin Passage Lower Granit              | 4/1/2002          | <a href="http://www.cbfish.org/Project.mvc/Display/2002-032-00">http://www.cbfish.org/Project.mvc/Display/2002-032-00</a> |
| RM&E             | Hydrosystem RM&E     | 55           | 7                    | BPA           | 2008-741-00      | Pit-Tag Dtctrs Spillwys-Turbine             | 10/1/2008         | <a href="http://www.cbfish.org/Project.mvc/Display/2008-741-00">http://www.cbfish.org/Project.mvc/Display/2008-741-00</a> |
| RM&E             | Hydrosystem RM&E     | 55           | 8                    | BPA           | 2008-744-00      | Evaluate New Tagging Technology             | 10/1/2008         | <a href="http://www.cbfish.org/Project.mvc/Display/2008-744-00">http://www.cbfish.org/Project.mvc/Display/2008-744-00</a> |
| RM&E             | Hydrosystem RM&E     | 55           | 1, 2, 5              | BPA           | 2008-724-00      | Pittag Sr Sockeye-Uc Sp.Chnook              | 10/1/2008         | <a href="http://www.cbfish.org/Project.mvc/Display/2008-724-00">http://www.cbfish.org/Project.mvc/Display/2008-724-00</a> |
| RM&E             | Hydrosystem RM&E     | 55           | 1,2                  | BPA           | 1989-098-00      | Hood River Production M&E - Warm Springs    |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1989-098-00">http://www.cbfish.org/Project.mvc/Display/1989-098-00</a> |
| RM&E             | Hydrosystem RM&E     | 55           | 1,2                  | BPA           | 1991-028-00      | Modeling & Evaluate Supplementation / CRISP |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1991-028-00">http://www.cbfish.org/Project.mvc/Display/1991-028-00</a> |
| RM&E             | Hydrosystem RM&E     | 55           | 1,2                  | BPA           | 1993-040-00      | ID Steelhead M&E Studies                    |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1993-040-00">http://www.cbfish.org/Project.mvc/Display/1993-040-00</a> |
| RM&E             | Hydrosystem RM&E     | 55           | 1,2                  | BPA           | 1996-020-00      | PIT Tagging Spring / Summer Chinook         |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1996-020-00">http://www.cbfish.org/Project.mvc/Display/1996-020-00</a> |
| RM&E             | Hydrosystem RM&E     | 55           | 1,2                  | BPA           | 2003-041-00      | Evaluate Salmon Through Snake River Dams    |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2003-041-00">http://www.cbfish.org/Project.mvc/Display/2003-041-00</a> |

**Table 1. BPA Project List**

| <b>H-Section</b> | <b>BiOp Strategy</b>   | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>                     | <b>Start Date</b> | <b>Action Information Link</b>  |
|------------------|------------------------|--------------|----------------------|---------------|------------------|--|-------------------|---|
| RM&E             | Hydrosystem RM&E       | 55           | 1,2                  | BPA           | 2005-002-00      | Lower Granite Dam Adult Trap Operations  |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2005-002-00">http://www.cbfish.org/Project.mvc/Display/2005-002-00</a> |
| RM&E             | Hydrosystem RM&E       | 55           | 1,2,4                | BPA           | 1987-127-00      | Smolt Monitoring By Non - Federal        |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1987-127-00">http://www.cbfish.org/Project.mvc/Display/1987-127-00</a> |
| RM&E             | Hydrosystem RM&E       | 55           | 4,5,7,8,9            | BPA           | 1983-319-00      | New Marking & Monitoring Technology      |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1983-319-00">http://www.cbfish.org/Project.mvc/Display/1983-319-00</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 1                    | BPA           | 1987-100-02      | Umatilla Anadromous Fish Habitat - CTUIR |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1987-100-02">http://www.cbfish.org/Project.mvc/Display/1987-100-02</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 1                    | BPA           | 1988-053-03      | Hood River Production M&E - Warm Springs |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1988-053-03">http://www.cbfish.org/Project.mvc/Display/1988-053-03</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 1                    | BPA           | 1988-053-04      | Smolt Monitoring By Non - Federal        |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1988-053-04">http://www.cbfish.org/Project.mvc/Display/1988-053-04</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 1                    | BPA           | 1989-098-00      | Hood River Production M&E - Warm Springs |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1989-098-00">http://www.cbfish.org/Project.mvc/Display/1989-098-00</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 1                    | BPA           | 1990-018-00      | Salmon Studies ID Rivers IDFC            |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1990-018-00">http://www.cbfish.org/Project.mvc/Display/1990-018-00</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 1                    | BPA           | 1990-044-00      | Salmon Studies ID Rivers IDFC            |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1990-044-00">http://www.cbfish.org/Project.mvc/Display/1990-044-00</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 1                    | BPA           | 1991-019-01      | Salmon Studies ID Rivers IDFC            |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1991-019-01">http://www.cbfish.org/Project.mvc/Display/1991-019-01</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 1                    | BPA           | 1992-026-04      | Life Studies Of Spring Chinook           |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1992-026-04">http://www.cbfish.org/Project.mvc/Display/1992-026-04</a> |

**Table 1. BPA Project List**

| H-Section | BiOp Strategy          | RPA # | RPA Subaction | Agency | Project #   | Project Title                        | Start Date | Action Information Link   |
|-----------|------------------------|-------|---------------|--------|-------------|--------------------------------------|------------|---|
| RM&E      | Tributary Habitat RM&E | 56    | 1             | BPA    | 1993-040-00 | ID Steelhead M&E Studies             |            | <a href="http://www.cbfish.org/Project.mvc/Display/1993-040-00">http://www.cbfish.org/Project.mvc/Display/1993-040-00</a> |
| RM&E      | Tributary Habitat RM&E | 56    | 1             | BPA    | 1994-018-05 | Asotin Enhancement / Restoration     |            | <a href="http://www.cbfish.org/Project.mvc/Display/1994-018-05">http://www.cbfish.org/Project.mvc/Display/1994-018-05</a> |
| RM&E      | Tributary Habitat RM&E | 56    | 1             | BPA    | 1994-018-06 | Tucannon Stream And Riparian R       |            | <a href="http://www.cbfish.org/Project.mvc/Display/1994-018-06">http://www.cbfish.org/Project.mvc/Display/1994-018-06</a> |
| RM&E      | Tributary Habitat RM&E | 56    | 1             | BPA    | 1994-042-00 | Trout Creek O&M                      |            | <a href="http://www.cbfish.org/Project.mvc/Display/1994-042-00">http://www.cbfish.org/Project.mvc/Display/1994-042-00</a> |
| RM&E      | Tributary Habitat RM&E | 56    | 1             | BPA    | 1995-063-35 | Oregon Fish Screens Project          |            | <a href="http://www.cbfish.org/Project.mvc/Display/1995-063-35">http://www.cbfish.org/Project.mvc/Display/1995-063-35</a> |
| RM&E      | Tributary Habitat RM&E | 56    | 1             | BPA    | 1996-017-00 | Oregon Fish Screens Project          |            | <a href="http://www.cbfish.org/Project.mvc/Display/1996-017-00">http://www.cbfish.org/Project.mvc/Display/1996-017-00</a> |
| RM&E      | Tributary Habitat RM&E | 56    | 1             | BPA    | 1996-035-01 | Yakama Reservation Watershed Project |            | <a href="http://www.cbfish.org/Project.mvc/Display/1996-035-01">http://www.cbfish.org/Project.mvc/Display/1996-035-01</a> |
| RM&E      | Tributary Habitat RM&E | 56    | 1             | BPA    | 1996-040-00 | Trout Creek O&M                      |            | <a href="http://www.cbfish.org/Project.mvc/Display/1996-040-00">http://www.cbfish.org/Project.mvc/Display/1996-040-00</a> |
| RM&E      | Tributary Habitat RM&E | 56    | 1             | BPA    | 1996-077-02 | PIT Tagging Spring / Summer Chinook  |            | <a href="http://www.cbfish.org/Project.mvc/Display/1996-077-02">http://www.cbfish.org/Project.mvc/Display/1996-077-02</a> |
| RM&E      | Tributary Habitat RM&E | 56    | 1             | BPA    | 1996-077-05 | PIT Tagging Spring / Summer Chinook  |            | <a href="http://www.cbfish.org/Project.mvc/Display/1996-077-05">http://www.cbfish.org/Project.mvc/Display/1996-077-05</a> |
| RM&E      | Tributary Habitat RM&E | 56    | 1             | BPA    | 1997-015-01 | Imnaha River Smolt Monitoring NPT    |            | <a href="http://www.cbfish.org/Project.mvc/Display/1997-015-01">http://www.cbfish.org/Project.mvc/Display/1997-015-01</a> |

**Table 1. BPA Project List**

| <b>H-Section</b> | <b>BiOp Strategy</b>   | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>                                | <b>Start Date</b> | <b>Action Information Link</b>  |
|------------------|------------------------|--------------|----------------------|---------------|------------------|---|-------------------|---|
| RM&E             | Tributary Habitat RM&E | 56           | 1                    | BPA           | 1997-056-00      | Klickitat Watershed Enhance                         |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1997-056-00">http://www.cbfish.org/Project.mvc/Display/1997-056-00</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 1                    | BPA           | 1998-010-03      | Spawning distribution of Snake River fall Chinook   |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1998-010-03">http://www.cbfish.org/Project.mvc/Display/1998-010-03</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 1                    | BPA           | 1998-019-00      | Escapement / Productivity Spring                    |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1998-019-00">http://www.cbfish.org/Project.mvc/Display/1998-019-00</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 1                    | BPA           | 2000-035-00      | Rehabilitate Newsome Creek - S                      |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2000-035-00">http://www.cbfish.org/Project.mvc/Display/2000-035-00</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 1                    | BPA           | 2000-036-00      | Protect And Restoration Mill Creek                  |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2000-036-00">http://www.cbfish.org/Project.mvc/Display/2000-036-00</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 1                    | BPA           | 2000-039-00      | Walla Walla River Basin Monitoring                  |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2000-039-00">http://www.cbfish.org/Project.mvc/Display/2000-039-00</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 1                    | BPA           | 2001-003-00      | Walla Walla River Basin Monitoring                  |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2001-003-00">http://www.cbfish.org/Project.mvc/Display/2001-003-00</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 1                    | BPA           | 2002-032-00      | Snake River Fall Chinook Life History Investigation |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2002-032-00">http://www.cbfish.org/Project.mvc/Display/2002-032-00</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 1                    | BPA           | 1983-350-03      | Ne Oregon Habitat Projects                          | 3/1/1984          | <a href="http://www.cbfish.org/Project.mvc/Display/1983-350-03">http://www.cbfish.org/Project.mvc/Display/1983-350-03</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 1                    | BPA           | 1984-021-00      | John Day Habitat Enhancement                        | 3/1/1984          | <a href="http://www.cbfish.org/Project.mvc/Display/1984-021-00">http://www.cbfish.org/Project.mvc/Display/1984-021-00</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 1                    | BPA           | 1984-025-00      | Ne Oregon Habitat Projects                          | 3/1/1984          | <a href="http://www.cbfish.org/Project.mvc/Display/1984-025-00">http://www.cbfish.org/Project.mvc/Display/1984-025-00</a> |

**Table 1. BPA Project List**

| <b>H-Section</b> | <b>BiOp Strategy</b>   | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>                                  | <b>Start Date</b> | <b>Action Information Link</b>  |
|------------------|------------------------|--------------|----------------------|---------------|------------------|---|-------------------|---|
| RM&E             | Tributary Habitat RM&E | 56           | 1                    | BPA           | 2002-061-00      | Integrated Status / Effect Program                    |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2002-061-00">http://www.cbfish.org/Project.mvc/Display/2002-061-00</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 1                    | BPA           | 2002-072-00      | Protect & Restoration Red River WS                    |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2002-072-00">http://www.cbfish.org/Project.mvc/Display/2002-072-00</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 1                    | BPA           | 1996-020-00      | Pit Tagging Spring/Summer Chin                        | 3/1/1996          | <a href="http://www.cbfish.org/Project.mvc/Display/1996-020-00">http://www.cbfish.org/Project.mvc/Display/1996-020-00</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 1                    | BPA           | 2003-022-00      | Grande Ronde Supplementation M&E                      |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2003-022-00">http://www.cbfish.org/Project.mvc/Display/2003-022-00</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 1                    | BPA           | 2003-039-00      | Monitoring Reproductive In Wenatchee / Tucannon / Kal |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2003-039-00">http://www.cbfish.org/Project.mvc/Display/2003-039-00</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 1                    | BPA           | 2003-060-00      | Rock Creek Fish And Habitat Assessment                |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2003-060-00">http://www.cbfish.org/Project.mvc/Display/2003-060-00</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 1                    | BPA           | 2005-001-00      | Rock Creek Fish And Habitat Assessment                |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2005-001-00">http://www.cbfish.org/Project.mvc/Display/2005-001-00</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 1                    | BPA           | 2007-086-00      | Mitigation Of Marine - Derived Nutrients              |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-086-00">http://www.cbfish.org/Project.mvc/Display/2007-086-00</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 1                    | BPA           | 2007-127-00      | E Fork Of S Fork Salmon Passage R                     |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-127-00">http://www.cbfish.org/Project.mvc/Display/2007-127-00</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 1                    | BPA           | 2008-745-00      | Additional IMW Studies                                | 10/1/2008         | <a href="http://www.cbfish.org/Project.mvc/Display/2008-745-00">http://www.cbfish.org/Project.mvc/Display/2008-745-00</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 1                    | BPA           | 2007-233-00      | ID Spring Chinook Captive Propagation                 |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-233-00">http://www.cbfish.org/Project.mvc/Display/2007-233-00</a> |

**Table 1. BPA Project List**

| <b>H-Section</b> | <b>BiOp Strategy</b>   | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>                                | <b>Start Date</b> | <b>Action Information Link</b>  |
|------------------|------------------------|--------------|----------------------|---------------|------------------|---|-------------------|---|
| RM&E             | Tributary Habitat RM&E | 56           | 1                    | BPA           | 2007-332-00      | Mitigation Of Marine - Derived Nutrients            |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-332-00">http://www.cbfish.org/Project.mvc/Display/2007-332-00</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 1.2                  | BPA           | 2007-325-00      | UPA Wenatchee Complexity                            |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-325-00">http://www.cbfish.org/Project.mvc/Display/2007-325-00</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 2                    | BPA           | 1999-016-00      | Pine Creek / Wagner Management                      |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1999-016-00">http://www.cbfish.org/Project.mvc/Display/1999-016-00</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 2                    | BPA           | 2000-001-00      | Enhance North Fork John Day River                   |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2000-001-00">http://www.cbfish.org/Project.mvc/Display/2000-001-00</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 2                    | BPA           | 1998-022-00      | Pine Creek/Wagner Management                        | 2/1/1998          | <a href="http://www.cbfish.org/Project.mvc/Display/1998-022-00">http://www.cbfish.org/Project.mvc/Display/1998-022-00</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 2                    | BPA           | 2008-745-01      | Additional IMW Studies                              |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2008-745-01">http://www.cbfish.org/Project.mvc/Display/2008-745-01</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 3                    | BPA           | 1986-050-00      | Umatilla Anadromous Fish Habitat - CTUIR            |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1986-050-00">http://www.cbfish.org/Project.mvc/Display/1986-050-00</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 3                    | BPA           | 2002-032-00      | Snake River Fall Chinook Life History Investigation |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2002-032-00">http://www.cbfish.org/Project.mvc/Display/2002-032-00</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 3                    | BPA           | 2008-747-00      | Juven Productivity Monitoring                       | 10/1/2008         | <a href="http://www.cbfish.org/Project.mvc/Display/2008-747-00">http://www.cbfish.org/Project.mvc/Display/2008-747-00</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 3                    | BPA           | 2008-745-02      | Additional IMW Studies                              |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2008-745-02">http://www.cbfish.org/Project.mvc/Display/2008-745-02</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 1, 2                 | BPA           | 2002-074-00      | Integrated Status / Effect Program                  |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2002-074-00">http://www.cbfish.org/Project.mvc/Display/2002-074-00</a> |

**Table 1. BPA Project List**

| <b>H-Section</b> | <b>BiOp Strategy</b>   | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>                    | <b>Start Date</b> | <b>Action Information Link</b>  |
|------------------|------------------------|--------------|----------------------|---------------|------------------|---|-------------------|---|
| RM&E             | Tributary Habitat RM&E | 56           | 1, 2                 | BPA           | 2000-031-00      | Enhance North Fork John Day Ri          | 4/1/2000          | <a href="http://www.cbfish.org/Project.mvc/Display/2000-031-00">http://www.cbfish.org/Project.mvc/Display/2000-031-00</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 1, 2                 | BPA           | 2003-017-00      | Integrated Status/Effect Progr          | 7/1/2003          | <a href="http://www.cbfish.org/Project.mvc/Display/2003-017-00">http://www.cbfish.org/Project.mvc/Display/2003-017-00</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 1,2                  | BPA           | 2002-059-00      | Integrated Status / Effect Program      |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2002-059-00">http://www.cbfish.org/Project.mvc/Display/2002-059-00</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 1,2                  | BPA           | 2003-006-00      | Integrated Status / Effect Program      |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2003-006-00">http://www.cbfish.org/Project.mvc/Display/2003-006-00</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 1,2                  | BPA           | 2003-007-00      | Integrated Status / Effect Program      |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2003-007-00">http://www.cbfish.org/Project.mvc/Display/2003-007-00</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 1,2                  | BPA           | 2003-010-00      | Integrated Status / Effect Program      |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2003-010-00">http://www.cbfish.org/Project.mvc/Display/2003-010-00</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 1,2                  | BPA           | 2007-083-00      | Grande Ronde Supplementation M&E        |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-083-00">http://www.cbfish.org/Project.mvc/Display/2007-083-00</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 1,2                  | BPA           | 2007-156-00      | Snake River Sockeye Captive Propagation |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-156-00">http://www.cbfish.org/Project.mvc/Display/2007-156-00</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 1,2                  | BPA           | 2007-397-00      | John Day Tributary / Passage & Flow     |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-397-00">http://www.cbfish.org/Project.mvc/Display/2007-397-00</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 1,2                  | BPA           | 2008-471-00      | Upper Columbia Nutrient Supplementation |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2008-471-00">http://www.cbfish.org/Project.mvc/Display/2008-471-00</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 1,2                  | BPA           | 2009-003-00      | Upper Columbia Habitat Restoration      |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2009-003-00">http://www.cbfish.org/Project.mvc/Display/2009-003-00</a> |

**Table 1. BPA Project List**

| <b>H-Section</b> | <b>BiOp Strategy</b>   | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>                     | <b>Start Date</b> | <b>Action Information Link</b>  |
|------------------|------------------------|--------------|----------------------|---------------|------------------|--|-------------------|---|
| RM&E             | Tributary Habitat RM&E | 56           | 1,3                  | BPA           | 1987-100-01      | Umatilla Anadromous Fish Habitat - CTUIR |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1987-100-01">http://www.cbfish.org/Project.mvc/Display/1987-100-01</a> |
| RM&E             | Tributary Habitat RM&E | 56           | 1,3                  | BPA           | 2002-070-00      | Lapwai Creek Anadromous Habitat          |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2002-070-00">http://www.cbfish.org/Project.mvc/Display/2002-070-00</a> |
| RM&E             | Tributary Habitat RM&E | 57           | 1                    | BPA           | 2002-061-00      | Integrated Status / Effect Program       |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2002-061-00">http://www.cbfish.org/Project.mvc/Display/2002-061-00</a> |
| RM&E             | Tributary Habitat RM&E | 57           | 2                    | BPA           | 1989-098-00      | Hood River Production M&E - Warm Springs |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1989-098-00">http://www.cbfish.org/Project.mvc/Display/1989-098-00</a> |
| RM&E             | Tributary Habitat RM&E | 57           | 2                    | BPA           | 1990-044-00      | Salmon Studies ID Rivers IDFC            |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1990-044-00">http://www.cbfish.org/Project.mvc/Display/1990-044-00</a> |
| RM&E             | Tributary Habitat RM&E | 57           | 2                    | BPA           | 1991-019-01      | Salmon Studies ID Rivers IDFC            |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1991-019-01">http://www.cbfish.org/Project.mvc/Display/1991-019-01</a> |
| RM&E             | Tributary Habitat RM&E | 57           | 4                    | BPA           | 1994-042-00      | Trout Creek O&M                          |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1994-042-00">http://www.cbfish.org/Project.mvc/Display/1994-042-00</a> |
| RM&E             | Tributary Habitat RM&E | 57           | 4                    | BPA           | 1996-040-00      | Trout Creek O&M                          |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1996-040-00">http://www.cbfish.org/Project.mvc/Display/1996-040-00</a> |
| RM&E             | Tributary Habitat RM&E | 57           | 4                    | BPA           | 2007-083-00      | Grande Ronde Supplementation M&E         |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-083-00">http://www.cbfish.org/Project.mvc/Display/2007-083-00</a> |
| RM&E             | Tributary Habitat RM&E | 57           | 4                    | BPA           | 2007-156-00      | Snake River Sockeye Captive Propagation  |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-156-00">http://www.cbfish.org/Project.mvc/Display/2007-156-00</a> |
| RM&E             | Tributary Habitat RM&E | 57           | 4                    | BPA           | 2007-325-00      | Upa Wenatchee Complexity                 | 9/27/2007         | <a href="http://www.cbfish.org/Project.mvc/Display/2007-325-00">http://www.cbfish.org/Project.mvc/Display/2007-325-00</a> |

**Table 1. BPA Project List**

| H-Section | BiOp Strategy          | RPA # | RPA Subaction | Agency | Project #       | Project Title                      | Start Date | Action Information Link   |
|-----------|------------------------|-------|---------------|--------|-----------------|------------------------------------|------------|---|
| RM&E      | Tributary Habitat RM&E | 57    | 4             | BPA    | 2007-397-00     | John Day Trib/Pass & Flow          | 2/1/2007   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-397-00">http://www.cbfish.org/Project.mvc/Display/2007-397-00</a> |
| RM&E      | Tributary Habitat RM&E | 57    | 4             | BPA    | 2009-003-00     | Upper Columbia Habitat Restoration |            | <a href="http://www.cbfish.org/Project.mvc/Display/2009-003-00">http://www.cbfish.org/Project.mvc/Display/2009-003-00</a> |
| RM&E      | Tributary Habitat RM&E | 57    | 5             | BPA    | None Identified |                                    |            | -   |
| RM&E      | Tributary Habitat RM&E | 57    | 1234          | BPA    | 2008-745-00     | Additional IMW Studies             | 10/1/2008  | <a href="http://www.cbfish.org/Project.mvc/Display/2008-745-00">http://www.cbfish.org/Project.mvc/Display/2008-745-00</a> |
| RM&E      | Tributary Habitat RM&E | 57    | 1234          | BPA    | 2008-746-00     | Nutrient Supplementation Studies   | 10/1/2008  | <a href="http://www.cbfish.org/Project.mvc/Display/2008-746-00">http://www.cbfish.org/Project.mvc/Display/2008-746-00</a> |
| RM&E      | Tributary Habitat RM&E | 57    | 1234          | BPA    | 2008-745-03     | Additional IMW Studies             |            | <a href="http://www.cbfish.org/Project.mvc/Display/2008-745-03">http://www.cbfish.org/Project.mvc/Display/2008-745-03</a> |
| RM&E      | Tributary Habitat RM&E | 57    | 1, 2,3,4      | BPA    | 2003-017-00     | Integrated Status/Effect Progr     | 7/1/2003   | <a href="http://www.cbfish.org/Project.mvc/Display/2003-017-00">http://www.cbfish.org/Project.mvc/Display/2003-017-00</a> |
| RM&E      | Tributary Habitat RM&E | 57    | 2,4           | BPA    | 2002-059-00     | Integrated Status / Effect Program |            | <a href="http://www.cbfish.org/Project.mvc/Display/2002-059-00">http://www.cbfish.org/Project.mvc/Display/2002-059-00</a> |
| RM&E      | Tributary Habitat RM&E | 57    | 2,3           | BPA    | 2003-010-00     | Integrated Status / Effect Program |            | <a href="http://www.cbfish.org/Project.mvc/Display/2003-010-00">http://www.cbfish.org/Project.mvc/Display/2003-010-00</a> |
| RM&E      | Tributary Habitat RM&E | 57    | 3,4           | BPA    | 2002-074-00     | Integrated Status / Effect Program |            | <a href="http://www.cbfish.org/Project.mvc/Display/2002-074-00">http://www.cbfish.org/Project.mvc/Display/2002-074-00</a> |
| RM&E      | Tributary Habitat RM&E | 57    | 3,4           | BPA    | 2003-006-00     | Integrated Status / Effect Program |            | <a href="http://www.cbfish.org/Project.mvc/Display/2003-006-00">http://www.cbfish.org/Project.mvc/Display/2003-006-00</a> |
| RM&E      | Tributary Habitat RM&E | 57    | 3,4           | BPA    | 2003-007-00     | Integrated Status / Effect Program |            | <a href="http://www.cbfish.org/Project.mvc/Display/2003-007-00">http://www.cbfish.org/Project.mvc/Display/2003-007-00</a> |

**Table 1. BPA Project List**

| <b>H-Section</b> | <b>BiOp Strategy</b> | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>                                 | <b>Start Date</b> | <b>Action Information Link</b>  |
|------------------|----------------------|--------------|----------------------|---------------|------------------|--|-------------------|---|
| RM&E             | Estuary Habitat RM&E | 58           | 3                    | BPA           | 2003-011-00      | Columbia River / Estuary Habitat                     |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2003-011-00">http://www.cbfish.org/Project.mvc/Display/2003-011-00</a> |
| RM&E             | Estuary Habitat RM&E | 58           | 3                    | BPA           | 2003-007-00      | Lower Columbia River/Estuary Ecosystem Monitoring    | 9/1/2003          | <a href="http://www.cbfish.org/Project.mvc/Display/2003-007-00">http://www.cbfish.org/Project.mvc/Display/2003-007-00</a> |
| RM&E             | Estuary Habitat RM&E | 58           | 3                    | BPA           | 2008-743-00      | Early-Ocean Productivity Asmnt                       | 10/1/2008         | <a href="http://www.cbfish.org/Project.mvc/Display/2008-743-00">http://www.cbfish.org/Project.mvc/Display/2008-743-00</a> |
| RM&E             | Estuary Habitat RM&E | 58           | 2, 3, 4              | BPA           | 2003-010-00      | Historic Habitat Opportunities and Food-Web Linkages | 5/1/2003          | <a href="http://www.cbfish.org/Project.mvc/Display/2003-010-00">http://www.cbfish.org/Project.mvc/Display/2003-010-00</a> |
| RM&E             | Estuary Habitat RM&E | 58           | 2,3                  | BPA           | 2005-001-00      | Rock Creek Fish And Habitat Assessment               |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2005-001-00">http://www.cbfish.org/Project.mvc/Display/2005-001-00</a> |
| RM&E             | Estuary Habitat RM&E | 58           | 3, 4                 | BPA           | 1998-014-00      | Ocean Survival of Salmonids                          | 9/1/1998          | <a href="http://www.cbfish.org/Project.mvc/Display/1998-014-00">http://www.cbfish.org/Project.mvc/Display/1998-014-00</a> |
| RM&E             | Estuary Habitat RM&E | 59           | 1                    | BPA           | 2007-513-00      | Eelgrass Enhancement And Restoration                 |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-513-00">http://www.cbfish.org/Project.mvc/Display/2007-513-00</a> |
| RM&E             | Estuary Habitat RM&E | 59           | 1, 2, 5              | BPA           | 2003-007-00      | Lower Columbia River/Estuary Ecosystem Monitoring    | 9/1/2003          | <a href="http://www.cbfish.org/Project.mvc/Display/2003-007-00">http://www.cbfish.org/Project.mvc/Display/2003-007-00</a> |
| RM&E             | Estuary Habitat RM&E | 59           | 1, 4, 5              | BPA           | 2005-001-00      | Estuary RME Tidal Freshwater                         | 2/20/2005         | <a href="http://www.cbfish.org/Project.mvc/Display/2005-001-00">http://www.cbfish.org/Project.mvc/Display/2005-001-00</a> |
| RM&E             | Estuary Habitat RM&E | 59           | 1,5                  | BPA           | 2003-011-00      | Columbia River / Estuary Habitat                     |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2003-011-00">http://www.cbfish.org/Project.mvc/Display/2003-011-00</a> |
| RM&E             | Estuary Habitat RM&E | 59           | 4,5                  | BPA           | 2003-010-00      | Historic Habitat Opportunities and Food-Web Linkages | 5/1/2003          | <a href="http://www.cbfish.org/Project.mvc/Display/2003-010-00">http://www.cbfish.org/Project.mvc/Display/2003-010-00</a> |

**Table 1. BPA Project List**

| <b>H-Section</b> | <b>BiOp Strategy</b> | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>                              | <b>Start Date</b> | <b>Action Information Link</b>  |
|------------------|----------------------|--------------|----------------------|---------------|------------------|---|-------------------|---|
| RM&E             | Estuary Habitat RM&E | 60           | 1                    | BPA           | 2005-001-00      | Rock Creek Fish And Habitat Assessment            |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2005-001-00">http://www.cbfish.org/Project.mvc/Display/2005-001-00</a> |
| RM&E             | Estuary Habitat RM&E | 60           | 2                    | BPA           | 2005-001-00      | Estuary RME Tidal Freshwater                      | 2/20/2005         | <a href="http://www.cbfish.org/Project.mvc/Display/2005-001-00">http://www.cbfish.org/Project.mvc/Display/2005-001-00</a> |
| RM&E             | Estuary Habitat RM&E | 60           | 2                    | BPA           | 2007-513-00      | Eelgrass Enhancement And Resto                    | 2/1/2008          | <a href="http://www.cbfish.org/Project.mvc/Display/2007-513-00">http://www.cbfish.org/Project.mvc/Display/2007-513-00</a> |
| RM&E             | Estuary Habitat RM&E | 60           | 1, 2                 | BPA           | 2003-007-00      | Lower Columbia River/Estuary Ecosystem Monitoring | 9/1/2003          | <a href="http://www.cbfish.org/Project.mvc/Display/2003-007-00">http://www.cbfish.org/Project.mvc/Display/2003-007-00</a> |
| RM&E             | Estuary Habitat RM&E | 60           | 1, 2, 3              | BPA           | 2003-011-00      | Lower Columbia River/Estuary Habitat Restoration  | 5/21/2003         | <a href="http://www.cbfish.org/Project.mvc/Display/2003-011-00">http://www.cbfish.org/Project.mvc/Display/2003-011-00</a> |
| RM&E             | Estuary Habitat RM&E | 61           | 1                    | BPA           | 2005-001-00      | Rock Creek Fish And Habitat Assessment            |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2005-001-00">http://www.cbfish.org/Project.mvc/Display/2005-001-00</a> |
| RM&E             | Estuary Habitat RM&E | 61           | 1                    | BPA           | 2007-275-00      | Impact Of American Shad                           |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-275-00">http://www.cbfish.org/Project.mvc/Display/2007-275-00</a> |
| RM&E             | Estuary Habitat RM&E | 61           | 2                    | BPA           | 2003-114-00      | Pacific Ocean Shelf Tracking (POST)               | 12/1/2003         | <a href="http://www.cbfish.org/Project.mvc/Display/2003-114-00">http://www.cbfish.org/Project.mvc/Display/2003-114-00</a> |
| RM&E             | Estuary Habitat RM&E | 61           | 3                    | BPA           | 2003-011-00      | Columbia River / Estuary Habitat                  |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2003-011-00">http://www.cbfish.org/Project.mvc/Display/2003-011-00</a> |
| RM&E             | Estuary Habitat RM&E | 61           | 3                    | BPA           | 2005-001-00      | Estuary RME Tidal Freshwater                      | 2/20/2005         | <a href="http://www.cbfish.org/Project.mvc/Display/2005-001-00">http://www.cbfish.org/Project.mvc/Display/2005-001-00</a> |
| RM&E             | Estuary Habitat RM&E | 61           | 1, 2                 | BPA           | 2003-009-00      | Canada-USA Shelf Sal Survival Study               | 10/1/2003         | <a href="http://www.cbfish.org/Project.mvc/Display/2003-009-00">http://www.cbfish.org/Project.mvc/Display/2003-009-00</a> |

**Table 1. BPA Project List**

| <b>H-Section</b> | <b>BiOp Strategy</b> | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>                                 | <b>Start Date</b> | <b>Action Information Link</b>  |
|------------------|----------------------|--------------|----------------------|---------------|------------------|--|-------------------|---|
| RM&E             | Estuary Habitat RM&E | 61           | 1, 2, 4              | BPA           | 1998-014-00      | Ocean Survival Of Salmonids                          | 9/1/1998          | <a href="http://www.cbfish.org/Project.mvc/Display/1998-014-00">http://www.cbfish.org/Project.mvc/Display/1998-014-00</a> |
| RM&E             | Estuary Habitat RM&E | 61           | 1, 3, 4              | BPA           | 2003-010-00      | Historic Habitat Opportunities and Food-Web Linkages | 5/1/2003          | <a href="http://www.cbfish.org/Project.mvc/Display/2003-010-00">http://www.cbfish.org/Project.mvc/Display/2003-010-00</a> |
| RM&E             | Estuary Habitat RM&E | 61           | 1,3                  | BPA           | 2003-007-00      | Lower Columbia River/Estuary Ecosystem Monitoring    | 9/1/2003          | <a href="http://www.cbfish.org/Project.mvc/Display/2003-007-00">http://www.cbfish.org/Project.mvc/Display/2003-007-00</a> |
| RM&E             | Harvest RM&E         | 62           | 1                    | BPA           | 1997-015-01      | Imnaha River Smolt Monitoring NPT                    |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1997-015-01">http://www.cbfish.org/Project.mvc/Display/1997-015-01</a> |
| RM&E             | Harvest RM&E         | 62           | 1                    | BPA           | 2008-502-00      | Expanded Tribal Catch Sampling                       |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2008-502-00">http://www.cbfish.org/Project.mvc/Display/2008-502-00</a> |
| RM&E             | Harvest RM&E         | 62           | 1                    | BPA           | 2008-508-00      | Power Analysis Catch Sampling Rates                  |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2008-508-00">http://www.cbfish.org/Project.mvc/Display/2008-508-00</a> |
| RM&E             | Harvest RM&E         | 62           | 2                    | BPA           | 2007-083-00      | Grande Ronde Supplementation M&E                     |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-083-00">http://www.cbfish.org/Project.mvc/Display/2007-083-00</a> |
| RM&E             | Harvest RM&E         | 62           | 2                    | BPA           | 1993-060-00      | Select Area Fishery Evaluation                       | 11/1/1993         | <a href="http://www.cbfish.org/Project.mvc/Display/1993-060-00">http://www.cbfish.org/Project.mvc/Display/1993-060-00</a> |
| RM&E             | Harvest RM&E         | 62           | 4                    | BPA           | 1990-005-00      | Umatilla Hatchery - M&E                              |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1990-005-00">http://www.cbfish.org/Project.mvc/Display/1990-005-00</a> |
| RM&E             | Harvest RM&E         | 62           | 4                    | BPA           | 1982-013-01      | Coded Wire Tag - Psmfc                               | 1/1/1982          | <a href="http://www.cbfish.org/Project.mvc/Display/1982-013-01">http://www.cbfish.org/Project.mvc/Display/1982-013-01</a> |
| RM&E             | Harvest RM&E         | 62           | 4                    | BPA           | 1982-013-02      | Coded Wire Tag - ODFW                                | 1/1/1982          | <a href="http://www.cbfish.org/Project.mvc/Display/1982-013-02">http://www.cbfish.org/Project.mvc/Display/1982-013-02</a> |

**Table 1. BPA Project List**

| <b>H-Section</b> | <b>BiOp Strategy</b> | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>                            | <b>Start Date</b> | <b>Action Information Link</b>  |
|------------------|----------------------|--------------|----------------------|---------------|------------------|---|-------------------|---|
| RM&E             | Harvest RM&E         | 62           | 4                    | BPA           | 1982-013-03      | Coded Wire Tag - USFWS                          | 1/1/1982          | <a href="http://www.cbfish.org/Project.mvc/Display/1982-013-03">http://www.cbfish.org/Project.mvc/Display/1982-013-03</a> |
| RM&E             | Harvest RM&E         | 62           | 4                    | BPA           | 1982-013-04      | Coded Wire Tag - WDFW                           | 1/1/1982          | <a href="http://www.cbfish.org/Project.mvc/Display/1982-013-04">http://www.cbfish.org/Project.mvc/Display/1982-013-04</a> |
| RM&E             | Harvest RM&E         | 62           | 4                    | BPA           | 2008-740-00      | Addtl Marking Hatchery Fish                     | 10/1/2008         | <a href="http://www.cbfish.org/Project.mvc/Display/2008-740-00">http://www.cbfish.org/Project.mvc/Display/2008-740-00</a> |
| RM&E             | Harvest RM&E         | 62           | 5                    | BPA           | 1997-038-00      | Listed Stock Chinook Salmon Gamete              |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1997-038-00">http://www.cbfish.org/Project.mvc/Display/1997-038-00</a> |
| RM&E             | Harvest RM&E         | 62           | 5                    | BPA           | 2003-050-00      | Evaluation Of Reproductive Success Of Steelhead |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2003-050-00">http://www.cbfish.org/Project.mvc/Display/2003-050-00</a> |
| RM&E             | Harvest RM&E         | 62           | 5                    | BPA           | 2003-063-00      | Reproductive Success Abernathy Creek            |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2003-063-00">http://www.cbfish.org/Project.mvc/Display/2003-063-00</a> |
| RM&E             | Harvest RM&E         | 62           | 5                    | BPA           | 2008-311-00      | Natural Production Management & Monitoring      |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2008-311-00">http://www.cbfish.org/Project.mvc/Display/2008-311-00</a> |
| RM&E             | Harvest RM&E         | 62           | 5                    | BPA           | 2008-907-00      | Genetic Assessment of Columbia River Stocks     |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2008-907-00">http://www.cbfish.org/Project.mvc/Display/2008-907-00</a> |
| RM&E             | Harvest RM&E         | 62           | 5                    | BPA           | 1983-350-00      | Nez Perce Tribal Hatchery O&M                   | 1/1/1983          | <a href="http://www.cbfish.org/Project.mvc/Display/1983-350-00">http://www.cbfish.org/Project.mvc/Display/1983-350-00</a> |
| RM&E             | Harvest RM&E         | 62           | 5                    | BPA           | 1988-053-04      | Hood River Production M&E-ODFW                  | 10/1/1988         | <a href="http://www.cbfish.org/Project.mvc/Display/1988-053-04">http://www.cbfish.org/Project.mvc/Display/1988-053-04</a> |
| RM&E             | Harvest RM&E         | 62           | 5                    | BPA           | 1988-053-08      | Hood R Powerdale/Oak Springs                    | 10/1/1988         | <a href="http://www.cbfish.org/Project.mvc/Display/1988-053-08">http://www.cbfish.org/Project.mvc/Display/1988-053-08</a> |

**Table 1. BPA Project List**

| <b>H-Section</b> | <b>BiOp Strategy</b> | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>                     | <b>Start Date</b> | <b>Action Information Link</b>  |
|------------------|----------------------|--------------|----------------------|---------------|------------------|--|-------------------|---|
| RM&E             | Harvest RM&E         | 62           | 5                    | BPA           | 1989-096-00      | Genetic M&E Prog For Sal/Steel           | 11/1/1989         | <a href="http://www.cbfish.org/Project.mvc/Display/1989-096-00">http://www.cbfish.org/Project.mvc/Display/1989-096-00</a> |
| RM&E             | Harvest RM&E         | 62           | 5                    | BPA           | 2002-030-00      | Salmonid Progeny Markers                 | 5/1/2002          | <a href="http://www.cbfish.org/Project.mvc/Display/2002-030-00">http://www.cbfish.org/Project.mvc/Display/2002-030-00</a> |
| RM&E             | Harvest RM&E         | 62           | 5                    | BPA           | 2003-054-00      | Repro of Steelhead In Hood River         | 10/1/2003         | <a href="http://www.cbfish.org/Project.mvc/Display/2003-054-00">http://www.cbfish.org/Project.mvc/Display/2003-054-00</a> |
| RM&E             | Harvest RM&E         | 62           | 5                    | BPA           | 2003-060-00      | Eval Repro Success Snake Rvr C           | 8/1/2003          | <a href="http://www.cbfish.org/Project.mvc/Display/2003-060-00">http://www.cbfish.org/Project.mvc/Display/2003-060-00</a> |
| RM&E             | Harvest RM&E         | 62           | 5                    | BPA           | 2007-404-00      | Or Spr Chinook Captive Prop              | 1/1/2007          | <a href="http://www.cbfish.org/Project.mvc/Display/2007-404-00">http://www.cbfish.org/Project.mvc/Display/2007-404-00</a> |
| RM&E             | Harvest RM&E         | 62           | 1, 4, 5              | BPA           | 1983-350-03      | Nez Perce Tribal Hatchery M&E            | 1/1/1983          | <a href="http://www.cbfish.org/Project.mvc/Display/1983-350-03">http://www.cbfish.org/Project.mvc/Display/1983-350-03</a> |
| RM&E             | Harvest RM&E         | 62           | 1, 5                 | BPA           | 1989-098-00      | Salmon Studies Id Rvrs Idfc              | 1/1/1989          | <a href="http://www.cbfish.org/Project.mvc/Display/1989-098-00">http://www.cbfish.org/Project.mvc/Display/1989-098-00</a> |
| RM&E             | Harvest RM&E         | 62           | 1,4                  | BPA           | 1988-053-03      | Hood River Production M&E - Warm Springs |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1988-053-03">http://www.cbfish.org/Project.mvc/Display/1988-053-03</a> |
| RM&E             | Harvest RM&E         | 62           | 1,5                  | BPA           | 1996-043-00      | Johnson Creek Artificial Propagation     |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1996-043-00">http://www.cbfish.org/Project.mvc/Display/1996-043-00</a> |
| RM&E             | Harvest RM&E         | 62           | 2, 3                 | BPA           | 2007-249-00      | Eval Of Live Capture Gear                | 9/1/2007          | <a href="http://www.cbfish.org/Project.mvc/Display/2007-249-00">http://www.cbfish.org/Project.mvc/Display/2007-249-00</a> |
| RM&E             | Harvest RM&E         | 62           | 4, 5                 | BPA           | 1995-063-25      | Ykfp - Monitoring And Evaluation         | 5/1/1995          | <a href="http://www.cbfish.org/Project.mvc/Display/1995-063-25">http://www.cbfish.org/Project.mvc/Display/1995-063-25</a> |

**Table 1. BPA Project List**

| H-Section | BiOp Strategy | RPA # | RPA Subaction | Agency | Project #   | Project Title  | Start Date | Action Information Link   |
|-----------|---------------|-------|---------------|--------|-------------|--|------------|---|
| RM&E      | Harvest RM&E  | 62    | 4,5           | BPA    | 1988-053-07 | Hood River Production O&M - WS / ODFW  |            | <a href="http://www.cbfish.org/Project.mvc/Display/1988-053-07">http://www.cbfish.org/Project.mvc/Display/1988-053-07</a> |
| RM&E      | Hatchery RM&E | 63    | 1             | BPA    | 1992-026-04 | Life Studies Of Spring Chinook   |            | <a href="http://www.cbfish.org/Project.mvc/Display/1992-026-04">http://www.cbfish.org/Project.mvc/Display/1992-026-04</a> |
| RM&E      | Hatchery RM&E | 63    | 1             | BPA    | 1996-043-00 | Johnson Creek Artificial Propagation   |            | <a href="http://www.cbfish.org/Project.mvc/Display/1996-043-00">http://www.cbfish.org/Project.mvc/Display/1996-043-00</a> |
| RM&E      | Hatchery RM&E | 63    | 1             | BPA    | 1997-038-00 | Listed Stock Chinook Salmon Gamete   |            | <a href="http://www.cbfish.org/Project.mvc/Display/1997-038-00">http://www.cbfish.org/Project.mvc/Display/1997-038-00</a> |
| RM&E      | Hatchery RM&E | 63    | 1             | BPA    | 2001-053-00 | Reintroduction Of Chum In Duncan Creek   |            | <a href="http://www.cbfish.org/Project.mvc/Display/2001-053-00">http://www.cbfish.org/Project.mvc/Display/2001-053-00</a> |
| RM&E      | Hatchery RM&E | 63    | 1             | BPA    | 2007-083-00 | Grande Ronde Supplementation M&E   |            | <a href="http://www.cbfish.org/Project.mvc/Display/2007-083-00">http://www.cbfish.org/Project.mvc/Display/2007-083-00</a> |
| RM&E      | Hatchery RM&E | 63    | 1             | BPA    | 2009-009-00 | Basinwide Supplementation Evaluation   |            | <a href="http://www.cbfish.org/Project.mvc/Display/2009-009-00">http://www.cbfish.org/Project.mvc/Display/2009-009-00</a> |
| RM&E      | Hatchery RM&E | 63    | 1             | BPA    | 1989-096-00 | Genetic Monitoring of Snake River Chinook Salmon and Steelhead (BPA 1989-096-00) | 11/1/1989  | <a href="http://www.cbfish.org/Project.mvc/Display/1989-096-00">http://www.cbfish.org/Project.mvc/Display/1989-096-00</a> |
| RM&E      | Hatchery RM&E | 63    | 1             | BPA    | 1998-007-02 | Grande Ronde Supplementation Lostine River O&M/M&E (BPA 1998-007-02)             | 1/1/1998   | <a href="http://www.cbfish.org/Project.mvc/Display/1998-007-02">http://www.cbfish.org/Project.mvc/Display/1998-007-02</a> |
| RM&E      | Hatchery RM&E | 63    | 1             | BPA    | 1998-007-03 | Grande Ronde Supplementation O&M/M&E (BPA 1998-007-03)                           | 1/1/1998   | <a href="http://www.cbfish.org/Project.mvc/Display/1998-007-03">http://www.cbfish.org/Project.mvc/Display/1998-007-03</a> |

**Table 1. BPA Project List**

| <b>H-Section</b> | <b>BiOp Strategy</b> | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>                                      | <b>Start Date</b> | <b>Action Information Link</b>  |
|------------------|----------------------|--------------|----------------------|---------------|------------------|---|-------------------|---|
| RM&E             | Hatchery RM&E        | 63           | 1                    | BPA           | 1998-007-04      | Grande Ronde Sp Chinook-ODFW                              | 1/1/1998          | <a href="http://www.cbfish.org/Project.mvc/Display/1998-007-04">http://www.cbfish.org/Project.mvc/Display/1998-007-04</a> |
| RM&E             | Hatchery RM&E        | 63           | 1                    | BPA           | 2007-402-00      | Snake River Sockeye Captive Propagation (BPA 2007-402-00) | 7/1/2007          | <a href="http://www.cbfish.org/Project.mvc/Display/2007-402-00">http://www.cbfish.org/Project.mvc/Display/2007-402-00</a> |
| RM&E             | Hatchery RM&E        | 63           | 1, 2                 | BPA           | 1989-098-00      | Salmon Studies Id Rvrs Idfc                               | 1/1/1989          | <a href="http://www.cbfish.org/Project.mvc/Display/1989-098-00">http://www.cbfish.org/Project.mvc/Display/1989-098-00</a> |
| RM&E             | Hatchery RM&E        | 64           | 1                    | BPA           | 1988-053-08      | Hood R Powerdale/Oak Springs                              | 10/1/1988         | <a href="http://www.cbfish.org/Project.mvc/Display/1988-053-08">http://www.cbfish.org/Project.mvc/Display/1988-053-08</a> |
| RM&E             | Hatchery RM&E        | 64           | 1                    | BPA           | 2003-054-00      | Repro Of Steelhead In Hood River                          | 10/1/2003         | <a href="http://www.cbfish.org/Project.mvc/Display/2003-054-00">http://www.cbfish.org/Project.mvc/Display/2003-054-00</a> |
| RM&E             | Hatchery RM&E        | 64           | 2                    | BPA           | 1983-350-00      | Nez Perce Tribal Hatchery M&E                             |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1983-350-00">http://www.cbfish.org/Project.mvc/Display/1983-350-00</a> |
| RM&E             | Hatchery RM&E        | 64           | 2                    | BPA           | 1983-435-00      | Umatilla Hatchery O&M - CTUIR                             |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1983-435-00">http://www.cbfish.org/Project.mvc/Display/1983-435-00</a> |
| RM&E             | Hatchery RM&E        | 64           | 2                    | BPA           | 1988-053-01      | NE OR Hatchery Master Plan                                |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1988-053-01">http://www.cbfish.org/Project.mvc/Display/1988-053-01</a> |
| RM&E             | Hatchery RM&E        | 64           | 2                    | BPA           | 1992-026-04      | Life Studies Of Spring Chinook                            |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1992-026-04">http://www.cbfish.org/Project.mvc/Display/1992-026-04</a> |
| RM&E             | Hatchery RM&E        | 64           | 2                    | BPA           | 1996-043-00      | Johnson Creek Artificial Propagation                      |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1996-043-00">http://www.cbfish.org/Project.mvc/Display/1996-043-00</a> |
| RM&E             | Hatchery RM&E        | 64           | 2                    | BPA           | 1997-015-01      | Imnaha River Smolt Monitoring NPT                         |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1997-015-01">http://www.cbfish.org/Project.mvc/Display/1997-015-01</a> |

**Table 1. BPA Project List**

| <b>H-Section</b> | <b>BiOp Strategy</b> | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>   | <b>Start Date</b> | <b>Action Information Link</b>  |
|------------------|----------------------|--------------|----------------------|---------------|------------------|--|-------------------|---|
| RM&E             | Hatchery RM&E        | 64           | 2                    | BPA           | 1997-038-00      | Listed Stock Chinook Salmon Gamete   |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1997-038-00">http://www.cbfish.org/Project.mvc/Display/1997-038-00</a> |
| RM&E             | Hatchery RM&E        | 64           | 2                    | BPA           | 1998-010-03      | Spawning distribution of Snake River fall Chinook                                    |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1998-010-03">http://www.cbfish.org/Project.mvc/Display/1998-010-03</a> |
| RM&E             | Hatchery RM&E        | 64           | 2                    | BPA           | 2000-019-00      | Tucannon River Spring Chinook  |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2000-019-00">http://www.cbfish.org/Project.mvc/Display/2000-019-00</a> |
| RM&E             | Hatchery RM&E        | 64           | 2                    | BPA           | 2002-031-00      | Chinook Growth Rate Modulation   |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2002-031-00">http://www.cbfish.org/Project.mvc/Display/2002-031-00</a> |
| RM&E             | Hatchery RM&E        | 64           | 2                    | BPA           | 2008-311-00      | Natural Production Management & Monitoring   |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2008-311-00">http://www.cbfish.org/Project.mvc/Display/2008-311-00</a> |
| RM&E             | Hatchery RM&E        | 64           | 2                    | BPA           | 2008-458-00      | Steelhead Kelt Reconditioning  |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2008-458-00">http://www.cbfish.org/Project.mvc/Display/2008-458-00</a> |
| RM&E             | Hatchery RM&E        | 64           | 2                    | BPA           | 1983-350-03      | Nez Perce Tribal Hatchery M&E [Snake River fall Chinook component] (BPA 1983-350-03) | 1/1/1983          | <a href="http://www.cbfish.org/Project.mvc/Display/1983-350-03">http://www.cbfish.org/Project.mvc/Display/1983-350-03</a> |
| RM&E             | Hatchery RM&E        | 64           | 2                    | BPA           | 1989-096-00      | Genetic M&E Prog For Sal/Steel   | 11/1/1989         | <a href="http://www.cbfish.org/Project.mvc/Display/1989-096-00">http://www.cbfish.org/Project.mvc/Display/1989-096-00</a> |
| RM&E             | Hatchery RM&E        | 64           | 2                    | BPA           | 1990-005-00      | Umatilla Hatchery M&E [MCR steelhead component] (BPA 1990-005-00)                    | 11/1/1990         | <a href="http://www.cbfish.org/Project.mvc/Display/1990-005-00">http://www.cbfish.org/Project.mvc/Display/1990-005-00</a> |
| RM&E             | Hatchery RM&E        | 64           | 2                    | BPA           | 1995-063-25      | YKFP – Monitoring and Evaluation (BPA 1995-063-25)                                   | 5/1/1995          | <a href="http://www.cbfish.org/Project.mvc/Display/1995-063-25">http://www.cbfish.org/Project.mvc/Display/1995-063-25</a> |

**Table 1. BPA Project List**

| H-Section | BiOp Strategy | RPA # | RPA Subaction | Agency | Project #   | Project Title   | Start Date | Action Information Link   |
|-----------|---------------|-------|---------------|--------|-------------|---|------------|---|
| RM&E      | Hatchery RM&E | 64    | 2             | BPA    | 1998-007-02 | Gd Ronde Supp Lostine O&M/M&E   | 1/1/1998   | <a href="http://www.cbfish.org/Project.mvc/Display/1998-007-02">http://www.cbfish.org/Project.mvc/Display/1998-007-02</a> |
| RM&E      | Hatchery RM&E | 64    | 2             | BPA    | 1998-007-03 | Grande Ronde Supp. O&M/M&E  | 1/1/1998   | <a href="http://www.cbfish.org/Project.mvc/Display/1998-007-03">http://www.cbfish.org/Project.mvc/Display/1998-007-03</a> |
| RM&E      | Hatchery RM&E | 64    | 2             | BPA    | 1998-007-04 | Grande Ronde Sp Chinook-ODFW  | 1/1/1998   | <a href="http://www.cbfish.org/Project.mvc/Display/1998-007-04">http://www.cbfish.org/Project.mvc/Display/1998-007-04</a> |
| RM&E      | Hatchery RM&E | 64    | 2             | BPA    | 1998-010-04 | M&E Snake R. Fall Ch Spawning   | 1/1/1998   | <a href="http://www.cbfish.org/Project.mvc/Display/1998-010-04">http://www.cbfish.org/Project.mvc/Display/1998-010-04</a> |
| RM&E      | Hatchery RM&E | 64    | 2             | BPA    | 2002-030-00 | Develop Progeny Marker for Salmonids to Evaluate Supplementation (BPA 2002-030-00 – a project in the Agreement on 2007 FCRPS Fish Operations)     | 5/1/2002   | <a href="http://www.cbfish.org/Project.mvc/Display/2002-030-00">http://www.cbfish.org/Project.mvc/Display/2002-030-00</a> |
| RM&E      | Hatchery RM&E | 64    | 2             | BPA    | 2003-039-00 | Monitoring the Reproductive Success of Naturally Spawning Hatchery and Natural Spring Chinook Salmon in the Wenatchee Watershed (BPA 2003-039-00) | 4/1/2003   | <a href="http://www.cbfish.org/Project.mvc/Display/2003-039-00">http://www.cbfish.org/Project.mvc/Display/2003-039-00</a> |
| RM&E      | Hatchery RM&E | 64    | 2             | BPA    | 2003-050-00 | Evaluation of Reproduction of Steelhead (BPA 2003-050-00)   | 12/1/2003  | <a href="http://www.cbfish.org/Project.mvc/Display/2003-050-00">http://www.cbfish.org/Project.mvc/Display/2003-050-00</a> |

**Table 1. BPA Project List**

| <b>H-Section</b> | <b>BiOp Strategy</b> | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>   | <b>Start Date</b> | <b>Action Information Link</b>  |
|------------------|----------------------|--------------|----------------------|---------------|------------------|--|-------------------|---|
| RM&E             | Hatchery RM&E        | 64           | 2                    | BPA           | 2003-060-00      | Eval Repro Success Snake Rvr C   | 8/1/2003          | <a href="http://www.cbfish.org/Project.mvc/Display/2003-060-00">http://www.cbfish.org/Project.mvc/Display/2003-060-00</a> |
| RM&E             | Hatchery RM&E        | 64           | 2                    | BPA           | 2003-063-00      | Reproductive Success of Abernathy Creek Steelhead (BPA 2003-063-00)t                         | 1/1/2003          | <a href="http://www.cbfish.org/Project.mvc/Display/2003-063-00">http://www.cbfish.org/Project.mvc/Display/2003-063-00</a> |
| RM&E             | Hatchery RM&E        | 64           | 2                    | BPA           | 2007-401-00      | Evaluate the Relative Reproductive Success of Reconditioned Kelt Steelhead (BPA 2004-401-00) | 4/1/2007          | <a href="http://www.cbfish.org/Project.mvc/Display/2007-401-00">http://www.cbfish.org/Project.mvc/Display/2007-401-00</a> |
| RM&E             | Hatchery RM&E        | 64           | 1, 2                 | BPA           | 1988-053-03      | Hood River Production M&E - Ws   | 10/1/1988         | <a href="http://www.cbfish.org/Project.mvc/Display/1988-053-03">http://www.cbfish.org/Project.mvc/Display/1988-053-03</a> |
| RM&E             | Hatchery RM&E        | 64           | 1, 2                 | BPA           | 1988-053-04      | Hood River Production M&E-ODFW   | 10/1/1988         | <a href="http://www.cbfish.org/Project.mvc/Display/1988-053-04">http://www.cbfish.org/Project.mvc/Display/1988-053-04</a> |
| RM&E             | Hatchery RM&E        | 64           | 1, 2                 | BPA           | 2007-083-00      | Grande Ronde Suppmentation M&E   | 1/1/2007          | <a href="http://www.cbfish.org/Project.mvc/Display/2007-083-00">http://www.cbfish.org/Project.mvc/Display/2007-083-00</a> |
| RM&E             | Hatchery RM&E        | 64           | 1,2                  | BPA           | 1988-053-07      | Hood River Production O&M - WS / ODFW  |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1988-053-07">http://www.cbfish.org/Project.mvc/Display/1988-053-07</a> |
| RM&E             | Hatchery RM&E        | 64           | 2, 3                 | BPA           | 1989-098-00      | Salmon Studies Id Rvrs Idfc  | 1/1/1989          | <a href="http://www.cbfish.org/Project.mvc/Display/1989-098-00">http://www.cbfish.org/Project.mvc/Display/1989-098-00</a> |
| RM&E             | Hatchery RM&E        | 64           | 2, 3                 | BPA           | 2007-402-00      | Snake River Sockeye Cap Prop   | 7/1/2007          | <a href="http://www.cbfish.org/Project.mvc/Display/2007-402-00">http://www.cbfish.org/Project.mvc/Display/2007-402-00</a> |
| RM&E             | Hatchery RM&E        | 64           | 2, 3                 | BPA           | 2007-403-00      | Id Spr Chinook Captive Prop  | 12/1/2007         | <a href="http://www.cbfish.org/Project.mvc/Display/2007-403-00">http://www.cbfish.org/Project.mvc/Display/2007-403-00</a> |

**Table 1. BPA Project List**

| H-Section | BiOp Strategy | RPA # | RPA Subaction | Agency | Project #       | Project Title  | Start Date | Action Information Link   |
|-----------|---------------|-------|---------------|--------|-----------------|--|------------|---|
| RM&E      | Hatchery RM&E | 64    | 2, 3          | BPA    | 2007-404-00     | Or Spr Chinook Captive Prop  | 1/1/2007   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-404-00">http://www.cbfish.org/Project.mvc/Display/2007-404-00</a>         |
| RM&E      | Hatchery RM&E | 64    | All           | BPA    | 2008-721-00     | Investigate Snake River sockeye salmon smolt mortality between the Stanley Basin and Lower Granite Dam (New - BPA 2008-721-00) | 10/1/2008  | <a href="http://www.cbfish.org/Project.mvc/Display/2008-721-00">http://www.cbfish.org/Project.mvc/Display/2008-721-00</a>         |
| RM&E      | Hatchery RM&E | 64    | All           | BPA    | 2008-722-00     | Methow River steelhead relative reproductive success study (New - BPA 2008-722-00)   | 10/1/2008  | <a href="http://www.cbfish.org/Project.mvc/Display/2008-722-00">http://www.cbfish.org/Project.mvc/Display/2008-722-00</a>         |
| RM&E      | Hatchery RM&E | 65    | 3             |        | None Identified |  |            | <a href="http://www.cbfish.org/Project.mvc/Display/None Identified">http://www.cbfish.org/Project.mvc/Display/None Identified</a> |
| RM&E      | Hatchery RM&E | 65    | ?             | BPA    | 2008-724-00     | PIT Tag Snake River Sockeye and Upper Columbia Spring Chinook  |            | <a href="http://www.cbfish.org/Project.mvc/Display/2008-724-00">http://www.cbfish.org/Project.mvc/Display/2008-724-00</a>         |
| RM&E      | Hatchery RM&E | 65    | 1, 2          | BPA    | 1998-010-03     | M&E Yearling Snake R. Fall Ch  | 12/1/1998  | <a href="http://www.cbfish.org/Project.mvc/Display/1998-010-03">http://www.cbfish.org/Project.mvc/Display/1998-010-03</a>         |
| RM&E      | Hatchery RM&E | 65    | 1, 2          | BPA    | 1998-010-04     | M&E Snake R. Fall Ch Spawning  | 1/1/1998   | <a href="http://www.cbfish.org/Project.mvc/Display/1998-010-04">http://www.cbfish.org/Project.mvc/Display/1998-010-04</a>         |
| RM&E      | Hatchery RM&E | 65    | 1,2           | BPA    | 2003-060-00     | Rock Creek Fish And Habitat Assessment   |            | <a href="http://www.cbfish.org/Project.mvc/Display/2003-060-00">http://www.cbfish.org/Project.mvc/Display/2003-060-00</a>         |

**Table 1. BPA Project List**

| H-Section | BiOp Strategy                    | RPA # | RPA Subaction | Agency | Project #       | Project Title  | Start Date | Action Information Link   |
|-----------|----------------------------------|-------|---------------|--------|-----------------|--|------------|---|
| RM&E      | Hatchery RM&E                    | 66    | All           | BPA    | 1997-024-00     | Monitor and Evaluate the Caspian Tern Population in the Columbia River Estuary             | 2/1/1997   | <a href="http://www.cbfish.org/Project.mvc/Display/1997-024-00">http://www.cbfish.org/Project.mvc/Display/1997-024-00</a>           |
| RM&E      | Predation Management RM&E        | 67    | All           | BPA    | 1997-024-00     | Monitor and Evaluate the Double Crested Cormorant Population in the Columbia River Estuary | 2/1/1997   | <a href="http://www.cbfish.org/Project.mvc/Display/1997-024-00">http://www.cbfish.org/Project.mvc/Display/1997-024-00</a>           |
| RM&E      | Predation Management RM&E        | 68    | All           | BPA    | 1997-024-00     | Monitor and Evaluate Inland Avian Predation  | 2/1/1997   | <a href="http://www.cbfish.org/Project.mvc/Display/1997-024-00">http://www.cbfish.org/Project.mvc/Display/1997-024-00</a>           |
| RM&E      | Predation Management RM&E        | 69    | 123           | BPA    | 2008-003-00     | RM&E - Marine Mammal Predation   | 2/22/2008  | <a href="http://www.cbfish.org/Project.mvc/Display/2008-003-00">http://www.cbfish.org/Project.mvc/Display/2008-003-00</a>           |
| RM&E      | Predation Management RM&E        | 69    | 123           | BPA    | 2008-004-00     | RM&E - Marine Mammal Predation   | 4/1/2008   | <a href="http://www.cbfish.org/Project.mvc/Display/2008-004-00">http://www.cbfish.org/Project.mvc/Display/2008-004-00</a>           |
| RM&E      | Predation Management RM&E        | 70    | 4             | BPA    | 2008-720-00     | Workshop Non-Indigenous Fishes   | 10/1/2007  | <a href="http://www.cbfish.org/Project.mvc/Display/2008-720-00">http://www.cbfish.org/Project.mvc/Display/2008-720-00</a>           |
| RM&E      | Predation Management RM&E        | 70    | 1, 2,3        | BPA    | 1990-077-00     | Dev Of Systemwide Predator Control   | 4/1/1990   | <a href="http://www.cbfish.org/Project.mvc/Display/1990-077-00">http://www.cbfish.org/Project.mvc/Display/1990-077-00</a>           |
| RM&E      | Coordination and Data Management | 71    | 1             |        | None Identified |  |            | <a href="http://www.cbfish.org/Project.mvc/Display/None%20Identified">http://www.cbfish.org/Project.mvc/Display/None Identified</a> |
| RM&E      | Coordination and Data Management | 71    | 2             |        | None Identified |  |            | <a href="http://www.cbfish.org/Project.mvc/Display/None%20Identified">http://www.cbfish.org/Project.mvc/Display/None Identified</a> |

**Table 1. BPA Project List**

| <b>H-Section</b> | <b>BiOp Strategy</b>             | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>                                 | <b>Start Date</b> | <b>Action Information Link</b>  |
|------------------|----------------------------------|--------------|----------------------|---------------|------------------|--|-------------------|---|
| RM&E             | Coordination and Data Management | 71           | 3                    | BPA           | 1996-020-00      | PIT Tagging Spring / Summer Chinook                  |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1996-020-00">http://www.cbfish.org/Project.mvc/Display/1996-020-00</a> |
| RM&E             | Coordination and Data Management | 71           | 3                    | BPA           | 1996-043-00      | Johnson Creek Artificial Propagation                 |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1996-043-00">http://www.cbfish.org/Project.mvc/Display/1996-043-00</a> |
| RM&E             | Coordination and Data Management | 71           | 4                    | BPA           | 1982-013-01      | Coded Wire Tag - PSMFC                               |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1982-013-01">http://www.cbfish.org/Project.mvc/Display/1982-013-01</a> |
| RM&E             | Coordination and Data Management | 71           | 4                    | BPA           | 1988-108-04      | Streamnet (CIS / NED)                                |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1988-108-04">http://www.cbfish.org/Project.mvc/Display/1988-108-04</a> |
| RM&E             | Coordination and Data Management | 71           | 4                    | BPA           | 2003-007-00      | Integrated Status / Effect Program                   |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2003-007-00">http://www.cbfish.org/Project.mvc/Display/2003-007-00</a> |
| RM&E             | Coordination and Data Management | 71           | 4                    | BPA           | 2003-022-00      | Grande Ronde Supplementation M&E                     |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2003-022-00">http://www.cbfish.org/Project.mvc/Display/2003-022-00</a> |
| RM&E             | Coordination and Data Management | 71           | 4                    | BPA           | 2007-402-00      | Deschutes River Fall Chinook Research and Monitoring |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-402-00">http://www.cbfish.org/Project.mvc/Display/2007-402-00</a> |
| RM&E             | Coordination and Data Management | 71           | 4                    | BPA           | 2007-403-00      | ID Spring Chinook Captive Propagation                |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-403-00">http://www.cbfish.org/Project.mvc/Display/2007-403-00</a> |
| RM&E             | Coordination and Data Management | 71           | 4                    | BPA           | 2007-404-00      | OR Spring Chinook Captive Propagation                |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2007-404-00">http://www.cbfish.org/Project.mvc/Display/2007-404-00</a> |
| RM&E             | Coordination and Data Management | 71           | 4                    | BPA           | 2008-505-00      | Streamnet Library                                    |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2008-505-00">http://www.cbfish.org/Project.mvc/Display/2008-505-00</a> |
| RM&E             | Coordination and Data Management | 71           | 5                    | BPA           | 2005-001-00      | Rock Creek Fish And Habitat Assessment               |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2005-001-00">http://www.cbfish.org/Project.mvc/Display/2005-001-00</a> |

**Table 1. BPA Project List**

| <b>H-Section</b> | <b>BiOp Strategy</b>             | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>                              | <b>Start Date</b> | <b>Action Information Link</b>  |
|------------------|----------------------------------|--------------|----------------------|---------------|------------------|---|-------------------|---|
| RM&E             | Coordination and Data Management | 71           | 6                    | BPA           | 2008-727-01      | Regional Data Management Support and Coordination |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2008-727-01">http://www.cbfish.org/Project.mvc/Display/2008-727-01</a> |
| RM&E             | Coordination and Data Management | 71           | 6                    | BPA           | 2003-036-00      | Cbfwa Monitor/Eval Program                        | 9/1/2003          | <a href="http://www.cbfish.org/Project.mvc/Display/2003-036-00">http://www.cbfish.org/Project.mvc/Display/2003-036-00</a> |
| RM&E             | Coordination and Data Management | 71           | 3, 6                 | BPA           | 2007-216-00      | Pnamp Rme Design And Protocols                    | 10/1/2007         | <a href="http://www.cbfish.org/Project.mvc/Display/2007-216-00">http://www.cbfish.org/Project.mvc/Display/2007-216-00</a> |
| RM&E             | Coordination and Data Management | 71           | 3,4                  | BPA           | 1994-033-00      | Fish Passage Center                               |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1994-033-00">http://www.cbfish.org/Project.mvc/Display/1994-033-00</a> |
| RM&E             | Coordination and Data Management | 71           | 3,4,5,6              | BPA           | 2004-002-00      | Pnamp Funding                                     | 10/1/2004         | <a href="http://www.cbfish.org/Project.mvc/Display/2004-002-00">http://www.cbfish.org/Project.mvc/Display/2004-002-00</a> |
| RM&E             | Coordination and Data Management | 71           | 4, 6                 | BPA           | 2008-727-00      | Regional Data Management Support and Coordination | 10/1/2008         | <a href="http://www.cbfish.org/Project.mvc/Display/2008-727-00">http://www.cbfish.org/Project.mvc/Display/2008-727-00</a> |
| RM&E             | Coordination and Data Management | 71           | 4,5                  | BPA           | 2003-017-00      | Integrated Status / Effect Program                |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2003-017-00">http://www.cbfish.org/Project.mvc/Display/2003-017-00</a> |
| RM&E             | Coordination and Data Management | 71           | 4,5,6                | BPA           | 2003-072-00      | Biodiversity System For Columbia                  |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2003-072-00">http://www.cbfish.org/Project.mvc/Display/2003-072-00</a> |
| RM&E             | Coordination and Data Management | 71           | 5,6                  | BPA           | 2002-077-00      | Estuary / Ocean RM&E Support                      |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2002-077-00">http://www.cbfish.org/Project.mvc/Display/2002-077-00</a> |
| RM&E             | Coordination and Data Management | 72           | 1                    | BPA           | 1987-127-00      | Smolt Monitoring By Non - Federal                 |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1987-127-00">http://www.cbfish.org/Project.mvc/Display/1987-127-00</a> |
| RM&E             | Coordination and Data Management | 72           | 1                    | BPA           | 2008-727-02      | Regional Data Management Support and Coordination |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2008-727-02">http://www.cbfish.org/Project.mvc/Display/2008-727-02</a> |

**Table 1. BPA Project List**

| H-Section | BiOp Strategy                    | RPA # | RPA Subaction | Agency | Project #   | Project Title                                     | Start Date | Action Information Link   |
|-----------|----------------------------------|-------|---------------|--------|-------------|---|------------|---|
| RM&E      | Coordination and Data Management | 72    | 1             | BPA    | 2002-077-00 | Estuary/Ocean Rme Support                         | 10/1/2002  | <a href="http://www.cbfish.org/Project.mvc/Display/2002-077-00">http://www.cbfish.org/Project.mvc/Display/2002-077-00</a> |
| RM&E      | Coordination and Data Management | 72    | 1             | BPA    | 2003-036-00 | Cbfwa Monitor/Eval Program                        | 9/1/2003   | <a href="http://www.cbfish.org/Project.mvc/Display/2003-036-00">http://www.cbfish.org/Project.mvc/Display/2003-036-00</a> |
| RM&E      | Coordination and Data Management | 72    | 1             | BPA    | 2005-001-00 | Estuary Rme Pilot Project                         | 2/20/2005  | <a href="http://www.cbfish.org/Project.mvc/Display/2005-001-00">http://www.cbfish.org/Project.mvc/Display/2005-001-00</a> |
| RM&E      | Coordination and Data Management | 72    | 2             | BPA    | 2008-727-03 | Regional Data Management Support and Coordination |            | <a href="http://www.cbfish.org/Project.mvc/Display/2008-727-03">http://www.cbfish.org/Project.mvc/Display/2008-727-03</a> |
| RM&E      | Coordination and Data Management | 72    | 2             | BPA    | 1996-019-00 | Dart-Data Access In Real Time                     | 10/1/1996  | <a href="http://www.cbfish.org/Project.mvc/Display/1996-019-00">http://www.cbfish.org/Project.mvc/Display/1996-019-00</a> |
| RM&E      | Coordination and Data Management | 72    | 3             | BPA    | 2008-727-04 | Regional Data Management Support and Coordination |            | <a href="http://www.cbfish.org/Project.mvc/Display/2008-727-04">http://www.cbfish.org/Project.mvc/Display/2008-727-04</a> |
| RM&E      | Coordination and Data Management | 72    | 3             | BPA    | 1996-017-00 | Tech Support Bio Analyst Inc                      | 1/1/1996   | <a href="http://www.cbfish.org/Project.mvc/Display/1996-017-00">http://www.cbfish.org/Project.mvc/Display/1996-017-00</a> |
| RM&E      | Coordination and Data Management | 72    | 1, 2, 3       | BPA    | 1988-108-04 | Streamnet (Cis/Ned)                               | 10/1/1988  | <a href="http://www.cbfish.org/Project.mvc/Display/1988-108-04">http://www.cbfish.org/Project.mvc/Display/1988-108-04</a> |
| RM&E      | Coordination and Data Management | 72    | 1, 3          | BPA    | 2004-002-00 | Pnamp Funding                                     | 10/1/2004  | <a href="http://www.cbfish.org/Project.mvc/Display/2004-002-00">http://www.cbfish.org/Project.mvc/Display/2004-002-00</a> |
| RM&E      | Coordination and Data Management | 72    | 1,2,3         | BPA    | 2008-727-00 | Regional Data Management Support and Coordination | 10/1/2008  | <a href="http://www.cbfish.org/Project.mvc/Display/2008-727-00">http://www.cbfish.org/Project.mvc/Display/2008-727-00</a> |
| RM&E      | Coordination and Data Management | 72    | 1,3           | BPA    | 1982-013-01 | Coded Wire Tag - PSMFC                            |            | <a href="http://www.cbfish.org/Project.mvc/Display/1982-013-01">http://www.cbfish.org/Project.mvc/Display/1982-013-01</a> |

**Table 1. BPA Project List**

| <b>H-Section</b> | <b>BiOp Strategy</b>                     | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>                   | <b>Start Date</b> | <b>Action Information Link</b>  |
|------------------|--|--------------|----------------------|---------------|------------------|--|-------------------|---|
| RM&E             | Coordination and Data Management         | 72           | 1,3                  | BPA           | 1998-031-00      | Implement Wy - Kan - Ush - Mi Wa - Kis |                   | <a href="http://www.cbfish.org/Project.mvc/Display/1998-031-00">http://www.cbfish.org/Project.mvc/Display/1998-031-00</a> |
| RM&E             | Coordination and Data Management         | 72           | 1,3                  | BPA           | 2008-505-00      | Streamnet Library                      |                   | <a href="http://www.cbfish.org/Project.mvc/Display/2008-505-00">http://www.cbfish.org/Project.mvc/Display/2008-505-00</a> |
| RM&E             | Implementation and Compliance Monitoring | 73           | 1,2,3                | BPA           | None identified  | None identified                        | None identified   |   |

**Table 2. Reclamation Project List**

| H-Section | BiOp Strategy                         | RPA # | RPA Subaction | Agency      | Project # | Project Title                                | Start Date | Action Information Link |
|-----------|---------------------------------------|-------|---------------|-------------|-----------|--|------------|-------------------------|
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | Reclamation | 4034      | MVID East Canal Diversion Dam                | 9/13/2002  |                         |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | Reclamation | 4035      | MVID West Canal Diversion Dam                | 9/13/2002  |                         |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | Reclamation | 4261      | Elbow Coulee Side Channel Restoration        | 5/4/2005   |                         |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | Reclamation | 4263      | Upper Beaver Creek Side Channel Reconnection | 5/3/2005   |                         |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | Reclamation | 4328      | L-1 Diversion                                | 4/1/2008   |                         |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | Reclamation | 4342      | Pole Creek Diversion Enhancement             | 9/10/2008  |                         |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | Reclamation | 4239      | East Fork Salmon River-EF 13 Diversion       | 3/9/2004   |                         |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | Reclamation | 4247      | East Fork Salmon River-EF 14 Diversion       | 2/16/2006  |                         |

**Table 2. Reclamation Project List**

| <b>H-Section</b> | <b>BiOp Strategy</b>                  | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>                      | <b>Start Date</b> | <b>Action Information Link</b> |
|------------------|---------------------------------------|--------------|----------------------|---------------|------------------|---|-------------------|--------------------------------|
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | Reclamation   | 4249             | East Fork Salmon River EF 16 Diversion    | 2/16/2006         |                                |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | Reclamation   | 4335             | Big Springs Creek 1 Diversion Enhancement | 7/1/2008          |                                |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | Reclamation   | 4296             | Smith Ditch Diversion                     | 10/18/2006        |                                |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | Reclamation   | 4345             | Boulder Creek Ranch Diversion             | 7/25/2008         |                                |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | Reclamation   | 4304             | Panama Ditch Diversion                    | 10/18/2006        |                                |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | Reclamation   | 4300             | Bower's/Lemon's Ditch Diversion           | 10/18/2006        |                                |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | Reclamation   | 4302             | Long Box Diversion                        | 10/18/2006        |                                |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | Reclamation   | 4298             | Beech Creek Crossing                      | 10/18/2006        |                                |

**Table 2. Reclamation Project List**

| <b>H-Section</b> | <b>BiOp Strategy</b>                  | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>  | <b>Start Date</b> | <b>Action Information Link</b> |
|------------------|---------------------------------------|--------------|----------------------|---------------|------------------|---|-------------------|--------------------------------|
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | Reclamation   | 4301             | Hufstader Pump Station  | 10/18/2006        |                                |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | Reclamation   | 4323             | Kennedy (UPJD RM 209) and Murray (UPJD RM 210.2) Ditch Diversions               | 1/24/2008         |                                |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | Reclamation   | 4369             | Grant SWCD-Cummings River Ditch Diversion (UPJD RM 222.5)                       | 2/4/2008          |                                |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | Reclamation   | 4314             | Grant SWCD-Stout Diversion (UPJD RM 214.3)                                      | 3/31/2008         |                                |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | Reclamation   | 4350             | Oliver Ditch # 47 (UPJD RM 253.3) Diversion (combined with Oliver #48 in 2008)  | 7/28/2008         |                                |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | Reclamation   | 4351             | Oliver Ditch # 48 (UPJD RM 253.2) Diversion (combined with Oliver # 47 in 2008) | 7/28/2008         |                                |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | Reclamation   | 4353             | Oliver Ditch # 49 Diversion (UPJD RM 252.2)                                     | 7/28/2008         |                                |

**Table 2. Reclamation Project List**

| <b>H-Section</b> | <b>BiOp Strategy</b>                  | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>   | <b>Start Date</b> | <b>Action Information Link</b> |
|------------------|---------------------------------------|--------------|----------------------|---------------|------------------|--|-------------------|--------------------------------|
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | Reclamation   | 4349             | Eddington Ditch Diversion (Page Pump Station- UPJD RM 231.7) | 7/28/2008         |                                |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | Reclamation   | 4288             | Stillwater Complexity Project                                | 7/21/2006         |                                |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | Reclamation   | 4326             | Keystone Canyon Project                                      | 1/29/2007         |                                |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | Reclamation   | 4329             | Harrison Side Channel  | 6/26/2007         |                                |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | Reclamation   | 4306             | WPP Beaver Creek 3 Culvert Replacements                      | 1/19/2007         |                                |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | Reclamation   | 4258             | Wenatchee Watershed Fluvial Habitat Resoration Plan (WWFHRP) | 9/26/2005         |                                |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | Reclamation   | 4193             | Jones Shotwell Ditch   | 2/2/2004          |                                |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | Reclamation   | 4330             | Poorman Cutoff Road Culvert                                  | 2/15/2008         |                                |

**Table 2. Reclamation Project List**

| <b>H-Section</b> | <b>BiOp Strategy</b>                  | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>                                    | <b>Start Date</b> | <b>Action Information Link</b> |
|------------------|---------------------------------------|--------------|----------------------|---------------|------------------|---|-------------------|--------------------------------|
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | Reclamation   | 4325             | Big Valley Reach Assessment                             | 10/2/2006         |                                |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | Reclamation   | 4333             | Big Valley Light Heath                                  | 1/19/2007         |                                |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | Reclamation   | 4262             | Rockview-Fender Mills Phase I Side Channel Reconnection | 5/12/2005         |                                |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | Reclamation   | 4318             | CTWSRO Middle Fork Forrest Reach Assessment             | 9/18/2007         |                                |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | Reclamation   | 4319             | CTWSRO Oxbow Reach Assessment                           | 9/5/2007          |                                |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | Reclamation   | 4162             | Chewuch Basin Water Acquisition                         | 10/1/2007         |                                |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | Reclamation   | 4214             | Pioneer Ditch   | 7/26/2004         |                                |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | Reclamation   | 4380             | Two Mission Creek Projects- 2008                        | 6/26/2008         |                                |

**Table 2. Reclamation Project List**

| <b>H-Section</b> | <b>BiOp Strategy</b>                  | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>  | <b>Start Date</b> | <b>Action Information Link</b> |
|------------------|---------------------------------------|--------------|----------------------|---------------|------------------|---|-------------------|--------------------------------|
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | Reclamation   | 4315             | CMZ 12/13   | 2/26/2008         |                                |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | Reclamation   | 4316             | CMZ 11  | 2/26/2008         |                                |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | Reclamation   | 4378             | Upper Lemhi River Flow Enhancement / Eighteenmile Creek Reconnect | 10/16/2006        |                                |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | Reclamation   | 4327             | Orodell Diversion Fish Passage Enhancement Project                | 9/24/2007         |                                |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | Reclamation   | 4198             | Pauls Upper John Day Water Lease                                  | 10/1/2007         |                                |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | Reclamation   | 4347             | Fry-Ingle Diversion   | 7/28/2008         |                                |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | Reclamation   | 4348             | Cummings Creek Pump   | 6/28/2008         |                                |
| Habitat          | Protect and Improve Tributary Habitat | 34           | All                  | Reclamation   | 4283             | Big Boulder Habitat Improvement Project                           | 9/6/2005          |                                |

**Table 2. Reclamation Project List**

| H-Section | BiOp Strategy                         | RPA # | RPA Subaction | Agency      | Project #                          | Project Title   | Start Date | Action Information Link   |
|-----------|---------------------------------------|-------|---------------|-------------|------------------------------------|---|------------|---|
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | Reclamation | 4317                               | Middle Fork Rock Replacement Projects                     | 9/17/2007  |   |
| Habitat   | Protect and Improve Tributary Habitat | 34    | All           | Reclamation | 4320                               | Forrest-Emmel Habitat Improvement Program                 | 8/27/2007  |   |
| RM&E      | Tributary Habitat RM&E                | 56    | 1             | Reclamation | USBR IA w/ USGS 1425-08-AA-1C-4887 | Methow Fish Production, Food Webs,                        |            | <a href="http://.../Documents and Settings/RWS4093/My Documents/BiOp RPA/Reports/Attachment 2 final 200901005 withlinks.htm - RANGE!P1#RANGE!P1">../.../Documents and Settings/RWS4093/My Documents/BiOp RPA/Reports/Attachment 2 final 200901005 withlinks.htm - RANGE!P1#RANGE!P1</a> |
| RM&E      | Tributary Habitat RM&E                | 56    | 1             | Reclamation | USBR IA 1425-06-AA-1C-4797         | Fish Pop Genetics   |            | <a href="http://.../Documents and Settings/RWS4093/My Documents/BiOp RPA/Reports/Attachment 2 final 200901005 withlinks.htm - RANGE!P1#RANGE!P1">../.../Documents and Settings/RWS4093/My Documents/BiOp RPA/Reports/Attachment 2 final 200901005 withlinks.htm - RANGE!P1#RANGE!P1</a> |
| RM&E      | Tributary Habitat RM&E                | 57    | 4             | Reclamation | USGS IA 1425-08-AA-1C-4887         | Methow Channel Restoration and Fish Productivity Response |            | <a href="http://.../Documents and Settings/RWS4093/My Documents/BiOp RPA/Reports/Attachment 2 final 200901005 withlinks.htm - RANGE!P1#RANGE!P1">../.../Documents and Settings/RWS4093/My Documents/BiOp RPA/Reports/Attachment 2 final 200901005 withlinks.htm - RANGE!P1#RANGE!P1</a> |
| RM&E      | Tributary Habitat RM&E                | 57    | 5             | Reclamation | NWFSC IA 1425-06-AA-1C-4806        | Landscape Influences on Stream Condition                  |            | <a href="http://.../Documents and Settings/RWS4093/My Documents/BiOp RPA/Reports/Attachment 2 final 200901005 withlinks.htm - RANGE!P1#RANGE!P1">../.../Documents and Settings/RWS4093/My Documents/BiOp RPA/Reports/Attachment 2 final 200901005 withlinks.htm - RANGE!P1#RANGE!P1</a> |

**Table 3. Corps Project List**

| H-Section | BiOp Strategy    | RPA # | RPA Subaction | Agency | Project #  | Project Title  | Start Date | Action Information Link |
|-----------|------------------|-------|---------------|--------|------------|--|------------|-------------------------|
| RM&E      | Hydrosystem RM&E | 52    | 1             | COE    | SPE-06-2   | Comparative Performance of Acoustic - Tagged and PIT - Tagged Juvenile Salmonids |            |                         |
| RM&E      | Hydrosystem RM&E | 52    | 1             | COE    | SPE-P-08-3 | Studies of Surface Spill at John Day Dam   |            |                         |
| RM&E      | Hydrosystem RM&E | 52    | 1             | COE    | SPE-W-04-2 | Juvenile Survival and Passage at Little Goose Dam.                               |            |                         |
| RM&E      | Hydrosystem RM&E | 52    | 1             | COE    | SPE-W-05-1 | Evaluation of Temporary Spillway Weirs (TSW's) at McNary Dam                     |            |                         |
| RM&E      | Hydrosystem RM&E | 52    | 1             | COE    | SPE-W-08-4 | Fish passage and survival at Lower Monumental Dam after installation of an RSW   |            |                         |
| RM&E      | Hydrosystem RM&E | 52    | 3, 7          | COE    | ADS-00-4   | Investigation of Fate of Fish; Straying in Adult Salmon and Steelhead. (RM&E)    |            |                         |

**Table 3. Corps Project List**

| H-Section | BiOp Strategy    | RPA # | RPA Subaction | Agency | Project #   | Project Title  | Start Date | Action Information Link |
|-----------|------------------|-------|---------------|--------|-------------|--|------------|-------------------------|
| RM&E      | Hydrosystem RM&E | 53    | 5             | COE    | ADS-P-00-6  | Evaluation of Steelhead Kelt and Overwintering Summer Steelhead Downstream Passage Through Columbia and Snake River dams.  |            |                         |
| RM&E      | Hydrosystem RM&E | 54    | 2             | COE    | SPE-P-08-2  | Condition and Gatewell Retention Time Evaluation for Subyearling Chinook (Spring Creek Hatchery Origin & Run - of - the - River) through FGE modified units at the Second Powerhouse Bonneville Dam. |            |                         |
| RM&E      | Hydrosystem RM&E | 54    | 4             | COE    | TSP-05-1    | Pressure Investigations to Support Biological Index Testing  |            |                         |
| RM&E      | Hydrosystem RM&E | 54    | 6             | COE    | TPE-W-00-06 | Analyze the Benefits of Transporting Lower Snake River Juvenile Fall Chinook Salmon  |            |                         |

**Table 3. Corps Project List**

| H-Section | BiOp Strategy    | RPA # | RPA Subaction | Agency | Project #   | Project Title  | Start Date | Action Information Link |
|-----------|------------------|-------|---------------|--------|-------------|--|------------|-------------------------|
| RM&E      | Hydrosystem RM&E | 54    | 6             | COE    | TPE-W-04-1  | Determine the Seasonal Effects of Transporting fish from the Snake River to optimize a Transportation Strategy.  |            |                         |
| RM&E      | Hydrosystem RM&E | 54    | 8             | COE    | AVS-08-01   | Evaluate Management Measures and Develop Baseline Information on Double - crested Cormorants Directed at Reducing the Impact of Their Predation on Salmonid Smolts in the Columbia River Estuary |            |                         |
| RM&E      | Hydrosystem RM&E | 54    | 8             | COE    | AVS-W-03-01 | Evaluate the Impact of Avian Predation on Salmonid Smolts from the Columbia and Snake Rivers   |            |                         |
| RM&E      | Hydrosystem RM&E | 54    | 9             | COE    | ADS-00-4    | Investigation of Fate of Fish; Straying in Adult Salmon and Steelhead. (RM&E)  |            |                         |

**Table 3. Corps Project List**

| H-Section | BiOp Strategy    | RPA # | RPA Subaction | Agency | Project #  | Project Title   | Start Date | Action Information Link |
|-----------|------------------|-------|---------------|--------|------------|---|------------|-------------------------|
| RM&E      | Hydrosystem RM&E | 54    | 9             | COE    | SPE-06-2   | Comparative Performance of Acoustic - Tagged and PIT - Tagged Juvenile Salmonids  |            |                         |
| RM&E      | Hydrosystem RM&E | 54    | 10            | COE    | ADS-W-08-1 | Little Goose Adult Passage at Varying Spill Levels and Patterns.  |            |                         |
| RM&E      | Hydrosystem RM&E | 54    | 12            | COE    | ADS-00-1   | Evaluation of Adult Salmon and Steelhead Delay and Fallback at Snake and Columbia River Dams.                             |            |                         |
| RM&E      | Hydrosystem RM&E | 54    | 13            | COE    | ADS-P-00-6 | Evaluation of Steelhead Kelt and Overwintering Summer Steelhead Downstream Passage Through Columbia and Snake River dams. |            |                         |
| RM&E      | Hydrosystem RM&E | 54    | 14            | COE    | ADS-P-00-6 | Evaluation of Steelhead Kelt and Overwintering Summer Steelhead Downstream Passage Through Columbia and Snake River dams. |            |                         |

**Table 3. Corps Project List**

| H-Section | BiOp Strategy    | RPA # | RPA Subaction | Agency | Project #    | Project Title  | Start Date | Action Information Link |
|-----------|------------------|-------|---------------|--------|--------------|--|------------|-------------------------|
| RM&E      | Hydrosystem RM&E | 54    | 1, 2,3,4,5, 9 | COE    | SPE-P-08-3   | Studies of Surface Spill at John Day Dam   |            |                         |
| RM&E      | Hydrosystem RM&E | 54    | 1, 2,3,4,5, 9 | COE    | SPE-W-04-2   | Juvenile Survival and Passage at Little Goose Dam.   |            |                         |
| RM&E      | Hydrosystem RM&E | 54    | 1, 2,3,4,5, 9 | COE    | SPE-W-05-1   | Evaluation of Temporary Spillway Weirs (TSW's) at McNary Dam                               |            |                         |
| RM&E      | Hydrosystem RM&E | 54    | 1, 2,3,4,5, 9 | COE    | SPE-W-08-4   | Fish passage and survival at Lower Monumental Dam after installation of an RSW             |            |                         |
| RM&E      | Hydrosystem RM&E | 54    | 3, 9          | COE    | SPE-P-08-1   | Evaluation of a Behavioral Guidance Structure at Bonneville Dam Second Powerhouse          |            |                         |
| RM&E      | Hydrosystem RM&E | 54    | 3, 9          | COE    | SPE-W-09-New | Direct Injury and Survival of Juvenile Salmonids through the Spillway at Little Goose Dam. |            |                         |
| RM&E      | Hydrosystem RM&E | 55    | 1             | COE    | TPE-W-00-06  | Analyze the Benefits of Transporting Lower Snake River Juvenile Fall Chinook Salmon        |            |                         |

**Table 3. Corps Project List**

| H-Section | BiOp Strategy    | RPA # | RPA Subaction | Agency | Project #   | Project Title   | Start Date | Action Information Link |
|-----------|------------------|-------|---------------|--------|-------------|---|------------|-------------------------|
| RM&E      | Hydrosystem RM&E | 55    | 1             | COE    | TPE-W-04-1  | Determine the Seasonal Effects of Transporting fish from the Snake River to optimize a Transportation Strategy. |            |                         |
| RM&E      | Hydrosystem RM&E | 55    | 2             | COE    | EST-02-01   | A Study of Salmonid Survival and Behavior through the Columbia River Estuary Using Acoustic Tags                |            |                         |
| RM&E      | Hydrosystem RM&E | 55    | 2             | COE    | TPE-W-00-06 | Analyze the Benefits of Transporting Lower Snake River Juvenile Fall Chinook Salmon                             |            |                         |
| RM&E      | Hydrosystem RM&E | 55    | 2             | COE    | TPE-W-04-1  | Determine the Seasonal Effects of Transporting fish from the Snake River to optimize a Transportation Strategy. |            |                         |
| RM&E      | Hydrosystem RM&E | 55    | 4             | COE    | EST-02-01   | A Study of Salmonid Survival and Behavior through the Columbia River Estuary Using Acoustic Tags                |            |                         |

**Table 3. Corps Project List**

| H-Section | BiOp Strategy        | RPA # | RPA Subaction | Agency | Project #   | Project Title  | Start Date | Action Information Link |
|-----------|----------------------|-------|---------------|--------|-------------|--|------------|-------------------------|
| RM&E      | Hydrosystem RM&E     | 55    | 4             | COE    | TPE-W-00-06 | Analyze the Benefits of Transporting Lower Snake River Juvenile Fall Chinook Salmon              |            |                         |
| RM&E      | Hydrosystem RM&E     | 55    | 6             | COE    | TSP-05-1    | Pressure Investigations to Support Biological Index Testing                                      |            |                         |
| RM&E      | Hydrosystem RM&E     | 55    | 8             | COE    | SPE-06-2    | Comparative Performance of Acoustic - Tagged and PIT - Tagged Juvenile Salmonids                 |            |                         |
| RM&E      | Hydrosystem RM&E     | 55    | 9             | COE    | ADS-00-4    | Investigation of Fate of Fish; Straying in Adult Salmon and Steelhead. (RM&E)                    |            |                         |
| RM&E      | Estuary Habitat RM&E | 58    | 1             | COE    | EST-02-01   | A Study of Salmonid Survival and Behavior through the Columbia River Estuary Using Acoustic Tags |            |                         |

**Table 3. Corps Project List**

| H-Section | BiOp Strategy        | RPA # | RPA Subaction | Agency | Project #    | Project Title   | Start Date | Action Information Link |
|-----------|----------------------|-------|---------------|--------|--------------|---|------------|-------------------------|
| RM&E      | Estuary Habitat RM&E | 58    | 1             | COE    | EST-09-P-new | Evaluation of Life History Diversity, Habitat Connectivity, and Survival Benefits Associated with Habitat Restoration Actions in the Lower Columbia River and Estuary |            |                         |
| RM&E      | Estuary Habitat RM&E | 58    | 2             | COE    | EST-09-P-new | Evaluation of Life History Diversity, Habitat Connectivity, and Survival Benefits Associated with Habitat Restoration Actions in the Lower Columbia River and Estuary |            |                         |
| RM&E      | Estuary Habitat RM&E | 59    | 1             | COE    | AER7         | JBH Tide Gate Replacement   |            |                         |
| RM&E      | Estuary Habitat RM&E | 59    | 3             | COE    | AER7         | JBH Tide Gate Replacement   |            |                         |
| RM&E      | Estuary Habitat RM&E | 59    | 4             | COE    | EST-02-01    | A Study of Salmonid Survival and Behavior through the Columbia River Estuary Using Acoustic Tags  |            |                         |
| RM&E      | Estuary Habitat RM&E | 59    | 5             | COE    | STM3         | Tides and Currents  |            |                         |

**Table 3. Corps Project List**

| H-Section | BiOp Strategy        | RPA # | RPA Subaction | Agency | Project #    | Project Title   | Start Date | Action Information Link |
|-----------|----------------------|-------|---------------|--------|--------------|---|------------|-------------------------|
| RM&E      | Estuary Habitat RM&E | 59    | 5             | COE    | STM4         | ODEQ Ambient Water Quality Monitoring   |            |                         |
| RM&E      | Estuary Habitat RM&E | 59    | 5             | COE    | STM5         | USGS Discharge and WQ Monitoring  |            |                         |
| RM&E      | Estuary Habitat RM&E | 59    | 5             | COE    | STM6         | WDOE Ambient WQ Monitoring  |            |                         |
| RM&E      | Estuary Habitat RM&E | 59    | 1, 5          | COE    | EST-02-P-04  | Evaluating Cumulative Ecosystem Response to Habitat Restoration Projects in the Lower Columbia River and Estuary  |            |                         |
| RM&E      | Estuary Habitat RM&E | 59    | 2,3           | COE    | EST-09-P-new | Evaluation of Life History Diversity, Habitat Connectivity, and Survival Benefits Associated with Habitat Restoration Actions in the Lower Columbia River and Estuary |            |                         |
| RM&E      | Estuary Habitat RM&E | 60    | 2             | COE    | AER5         | Pile Structure Evaluation Coal Creek  |            |                         |
| RM&E      | Estuary Habitat RM&E | 60    | 2             | COE    | AER9         | Tenasillahe Is. Monitoring  |            |                         |

**Table 3. Corps Project List**

| H-Section | BiOp Strategy        | RPA # | RPA Subaction | Agency | Project #   | Project Title  | Start Date | Action Information Link |
|-----------|----------------------|-------|---------------|--------|-------------|--|------------|-------------------------|
| RM&E      | Estuary Habitat RM&E | 60    | 1, 2, 3       | COE    | EST-02-P-04 | Evaluating Cumulative Ecosystem Response to Habitat Restoration Projects in the Lower Columbia River and Estuary |            |                         |
| RM&E      | Estuary Habitat RM&E | 60    | 2, 3          | COE    | AER10       | Monitoring at Smith and Bybee Lakes  |            |                         |
| RM&E      | Estuary Habitat RM&E | 60    | 2, 3          | COE    | AER12       | Ramsey Lake Project Monitoring   |            |                         |
| RM&E      | Estuary Habitat RM&E | 60    | 2, 3          | COE    | AER7        | JBH Tide Gate Replacement  |            |                         |
| RM&E      | Estuary Habitat RM&E | 60    | 2, 3          | COE    | AER8        | Crims Island Monitoring  |            |                         |
| RM&E      | Estuary Habitat RM&E | 61    | 1             | COE    | EST-02-01   | A Study of Salmonid Survival and Behavior through the Columbia River Estuary Using Acoustic Tags                 |            |                         |
| RM&E      | Estuary Habitat RM&E | 61    | 3             | COE    | EST-02-P-04 | Evaluating Cumulative Ecosystem Response to Habitat Restoration Projects in the Lower Columbia River and Estuary |            |                         |
| RM&E      | Estuary Habitat RM&E | 61    | 4             | COE    | STM3        | Tides and Currents   |            |                         |

**Table 3. Corps Project List**

| <b>H-Section</b> | <b>BiOp Strategy</b> | <b>RPA #</b> | <b>RPA Subaction</b> | <b>Agency</b> | <b>Project #</b> | <b>Project Title</b>   | <b>Start Date</b> | <b>Action Information Link</b> |
|------------------|----------------------|--------------|----------------------|---------------|------------------|--|-------------------|--------------------------------|
| RM&E             | Estuary Habitat RM&E | 61           | 4                    | COE           | STM5             | USGS Discharge and WQ Monitoring   |                   |                                |
| RM&E             | Estuary Habitat RM&E | 61           | 2, 3                 | COE           | EST-02-01        | A Study of Salmonid Survival and Behavior through the Columbia River Estuary Using Acoustic Tags |                   |                                |

## Attachment 2: Summary of FY07 and FY08 Accomplishments, by Population

Attachment 2 summarizes the tributary habitat measures implemented with funding from BPA or with technical assistance from Reclamation in 2007 and 2008. BPA uses Pisces, a contract management system, to track and record planned and actual work accomplishments. Reclamation metrics included here were summarized from the detailed metrics reported in Attachment 3, Tables 5.2 and 5.3. Further detail of work accomplished can be found in BPA's Report Center Habitat Metrics Report, available at <http://www.efw.bpa.gov/IntegratedFWP/reportcenter.aspx>.

NOTE: Metrics in this attachment may be reported twice if they are located in areas used by Chinook and steelhead.

| 2007/2008 Completed Metric        |                          |   |                          | Water Quantity         | Entrainment             | Passage             | Channel complexity    | Water Quality<br>Riparian Protection and Enhancement |                         |                          |  |  |
|-----------------------------------|--------------------------|---|--------------------------|------------------------|-------------------------|---------------------|-----------------------|--|-------------------------|--------------------------|--|--|
| ESA-listed ESU/DPS                | MPG                      | Population                                  | CFS acquired or enhanced | # of screens addressed | # of barriers addressed | Stream miles opened | Stream miles improved | Stream miles protected                               | Riparian acres improved | Riparian Acres protected |  |  |
| Snake River Spring/Summer Chinook | Grande Ronde / Imnaha    | Catherine Creek                             |                          |                        | 2                       | 23.5                |                       |  |                         |                          |  |  |
|                                   |                          | Lostine/Wallowa River                       | 17.22                    |                        | 1                       | 5                   | 1                     |  | 16                      |                          |  |  |
|                                   |                          | Minam River                                 |                          |                        |                         |                     |                       |  |                         |                          |  |  |
|                                   |                          | Grande Ronde River upper mainstem           |                          |                        |                         |                     |                       | 2  |                         | 220.5                    |  |  |
|                                   |                          | Wenaha River                                |                          |                        |                         |                     |                       |  |                         |                          |  |  |
|                                   |                          | Big Sheep Creek                             |                          |                        |                         |                     |                       |  |                         |                          |  |  |
|                                   |                          | Imnaha River mainstem                       |                          |                        |                         |                     |                       |  |                         |                          |  |  |
|                                   | Middle Fork Salmon River | Bear Valley Creek                           |                          |                        |                         |                     |                       |  |                         |                          |  |  |
|                                   |                          | Big Creek                                   |                          |                        |                         |                     |                       |  |                         |                          |  |  |
|                                   |                          | Camas Creek                                 |                          |                        |                         |                     |                       | 0.08   |                         |                          |  |  |
|                                   |                          | Loon Creek                                  |                          |                        |                         |                     |                       |  |                         |                          |  |  |
|                                   |                          | Marsh Creek                                 |                          |                        |                         |                     |                       |  |                         |                          |  |  |
|                                   |                          | Sulphur Creek                               |                          |                        |                         |                     |                       |  |                         |                          |  |  |
|                                   |                          | Middle Fork Salmon River above Indian Creek |                          |                        |                         |                     |                       |  |                         |                          |  |  |
|                                   |                          | Chamberlain Creek                           |                          |                        |                         |                     |                       |  |                         |                          |  |  |
|                                   |                          | Middle Fork Salmon River below Indian Creek |                          |                        |                         |                     |                       |  |                         |                          |  |  |
|                                   |                          |   |                          |                        |                         |                     |                       |  |                         |                          |  |  |
|                                   |                          |   |                          |                        |                         |                     |                       |  |                         |                          |  |  |

| 2007/2008 Completed Metric                       |                                     |                                   | Water Quantity           | Entrainment            | Passage                 | Channel complexity  | Water Quality<br>Riparian Protection and Enhancement |                        |                         |                          |  |
|--|-------------------------------------|-----------------------------------|--------------------------|------------------------|-------------------------|---------------------|--|------------------------|-------------------------|--------------------------|--|
| ESA-listed ESU/DPS                               | MPG                                 | Population                        | CFS acquired or enhanced | # of screens addressed | # of barriers addressed | Stream miles opened | Stream miles improved                                | Stream miles protected | Riparian acres improved | Riparian Acres protected |  |
|  | South Fork Salmon River             | East Fork South Fork Salmon River |                          |                        |                         |                     | 2  |                        |                         |                          |  |
|  |                                     | Little Salmon River               |                          |                        | 3                       | 15.5                |  |                        |                         |                          |  |
|  |                                     | Secesh River                      |                          |                        |                         |                     |  |                        |                         |                          |  |
|  | Lower Snake                         | South Fork Salmon River mainstem  |                          |                        |                         |                     |  |                        |                         |                          |  |
|  |                                     | Asotin Creek                      |                          |                        | 1                       | 11.2                |  |                        |                         | 34.9                     |  |
|  |                                     | Tucannon River                    |                          |                        |                         |                     |  | 17.8                   |                         | 369.8                    |  |
|  | Upper Salmon River                  | East Fork Salmon River            | 39.53                    |                        |                         |                     |  |                        |                         |                          |  |
|  |                                     | Lemhi River                       |                          |                        | 5                       | 147                 |  |                        |                         | 0.4                      |  |
|  |                                     | North Fork Salmon River           | 0                        |                        |                         |                     |  |                        |                         |                          |  |
|  |                                     | Pahsimeroi River                  | 29.55                    |                        |                         |                     |  |                        |                         |                          |  |
| Salmon River lower mainstem below Redfish Lake   |                                     |                                   |                          | 1                      | 2                       | 3                   |  |                        | 5                       |                          |  |
| Salmon River upper mainstem above Redfish Lake   |                                     | 29.61                             |                          |                        |                         |                     |  |                        |                         |                          |  |
|  | Valley Creek                        |                                   |                          |                        |                         |                     |  |                        |                         |                          |  |
|  | Yankee Fork                         |                                   |                          |                        |                         |                     |  |                        |                         |                          |  |
| <i>Snake River Spring/Summer Chinook Total</i>   |                                     |                                   | 115.91                   | 1                      | 14                      | 205.2               | 5.08   | 17.8                   | 276.8                   | 369.8                    |  |
| Upper Columbia River Spring Chinook              | Upper Columbia - Below Chief Joseph | Entiat River                      | 0                        | 0                      | 1                       | 0                   | 1  |                        |                         |                          |  |
|  |                                     | Methow River                      | 63.4                     | 1                      | 6                       | 113.8               | 3.5  |                        |                         |                          |  |
|  |                                     | Wenatchee River                   | 0                        | 5                      | 13                      | 20.4                | 1.2  |                        | 0.1                     |                          |  |
| <i>Upper Columbia River Spring Chinook Total</i> |                                     |                                   | 63.4                     | 6                      | 20                      | 134.2               | 5.7  | 0                      | 0.1                     | 0                        |  |
| Middle   | Cascades                            |                                   |                          |                        |                         |                     |  |                        |                         |                          |  |
|  |                                     |                                   | 104                      |                        |                         |                     | 0.9  | 51.7                   |                         | 598.6                    |  |

| 2007/2008 Completed Metric                   |                                |   | Water Quantity              | Entrainment            | Passage                 | Channel complexity  | Water Quality<br>Riparian Protection and Enhancement |                        |                         |                          |       |
|--|--------------------------------|---|-----------------------------|------------------------|-------------------------|---------------------|--|------------------------|-------------------------|--------------------------|-------|
| ESA-listed ESU/DPS                           | MPG                            | Population                                | CFS acquired or enhanced    | # of screens addressed | # of barriers addressed | Stream miles opened | Stream miles improved                                | Stream miles protected | Riparian acres improved | Riparian Acres protected |       |
| Columbia River Steelhead                     | Eastern Slope Tributaries      | eastside                                  |                             |                        |                         |                     |  |                        |                         |                          |       |
|  |                                | Deschutes River - westside                |                             |                        |                         |                     |  | 20.14                  |                         | 652.4                    |       |
|  |                                | Fifteenmile Creek (winter run)            | 3.76                        |                        |                         |                     |  | 21.16                  |                         | 340.8                    |       |
|  |                                | Klickitat River                           |                             |                        |                         |                     |  |                        |                         |                          |       |
|  |                                | Rock Creek                                |                             |                        |                         |                     |  |                        |                         |                          |       |
|  | John Day River                 | John Day River lower mainstem tributaries |                             |                        |                         | 15                  | 42.5   | 0.37                   | 60.51                   | 44                       | 869.9 |
|  |                                | John Day River upper mainstem             | 7.65                        | 1                      | 17                      | 58.25               | 8.1  | 9.7                    | 8.8                     | 153.1                    |       |
|  |                                | Middle Fork John Day River                | 25.27                       |                        | 13                      | 80.5                | 8.42   | 3                      | 33.5                    | 55                       |       |
|  |                                | North Fork John Day River                 | 0.9                         |                        | 1                       | 2.5                 |  | 5.1                    | 112.1                   | 492                      |       |
|  |                                | South Fork John Day River                 |                             | 1                      | 2                       | 4.5                 | 0.2  | 2.3                    | 15                      | 52                       |       |
|  | Umatilla and Walla Walla River | Touchet River                             | 2.78                        |                        | 2                       | 100.1               |  |                        |                         | 130                      |       |
|  |                                | Umatilla River                            | 6.2                         |                        | 3                       | 13                  | 24.84  | 14.98                  | 10                      | 18.3                     |       |
|  |                                | Walla Walla River                         | 1.22                        |                        | 1                       | 30                  | 0.22   |                        |                         |                          |       |
|  | Yakima River Group             | Naches River                              | 1.2                         |                        | 1                       | 1.5                 | 0.25   |                        |                         |                          |       |
|  |                                | Satus Creek                               |                             |                        |                         |                     |  |                        | 112                     |                          | 8062  |
|  |                                | Toppenish                                 |                             |                        | 1                       | 50                  | 1.5  | 1.7                    |                         |                          | 97    |
|  |                                |   | Yakima River upper mainstem | 36.79                  |                         | 1                   | 1.5  | 0.11                   | 10                      | 0.9                      |       |
| <i>Middle Columbia River Steelhead Total</i> |                                |   | <i>189.77</i>               | <i>2</i>               | <i>57</i>               | <i>384.35</i>       | <i>44.91</i>   | <i>312.29</i>          | <i>354.3</i>            | <i>11391.1</i>           |       |
| Snake River Steelhead                        | Clearwater River               | Clearwater River lower mainstem           |                             |                        | 3                       | 18.3                |  |                        | 279.6                   |                          |       |
|  |                                | Lochsa River                              |                             |                        | 4                       | 5                   |  |                        | 62.5                    |                          |       |
|  |                                | Lolo Creek                                |                             |                        | 2                       | 5.2                 | 0.1  |                        |                         |                          |       |

| 2007/2008 Completed Metric |     |  |                          | Water Quantity         | Entrainment             | Passage             | Channel complexity    | Water Quality<br>Riparian Protection and Enhancement |                         |                          |  |
|----------------------------|-----|--|--------------------------|------------------------|-------------------------|---------------------|-----------------------|--|-------------------------|--------------------------|--|
| ESA-listed ESU/DPS         | MPG | Population   | CFS acquired or enhanced | # of screens addressed | # of barriers addressed | Stream miles opened | Stream miles improved | Stream miles protected                               | Riparian acres improved | Riparian Acres protected |  |
|                            |     | Selway River   |                          |                        |                         |                     |                       |  |                         |                          |  |
|                            |     | South Fork Clearwater River  |                          |                        | 6                       | 28                  |                       |  | 12.6                    |                          |  |
| Grande Ronde River         |     | Grande Ronde River lower mainstem tributaries                      |                          |                        | 2                       | 11.5                |                       |  |                         |                          |  |
|                            |     | Grande Ronde River upper mainstem                                  |                          |                        | 3                       | 28.5                | 15.2                  |  | 375.4                   |                          |  |
|                            |     | Joseph Creek (OR)  |                          |                        | 1                       | 1.2                 | 8                     |  |                         | 2                        |  |
|                            |     | Joseph Creek (WA)  |                          |                        |                         |                     |                       |  |                         |                          |  |
|                            |     | Wallowa River  | 17.22                    |                        | 1                       | 5                   | 1                     |  |                         | 16                       |  |
| Hells Canyon               |     | Hells Canyon   |                          |                        |                         |                     |                       |  |                         |                          |  |
| Imnaha River               |     | Imnaha River   |                          |                        |                         |                     |                       |  |                         |                          |  |
| Lower Snake                |     | Asotin Creek   |                          |                        |                         |                     |                       |  | 124.2                   |                          |  |
|                            |     | Tucannon River   |                          |                        | 1                       | 11.2                |                       | 17.8   |                         | 369.8                    |  |
| Salmon River               |     | Lower Middle Fork mainstem and tribs (Big, Camas, and Loon Creeks) |                          |                        |                         |                     | 0.08                  |  |                         |                          |  |
|                            |     | Chamberlain Creek  | 2                        |                        |                         |                     |                       |  |                         |                          |  |
|                            |     | East Fork Salmon River   |                          | 1                      | 1                       | 2                   | 2                     |  | 0.4                     |                          |  |
|                            |     | Lemhi River  | 39.53                    |                        | 5                       | 147                 |                       |  |                         |                          |  |
|                            |     | Little Salmon and Rapid River                                      | 0                        |                        | 3                       | 15.5                |                       |  |                         |                          |  |
|                            |     | Middle Fork Salmon River upper mainstem                            | 7.66                     |                        |                         |                     |                       |  |                         |                          |  |
|                            |     | North Fork Salmon River  | 0                        |                        |                         |                     |                       |  |                         |                          |  |

| 2007/2008 Completed Metric                  |   |                             |                          | Water Quantity         | Entrainment             | Passage             | Channel complexity    | Water Quality<br>Riparian Protection and Enhancement |                         |                          |
|---|---|-----------------------------|--------------------------|------------------------|-------------------------|---------------------|-----------------------|--|-------------------------|--------------------------|
| ESA-listed ESU/DPS                          | MPG                                       | Population                  | CFS acquired or enhanced | # of screens addressed | # of barriers addressed | Stream miles opened | Stream miles improved | Stream miles protected                               | Riparian acres improved | Riparian Acres protected |
|   |   | Pahsimeroi River            | 37.15                    |                        | 1                       | 1                   |                       |  |                         |                          |
|   |   | Panther Creek               | 0                        |                        |                         |                     |                       |  |                         |                          |
|   |   | Salmon River upper mainstem | 37.15                    |                        | 1                       | 3                   |                       |  | 5                       |                          |
|   |   | Secesh River                |                          |                        |                         |                     |                       |  |                         |                          |
|   |   | South Fork Salmon River     |                          |                        |                         |                     |                       |  |                         |                          |
| <i>Snake River Steelhead Total</i>          |   |                             | <i>140.71</i>            | <i>1</i>               | <i>34</i>               | <i>282.4</i>        | <i>26.38</i>          | <i>17.8</i>  | <i>877.7</i>            | <i>369.8</i>             |
| Upper Columbia River Steelhead              | Upper Columbia River - Below Chief Joseph | Entiat River                |                          |                        | 1                       |                     | 1                     |  |                         |                          |
|   |   | Methow River                | 97.5                     | 1                      | 6                       | 113.8               | 3.5                   |  |                         |                          |
|   |   | Okanogan River              | 25                       |                        |                         |                     |                       | 0.51   | 20.4                    |                          |
|   |   | Wenatchee River             |                          | 5                      | 13                      | 20.4                | 1.2                   |  | 0.6                     |                          |
| <i>Upper Columbia River Steelhead Total</i> |   |                             | <i>122.5</i>             | <i>6</i>               | <i>20</i>               | <i>134.2</i>        | <i>5.7</i>            | <i>0.51</i>  | <i>21</i>               |                          |

## Attachment 3: FY07 – FY08 Progress of Projects, and Actions Identified for 2007-2009 Implementation in the FCRPS Biological Assessment, Attachment B.2.2-2, Tables 1-6

The Action Agencies committed to provide funding and technical assistance for specific tributary habitat projects as listed in Attachment B.2.2-2, Tables 1-6, of the FCRPS Biological Assessment. These projects were used as the basis for estimating changes in habitat quality for specific populations and established an initial performance standard for annual progress reporting. The tables in Attachment 3 describe the 2007 and 2008 implementation progress of the projects identified for implementation in the FCRPS Biological Assessment. Accomplishments may be reported more than once if they benefit both Chinook and steelhead. The 2009 Annual Progress Report will provide a full accounting of project progress for the 2007-2009 implementation cycle as anticipated in the FCRPS Biological Assessment.

**Table 1. Tributary Habitat Actions Identified for 2007-2009 Implementation in FCRPS BA, Attachment B.2.2-2, Tables 1a & b: Upper Columbia Spring Chinook & Steelhead**

| <b>Upper Columbia Spring Chinook &amp; Steelhead</b> (NOTE: Projects that benefit multiple ESUs/DPSs or populations are reported more than once) |                  |   |                                      |   |
|--|------------------|---|--------------------------------------|---|
| <b>Population</b>  | <b>Project #</b> | <b>Project Title &amp; Short Description</b>  | <b>2007–09 Action Description</b>    | <b>FY07-08 Progress</b>                             |
| Entiat River   | 200703400        | Columbia Cascade Pump Screen Correction<br>This project proposes to start a voluntary compliance pump screen correction program in the Methow, Entiat, and Wenatchee River basins in order to reduce juvenile fish losses due to entrapment in water diversions.  | Install Fish Screen                  | Pending inventory assessment                        |
|  | 200705500        | Entiat River - UPA - Lower Entiat River Off-Channel Restoration Project<br>The Lower Entiat River Off-Channel enhancement project will provide 0.28 miles of off-channel habitat to benefit Upper Columbia ESA listed steelhead, spring Chinook, and bull trout. An irrigation channel will be enhanced for rearing and spawning habitat. | Develop Pond                         | Contract in FY10                                    |
|  |                  |   | Increase Instream Habitat Complexity |   |
|  |                  |   | Install Fish Passage Structure       |   |
|  | 200723100        | UPA Entiat Subbasin Riparian Enhancement Program<br>Riparian projects are being proposed in the Entiat  | Plant Vegetation                     | 0.5 riparian mile fenced; 0.7 riparian mile planted |
| Install Fence  |                  |   |                                      |   |
|  |                  |   | Maintain Vegetation                  |   |

**Upper Columbia Spring Chinook & Steelhead** (NOTE: Projects that benefit multiple ESUs/DPSs or populations are reported more than once)

| Population   | Project # | Project Title & Short Description  | 2007–09 Action Description   | FY07-08 Progress   |
|--------------|-----------|--|--|--|
|              |           | subbasin to benefit Upper Columbia spring Chinook, steelhead and bull trout. Funding is requested for Tillicum Creek Fence and programmatic riparian projects.   | Plant Vegetation   |  |
|              | 200731800 | Entiat River - UPA - Knapp-Wham Hanan Detwiler Irrigation System Consolidation Project<br>Consolidation of the Knapp-Wham and Hanan Detwiler irrigation systems will eliminate partial fish passage barriers associated with 2 surface water diversions, add instream habitat within the lower Entiat River, and enhance instream flows via water saved. | Develop Alternative Water Source<br>Increase Instream Habitat Complexity<br>Install Well<br>Remove/Install Diversion | 10 new wells installed; regulatory permits received for instream structures            |
| Methow River | 200703400 | Columbia Cascade Pump Screen Correction<br>This project proposes to start a voluntary compliance pump screen correction program in the Methow, Entiat, and Wenatchee River basins in order to reduce juvenile fish losses due to entrapment in water diversions.   | Install Fish Screen  | Project work focused on Okanogan; Methow pending inventory, assessment, prioritization |
|              | 200703500 | UPA Project - Methow Basin Riparian Enhancement<br>MSRF proposes to partner with Bureau of Reclamation and Methow Conservancy to identify and prioritize riparian enhancement projects that will add value to passage, access and conservation projects. All projects will focus on TES species and habitat.   | Install Fence<br>Plant Vegetation  | 2.03 miles riparian fencing installed; 2.8 riparian miles planted                      |
|              | 200717200 | UPA Project - MVID West Canal Diversion and Headworks<br>Move POD 175' upstream by installing new concrete diversion headworks, realign 150' of  | Install Fish Passage Structure   | Project scope under consideration to assess fish benefits                              |

**Upper Columbia Spring Chinook & Steelhead** (NOTE: Projects that benefit multiple ESUs/DPSs or populations are reported more than once)

| Population | Project # | Project Title & Short Description   | 2007–09 Action Description  | FY07-08 Progress   |
|------------|-----------|---|---|--|
|            |           | West Canal intake and build new access road to connect new headworks, construct permanent channel-spanning natural rock roughened channel permanent diversion.  | Operate and Maintain Habitat/Passage<br>Plant Vegetation<br>Remove/Install Diversion  |  |
|            | 200721400 | UPA Project - Fender Mill Floodplain Restoration - Phase 1 Restore natural channel process, reestablish side channel rearing habitat, restore-improve riparian forest habitat, add wood complexes in main stem, install rock structure to keep majority of flow in main stem, breach existing levee, connect side channels. | Create, Restore, and/or Enhance Wetland<br>Increase Instream Habitat Complexity<br>Operate and Maintain Habitat/Passage<br>Plant Vegetation                       | Implementation deferred because of lengthy land acquisition and permitting processes |
|            | 200723700 | UPA Project - Elbow Coulee Floodplain Restoration This project would eliminate a dike; open an existing side channel and floodplain; reconnect a wetland; and use large woody debris and boulders to split flows. These would increase habitat complexity and create more dynamic habitats for listed salmonids.            | Create, Restore, and/or Enhance Wetland<br>Enhance Floodplain<br>Increase Instream Habitat Complexity<br>Operate and Maintain Habitat/Passage<br>Plant Vegetation | Dike notching, sill construction, and minimal channel improvements completed         |
|            |           |   | Realign, Connect, and/or Create Channel<br>Upland Erosion and Sedimentation Control   |  |

**Upper Columbia Spring Chinook & Steelhead** (NOTE: Projects that benefit multiple ESUs/DPSs or populations are reported more than once)

| Population      | Project # | Project Title & Short Description  | 2007–09 Action Description                    | FY07-08 Progress  |
|-----------------|-----------|--|---|---|
|                 | 200725100 | UPA Project - Methow Valley Irrigation District East Diversion Dam Replacement<br>This project will remove the present channel-spanning irrigation diversion dam and replace it with a reinforced earth and rock wing dam parallel to the thalweg. This project will also re-open 1/4 mile of side channel habitat blocked by a pushup berm. | Operate and Maintain Habitat/Passage          | Regulatory permitting and environmental compliance completed                              |
|                 |           |  | Plant Vegetation                              |   |
|                 |           |  | Realign, Connect, and/or Create Channel       |   |
|                 |           |  | Remove/Install Diversion                      |   |
|                 | 200726400 | UPA Project - Programmatic Habitat Complexity Projects in the Methow River Subbasin<br>These projects would eliminate dikes, open side channels, and enhance floodplain connectivity at various sites in the Methow subbasin. Identification and ranking to be based on MIHRP study.   | Realign, Connect, and/or Create Channel       | Regulatory permitting and environmental compliance under way                              |
|                 | 200201301 | Water Entity<br>Fund water right transactions that restore streamflows and focused riparian easements on critical fish-bearing Columbia Basin tributaries. Implemented as the Columbia Basin Water Transactions Program (CBWTP) in a partnership between BPA and NFWF.   | Acquire Water Instream                        | 29.3 cfs acquired or enhanced   |
|                 |           |  | Develop and Negotiate Water Right Transaction |   |
|                 |           |  | Install Flow Measuring Device                 |   |
|                 |           |  | Land Purchase                                 |   |
| Wenatchee River | 200703400 | Columbia Cascade Pump Screen Correction<br>This project proposes to start a voluntary compliance pump screen correction program in the Methow, Entiat, and Wenatchee River basins in order to reduce juvenile fish losses due to entrapment in water diversions.   | Install Fish Screen                           | Project work focused on Okanogan; Wenatchee pending inventory, assessment, prioritization |

**Upper Columbia Spring Chinook & Steelhead** (NOTE: Projects that benefit multiple ESUs/DPSs or populations are reported more than once)

| Population | Project # | Project Title & Short Description   | 2007–09 Action Description                                   | FY07-08 Progress                       |
|------------|-----------|---|--|--|
|            | 200704200 | UPA Wenatchee Passage Program<br>To replace 9 barrier culverts in Alder Creek, Clear Creek and Beaver Creek with fish-friendly structures to provide 4.0 miles of spawning and rearing habitat for ESA listed Upper Columbia steelhead.   | Install Fish Passage Structure<br><br>Remove/Modify Dam      | Combined into new project 200740000    |
|            | 200708500 | UPA Nason Creek Oxbow Reconnection Project<br>Project proposes to install two bottomless arch culverts in SR 207 to successfully reconnect 0.64 miles of historic oxbow habitat to the mainchannel Nason Creek. This project will increase Spring Chinook salmonid abundance by 25-50% in the Nason A.U.              | Install Fish Passage Structure                               | Combined into new project 200740000    |
|            | 200708600 | UPA Wenatchee Subbasin Riparian Enhancement Proposal<br>The Wenatchee Riparian proposal will involve planting native vegetation and fencing to establish a properly functioning riparian buffer in the Wenatchee Assessment Units. This project will benefit Upper Columbia steelhead, spring Chinook and bull trout. | Install Fence<br><br>Maintain Vegetation<br>Plant Vegetation | 0.26 mile riparian vegetation improved |
|            | 200728300 | UPA Wenatchee Subbasin Access Proposal<br>Forty three (43) potential fish passage barrier structures are being proposed for funding to benefit Upper Columbia spring Chinook, steelhead and bull trout. Emphasis is on replacing the Mill Creek Culvert near the mouth of Peshastin Creek.                            | Install Fish Passage Structure                               | Combined into new project 200740000    |

**Upper Columbia Spring Chinook & Steelhead** (NOTE: Projects that benefit multiple ESUs/DPSs or populations are reported more than once)

| Population     | Project # | Project Title & Short Description  | 2007–09 Action Description                    | FY07-08 Progress                                      |
|----------------|-----------|--|---|---|
|                | 200732500 | UPA Wenatchee Subbasin Complexity Proposal<br>Five potential complexity projects are being proposed for funding to benefit Upper Columbia spring Chinook, steelhead and bull trout. Funds are also requested for unidentified potential complexity projects to assist in meeting UPA metric goals.                           | Realign, Connect, and/or Create Channel       | 0.1 mile stream complexity improved                   |
|                | 200740000 | Wenatchee River Subbasin Fish Passage Enhancement (combination of 200704200, 2000708500, & 200728300)  | Install Fish Passage Structure                | 0.8 mile instream habitat accessed                    |
| Okanogan River | 199604200 | Restore and Enhance Anadromous Fish Populations and Habitat in Salmon Creek<br>This project is directed at reconnecting a productive tributary of the Okanogan River, Salmon Creek. This project involves a water lease with the Okanogan Irrigation District and construction of a low flow channel within the lower reach. | Acquire Water Instream                        | Channel modification design drafted, permits acquired |
|                |           |  | Develop and Negotiate Water Right Transaction |   |
|                |           |  | Install Well                                  |   |
|                |           |  | Realign, Connect, and/or Create Channel       |   |
|                | 200000100 | Anadromous Fish Habitat & Passage<br>The Tribe proposes continuing habitat rehabilitation efforts to decrease sediment loads and improve passage for anadromous steelhead and salmon. In addition, monitoring and evaluation efforts will assess effectiveness of ongoing activities.  | Develop Alternative Water Source              | 1.2 miles riparian, 0.4 mile upland fence installed   |
|                |           |  | Install Fence                                 |   |
|                | 200714500 | Okanogan Livestock and WaterProvide a cost share program to assist producers in developing offsite water for livestock and provide assistanc   | Develop Alternative Water Source              | 1.1 miles riparian fenced                             |
|                |           |  | Install Fence                                 |   |

**Upper Columbia Spring Chinook & Steelhead** (NOTE: Projects that benefit multiple ESUs/DPSs or populations are reported more than once)

| Population | Project # | Project Title & Short Description   | 2007-09 Action Description                    | FY07-08 Progress          |
|------------|-----------|---|---|---------------------------|
|            |           | fencing riparian areas. Allowing producers to respond to and prevent complaints.  | Plant Vegetation                              |                           |
|            | 200722400 | Implementation of the Okanogan Subbasin Plan. Initiate a Programmatic and Sequenced set of Key Habitat Restoration and Protection Actions. The integration of science into management, decision-making and recommended actions is an essential task for resource managers. This phased and programmatic plan is the centerpiece for mitigation, recovery and conservation in the Okanogan R & the Province. | Acquire Water Instream                        | 2 riparian acres improved |
|            |           |   | Enhance Floodplain                            |                           |
|            |           |   | Plant Vegetation                              |                           |
|            |           |   | Realign, Connect, and/or Create Channel       |                           |
|            |           |   | Upland Erosion and Sedimentation Control      |                           |
|            | 200201301 | Water Entity<br>Fund water right transactions that restore streamflows and focused riparian easements on critical fish-bearing Columbia Basin tributaries. Implemented as the Columbia Basin Water Transactions Program (CBWTP) in a partnership between BPA and NFWF.  | Acquire Water Instream                        | 25 cfs acquired           |
|            |           |   | Develop and Negotiate Water Right Transaction |                           |
|            |           |   | Install Flow Measuring Device                 |                           |
|            |           |   | Land Purchase                                 |                           |

**Table 2. Actions Identified for 2007-2009 Implementation in FCRPS BA, Attachment B.2.2-2, Table 2: Middle Columbia Steelhead**

| Middle Columbia Steelhead |           |                                   |                            |                  |
|---------------------------|-----------|-----------------------------------|----------------------------|------------------|
| Population                | Project # | Project Title & Short Description | 2007-09 Action Description | FY07-08 Progress |

**Middle Columbia Steelhead**

| Population                  | Project # | Project Title & Short Description  | 2007-09 Action Description               | FY07-08 Progress   |
|-----------------------------|-----------|--|--|--|
| Klickitat River (above BON) | 199705600 | Klickitat Watershed Enhancement<br>This project (KWEP) restores, enhances, and protects watershed health to aid recovery of native salmonid stocks in the Klickitat subbasin. Implemented by the Yakama Nation Fisheries Program and funded by BPA, KWEP addresses FWP goals and objectives. | Create, Restore, and/or Enhance Wetland  | Environmental compliance, plan design and specifications prepared; 2.2 miles instream habitat accessed and 7.3 riparian acres improved |
|                             |           |  | Develop Alternative Water Source         |  |
|                             |           |  | Enhance Floodplain                       |  |
|                             |           |  | Increase Instream Habitat Complexity     |  |
|                             |           |  | Install Fence                            |  |
|                             |           |  | Install Fish Passage Structure           |  |
|                             |           |  | Install Flow Measuring Device            |  |
|                             |           |  | Maintain Vegetation                      |  |
|                             |           |  | Operate and Maintain Habitat/Passage     |  |
|                             |           |  | Plant Vegetation                         |  |
|                             |           |  | Realign, Connect, and/or Create Channel  |  |
|                             |           |  | Upland Erosion and Sedimentation Control |  |

**Middle Columbia Steelhead**

| Population                     | Project # | Project Title & Short Description   | 2007-09 Action Description           | FY07-08 Progress  |
|--------------------------------|-----------|---|--------------------------------------|---|
|                                |           |   | Decommission Road                    |   |
|                                |           |   | Enhance Nutrients Instream           |   |
|                                |           |   | Improve/Relocate Road                |   |
|                                |           |   | Remove vegetation                    |   |
|                                |           |   | Remove Debris                        |   |
|                                | 198812035 | YKFP Klickitat Management, Data, and Habitat<br>Proposal provides for all YN management functions associated with the Yakima/Klickitat Fisheries Project including project planning, O&M, research, data management, and habitat improvement and acquisition actions in the Klickitat Subbasin. | Habitat improvement                  | Klickitat Master Plan under development                     |
|                                |           |   | Lease Land                           |   |
| Fifteen Mile Creek (above TDA) | 200102100 | 15 Mile Creek Riparian Buffers<br>This proposal develops riparian buffer systems on streams in the Fifteenmile Subbasin and other direct tributaries to the Columbia River in northern Wasco County. Implementation of buffer plans developed under this proposal are fully funded by USDA.     | Riparian Enhancement                 | 373.6 riparian acres protected through CCRP/CREP agreements |
|                                | 199304000 | Fifteenmile Creek Habitat Restoration and Monitoring Project<br>Provide continued operation and maintenance on previously installed fencing and instream habitat, monitor the success of all restoration efforts, and begin implementation to improve instream habitat                          | Develop Alternative Water Source     | 2.15 miles riparian fencing installed                       |
|                                |           |   | Increase Instream Habitat Complexity |   |
|                                |           |   | Install Fence                        |   |

**Middle Columbia Steelhead**

| <b>Population</b>              | <b>Project #</b> | <b>Project Title &amp; Short Description</b>   | <b>2007-09 Action Description</b>       | <b>FY07-08 Progress</b>  |
|--------------------------------|------------------|--|---|--|
|                                |                  | complexity within the Fifteenmile Creek Subbasin.  | Maintain Vegetation                     |  |
|                                |                  |  | Operate and Maintain Habitat/Passage    |  |
| Eastside Deschutes (above TDA) | 199404200        | Trout Creek Fish Habitat Restoration Project Construction, O&M, and M&E of numerous new and existing instream and riparian habitat restoration projects; Monitoring and Evaluation of summer steelhead smolt production and adult return. M&E of instream and riparian habitat restoration activities. | Develop Alternative Water Source        | 0.9 stream mile added; 3 acres wetland improved as a result of channel work                                    |
|                                |                  |  | Enhance Floodplain                      |  |
|                                |                  |  | Maintain Vegetation                     |  |
|                                |                  |  | Realign, Connect, and/or Create Channel |  |
|                                | 199802800        | Trout Creek Watershed Restoration Project Implementation of numerous riparian and upland habitat improvement projects on private lands in the Trout Creek watershed, Deschutes Basin. Monitoring and evaluation of current and past projects.  | Enhance Floodplain                      | Johnson & Priday irrigation improvements — pipeline installed, instream water acquired, fish screens installed |
|                                |                  |  | Plant Vegetation                        |  |
|                                |                  |  | Realign, Connect, and/or Create Channel |  |
|                                |                  |  | Remove/Install Diversion                |  |
|                                |                  |  | Install Pipeline                        |  |

**Middle Columbia Steelhead**

| <b>Population</b>                                       | <b>Project #</b> | <b>Project Title &amp; Short Description</b>  | <b>2007-09 Action Description</b>  | <b>FY07-08 Progress</b>   |
|---|------------------|---|--|---|
|   | 200201900        | Wasco Riparian Buffers<br>This proposal develops riparian buffer systems in southern Wasco County in the lower Deschutes and lower John Day subbasins of the Columbia Plateau Province. Implementation of buffer plans developed under this proposal is fully fun   | Riparian Enhancement   | 1179 riparian acres protected through CCRP/CREP agreements  |
| At least 1 John Day MPG population (above John Day dam) | 200201900        | Wasco Riparian Buffers<br>This proposal develops riparian buffer systems in southern Wasco County in the lower Deschutes and lower John Day subbasins of the Columbia Plateau Province. Implementation of buffer plans developed under this proposal is fully funded by USDA.   | Riparian Enhancement   | 1179 riparian acres protected   |
|   | 198402100        | Mainstem, Middle Fork, John Day Rivers Fish Habitat Enhancement Project<br>This project was initiated on July 1, 1984, (BPA) contract number DE A179-84 BP17460 and allows for initial landowner contacts, agreement development, project design, budgeting, and implementation for anadromous fish habitat on private lands. | Develop Alternative Water Source<br><br>Increase Instream Habitat Complexity | 58 structures installed, 0.57 mile stream complexity improved, 54 miles riparian fencing, 471 riparian acres protected through leases, 100 riparian acres planted |
|   |                  | Install Fence<br>Operate and Maintain Habitat/Passage<br>Plant Vegetation<br>Remove vegetation  |  |   |
|   | 199306600        | Oregon Fish Screens Project<br>The project provides immediate and long-term protection for anadromous and resident fish species in the John Day,  | Install Fish Passage Structure<br><br>Install Fish Screen                    | 6.5 miles habitat accessed, 1 screen addressed  |

**Middle Columbia Steelhead**

| Population | Project # | Project Title & Short Description  | 2007-09 Action Description  | FY07-08 Progress           |
|------------|-----------|--|---|----------------------------|
|            |           | Umatilla, and Walla Walla basins by the installation or replacement of out dated fish protection and passage devices on irrigation diversions.   | Operate and Maintain Habitat/Passage<br>Remove/Install Diversion  |                            |
|            | 199801800 | John Day Watershed RestorationContinue implementation of protection and restoration actions, planned under the John Day Subbasin Plan, to improve water quality, water quantity, and riparian habitat, and to eliminate passage barriers for anadromous and resident fish. | Develop Alternative Water Source<br>Increase Instream Habitat Complexity<br>Install Fish Passage Structure<br>Maintain Vegetation<br>Plant Vegetation | 3.5 miles habitat accessed |
|            |           |  | Remove/Install Diversion<br>Remove vegetation<br>Install Pipeline   |                            |
|            | 199901000 | Pine Hollow/Jackknife Habitat Implement practices to reduce erosion, flooding, and protect critical areas in the stream corridor which will allow natural recovery of riparian vegetation and channel stability in the Pine Hollow and Jackknife watersheds.               | Develop Alternative Water Source<br>Install Fence<br>Plant Vegetation<br>Upland Erosion and Sedimentation Control                                     | 468 upland acres improved  |

**Middle Columbia Steelhead**

| Population | Project # | Project Title & Short Description  | 2007-09 Action Description                    | FY07-08 Progress   |
|------------|-----------|--|---|--|
|            |           |  | Remove vegetation                             |  |
|            | 200001500 | Oxbow Conservation Area Management<br>The 1,022-acre Oxbow Conservation Area project is a mitigation property acquired by the CTWSRO through BPA funding. This proposal aims to continue the O&M, M&E, and habitat improvement projects on this valuable anadromous fish property. | Develop and Negotiate Water Right Transaction | 2.3 miles riparian fencing installed; 1 acre riparian vegetation planted; 33 acres riparian weed control and vegetation management |
|            |           |  | Increase Instream Habitat Complexity          |  |
|            |           |  | Install Fence                                 |  |
|            |           |  | Install Fish Passage Structure                |  |
|            |           |  | Install Fish Screen                           |  |
|            |           |  | Maintain Vegetation                           |  |
|            |           |  | Operate and Maintain Habitat/Passage          |  |
|            |           |  | Plant Vegetation                              |  |
|            |           |  | Realign, Connect, and/or Create Channel       |  |
|            |           |  | Remove vegetation                             |  |
|            |           |  | Conduct Controlled Burn                       |  |
|            | 200003100 | North Fork John Day Basin Anadromous Fish Habitat Enhancement Project<br>Increase habitat for Chinook salmon and steelhead on private and public-owned lands via   | Enhance Floodplain                            | 1.3 miles riparian fencing installed; 380 riparian acres protected through lease; 69 acres riparian vegetation planted             |
|            |           |  | Increase Instream Habitat Complexity          |  |

**Middle Columbia Steelhead**

| Population | Project # | Project Title & Short Description  | 2007-09 Action Description   | FY07-08 Progress   |
|------------|-----------|--|--|--|
|            |           | implementing fencing, off-stream water development, revegetation, culvert replacement, pool development, mine tailing removal and large wood placement projects.   | Install Fence<br>Install Fish Passage Structure<br>Maintain Vegetation<br>Plant Vegetation<br>Lease Land<br>Remove Mine Tailings   |  |
|            | 200104101 | Forrest Conservation Area Management<br>The Forrest Conservation Area consists of 4,232 acres and contains 8.5 miles of critical fish habitat in the Upper Mainstem and Middle Fork John Day River systems. Management prioritizes protection of fish, wildlife and their associated habitats. | Develop and Negotiate Water Right Transaction  | 1 riparian acre enhanced through dike recontour; 35 instream structures installed; 1.15 miles stream complexity improved; 4 miles habitat accessed; 0.5 riparian acre planted; 3 riparian acres improved through vegetation management |
|            |           |  | Increase Instream Habitat Complexity<br>Install Fish Passage Structure<br>Install Fish Screen<br>Maintain Vegetation<br>Operate and Maintain Habitat/Passage<br>Plant Vegetation<br>Remove vegetation<br>Conduct Controlled Burn |  |

**Middle Columbia Steelhead**

| <b>Population</b>                   | <b>Project #</b> | <b>Project Title &amp; Short Description</b>   | <b>2007-09 Action Description</b>    | <b>FY07-08 Progress</b>   |
|-------------------------------------|------------------|--|--------------------------------------|---|
|                                     |                  |  | Investigate Trespass                 |   |
|                                     | 200201500        | Provide Coordination and Technical Assistance to Watershed Councils and Individuals in Sherman County, Oregon  | Riparian Enhancement                 | 261 riparian acres protected through CCRP/CREP Agreements   |
|                                     | 200203400        | Wheeler Co Riparian Buffers<br>This proposal will provide technical support and planning needed to implement riparian buffer contracts (CREP) on streams within Wheeler County. Riparian buffers address many of the limiting factors identified in the John Day Sub-basin Plan                | Riparian Enhancement                 | 115 riparian acres protected through CCRP/CREP Agreements   |
|                                     | 200203500        | Gilliam Co Riparian Buffers<br>We seek BPA funding to continue our riparian buffer position. This job entails making 10-15 year contracts with private landowners to establish riparian areas. Non-BPA monies are then leveraged to develop, maintain and enhance fish and wildlife resources. | Riparian Enhancement                 | 382 riparian acres protected through CCRP/CREP Agreements   |
| Umatilla River (above John Day dam) | 198343600        | Umatilla Passage O&M<br>Westland Irrigation District, as contractor to Bonneville Power Administration, and West Extension Irrigation District, as subcontractor to Westland, provide labor, equipment, and material necessary for the operation, care, and maintenance of fish facilities.    | Operate and Maintain Habitat/Passage | Annual O&M at 17 sites to ensure that ladders, bypasses, screen sites, and trap facilities operate according to design criteria                             |
|                                     | 198710001        | Umatilla Anad Fish Hab - CTUIR instream and riparian habitat restoration for fisheries and wildlife in the Umatilla River Basin.   | Develop Alternative Water Source     | 41 miles stream complexity improved; 13 miles instream habitat accessed; 2 riparian acres planted; 365 riparian acres improved through noxious weed control |

**Middle Columbia Steelhead**

| Population | Project # | Project Title & Short Description  | 2007-09 Action Description  | FY07-08 Progress  |
|------------|-----------|--|---|---|
|            |           |  | Increase Instream Habitat Complexity<br>Install Fence<br>Maintain Vegetation<br>Operate and Maintain Habitat/Passage<br>Plant Vegetation  |   |
|            |           |  | Remove/Modify Dam<br>Remove vegetation<br>Lease Land  |   |
|            | 198710002 | Umatilla Subbasin Fish Habitat Improvement Project<br>The ongoing Umatilla Subbasin Fish Habitat Improvement Project (19871-100-02) is aimed at protecting (where possible) and enhancing/rehabilitating (where required), degraded fish habitat on private lands using passive and active restoration techniques. | Develop Alternative Water Source<br>Develop and Negotiate Water Right Transaction<br>Increase Instream Habitat Complexity<br>Install Fence<br>Maintain Vegetation<br>Operate and Maintain Habitat/Passage | 3.25 miles riparian fencing installed; 7 riparian acres protected through cooperative agreements/leases/easements; 4 riparian acres planted |

**Middle Columbia Steelhead**

| Population | Project # | Project Title & Short Description   | 2007-09 Action Description   | FY07-08 Progress                |
|------------|-----------|---|--|---------------------------------|
|            |           |   | Plant Vegetation<br>Realign, Connect, and/or Create Channel<br>Remove/Modify Dam |                                 |
|            |           |   | Improve/Relocate Road<br>Remove vegetation<br>Lease Land                         |                                 |
|            | 198802200 | Umatilla Fish Passage Operations<br>Increase survival of migrating juvenile and adult salmon and steelhead in the Umatilla Basin by operating passage facilities, flow enhancement measures, trapping facilities, and transport equipment to provide adequate passage conditions.             | Operate and Maintain Habitat/Passage<br>Trap and Haul                            | Trap and haul of 2,360 migrants |
|            | 198902700 | Power Repay Umatilla Basin Project<br>Provide reimbursement of power costs to Umatilla Electric Coopeative and Pacific Powr & Light Company for the Umatilla Basin Project pumping plants that provide Columbia River water to irrigators in exchange for Umatilla River water left instream. | Acquire Water Instream   | Ongoing utility reimbursements  |

**Middle Columbia Steelhead**

| <b>Population</b>             | <b>Project #</b> | <b>Project Title &amp; Short Description</b>   | <b>2007-09 Action Description</b>             | <b>FY07-08 Progress</b>   |
|-------------------------------|------------------|--|---|---|
| Walla Walla River (above MCN) | 199601100        | Walla Walla Juvenile and Adult Passage Improvements<br>Provide safe passage for migrating juvenile and adult salmonids in the Walla Walla Subbasin by constructing and maintaining passage facilities at irrigation diversion dams and canals and other passage barriers.                              | Install Fish Screen                           | Fish passage structures installed — 30 miles instream habitat accessed<br><br>Project work now combined with 2007-396-00  |
|                               | 199604601        | Walla Walla River Basin Fish Habitat Enhancement<br>The proposed project is a continued effort by the CTUIR to protect and restore habitat critical to the recovery of salmonid fish populations in the Walla Walla River Basin.   | Increase Instream Habitat Complexity          | 0.22 mile stream complexity improved; 0.75 mile riparian fencing installed; 9 riparian acres planted; 29 upland acres planted   |
|                               |                  |  | Maintain Vegetation                           |   |
|                               |                  |  | Plant Vegetation                              |   |
|                               | 200003300        | Walla Walla River Fish Passage Operations<br>Increase survival of migrating salmonids in the Walla Walla Basin by coordinating the overall passage program including monitoring passage conditions and operation of passage facilities and transport equipment to provide adequate passage conditions. | Operate and Maintain Habitat/Passage          | 261 fish trapped and hauled   |
|                               |                  |  | Trap and Haul                                 |   |
|                               | 200203600        | Restore Walla Walla River Flow<br>Irrigation efficiency and shallow aquifer recharge will improve Walla Walla River flows on flow -impaired priority restoration reaches at times of the year that are critical for steelhead, spring Chinook, and bull trout passage and habitat use.                 | Develop and Negotiate Water Right Transaction | Project work merged into 2007-396-00 Walla Walla Basinwide Tributary Passage and Flow Project — new intake and fish screens and fish passage structure installed to access 100 miles of habitat |
|                               |                  |  | Install Pipeline                              |   |
|                               |                  |  | Install Sprinkler                             |   |

**Middle Columbia Steelhead**

| <b>Population</b>  | <b>Project #</b>  | <b>Project Title &amp; Short Description</b>   | <b>2007-09 Action Description</b>   | <b>FY07-08 Progress</b>  |
|--|---|--|---|--|
|  | 200721700   | Operation and Maintenance for Walla Walla Basin Passage Projects Operation and maintenance of BPA-Constructed fish passage facilities in the Walla Walla Sub-basin.  | Operate and Maintain Habitat/Passage  | Annual O&M at Garden City/Lowden No. 2 Diversion Consolidation and Fish Passage Project, Gardena Fish Screens and related equipment, Gardena Ladder and related equipment, Little Walla Walla River fish screen facility, Nursery Bridge fish ladder |
| At least 1 populations:<br>- Satus Creek (above MCN)<br>- Toppenish Creek (above MCN)<br>- Naches River (above MCN)<br>- Upper Mainstem Yakima (above MCN) | 199206200   | Yakama Nation - Riparian/Wetlands Restoration<br>Continue implementation on YN Wetlands/Riparian Restoration Project by protecting and restoring native floodplain habitats along anadromous fish-bearing waterways in the agricultural area of the Yakama Reservation (~2,000 acres per year).    | Maintain Vegetation   | 60 riparian acres and 35 upland acres improved through controlled burn; 97 riparian acres protected through lease/easement/purchase; 165 upland acres planted  |
|  |   |  | Operate and Maintain Habitat/Passage  |  |
|  |   |  | Plant Vegetation  |  |
|  |   |  | Remove Debris   |  |
|  |   |  | Lease Land  |  |
|  | 199603501   | Yakama Reservation Watersheds Project<br>The YRWP works to restore natural function to the Satus, Toppenish and Ahtanum Watersheds. Our restoration and monitoring efforts take a comprehensive approach to the restoration of habitat for fisheries resources including steelhead and bull trout. | Enhance Floodplain  | 40 floodplain acres improved; 1.5 miles stream complexity improved; 13.2 miles riparian fencing installed; 59 miles stream habitat accessed; 1 fish screen installed; 8,062 riparian acres and 72,559 upland acres protected through lease           |
|  |   |  | Increase Instream Habitat Complexity  |  |
|  |   |  | Install Fence   |  |
|  |   |  | Plant Vegetation  |  |
|  |   |  | Realign, Connect, and/or Create Channel   |  |
| Lease Land   |   |  |   |  |
| 198812025  | YKFP Management, Data, Habitat Proposal provides for all YN management functions associated with the Yakima/Klickitat Fisheries Project including | Increase Instream Habitat Complexity   | 10 instream structures installed<br>155 riparian acres planted<br>11 riparian acres improved through vegetation removal |  |

**Middle Columbia Steelhead**

| Population                           | Project # | Project Title & Short Description  | 2007-09 Action Description              | FY07-08 Progress  |
|--------------------------------------|-----------|--|---|---|
|                                      |           |  | Plant Vegetation                        |   |
|                                      | 199200900 | Yakima Phase II/Huntsville Screen Operation & Maintenance<br>Continue to provide operation and maintenance to BPA's Phase II Fish Screen Facilities to ensure they provide maximum protection to all species and life stages of fish. This O&M function will include the addition of the Manastash basin facilities. | Operate and Maintain Habitat/Passage    | Annual maintenance to provide properly functioning Yakima and Walla Walla Phase II fish protection facilities   |
|                                      | 199503300 | O&M Yakima Basin Fish Screens<br>This proposal provides for continuation of funding for the existing comprehensive operation & maintenance program by Reclamation of BPA owned Yakima Phase II fish screening and trapping facilities.   | Operate and Maintain Habitat/Passage    | Routine O&M and annual maintenance to provide properly functioning fish screens   |
|                                      | 200202501 | Yakima Tributary Access & Habitat Program<br>The Yakima Tributary Access and Habitat Program intends to: a) screen diversion structures; b) provide for fish passage at man-made barriers; c) assist landowners improve stream habitat; and, d) coordinate the acquisition of riparian buffer easements.             | Create, Restore, and/or Enhance Wetland | 0.11 mile of stream complexity improved; 15 instream structures installed; 1.5 miles of habitat accessed; installed Hanson fish screen; removed Upper Lust diversion; installed Eslinger/Sorenson Parke Cr pipeline; improved 1.1 miles of stream reach |
| Develop Alternative Water Source     |           |  |   |   |
| Enhance Floodplain                   |           |  |   |   |
| Increase Instream Habitat Complexity |           |  |   |   |
| Install Fence                        |           |  |   |   |
| Install Fish Passage Structure       |           |  |   |   |
| Install Fish Screen                  |           |  |   |   |
| Install Well                         |           |  |   |   |

**Middle Columbia Steelhead**

| Population | Project # | Project Title & Short Description   | 2007-09 Action Description              | FY07-08 Progress  |
|------------|-----------|---|---|---|
|            |           |   | Maintain Vegetation                     |   |
|            |           |   | Plant Vegetation                        |   |
|            |           |   | Realign, Connect, and/or Create Channel |   |
|            |           |   | Remove/Install Diversion                |   |
|            |           |   | Install Pipeline                        |   |
|            | 200300100 | Manastash Crk Passage & Screening<br>The Manastash Creek Project will provide fish passage, diversion screening and seek instream flow to support fish recovery in the Yakima Basin. This proposal is for Phase 1: screening/passage. Phase 2: instream flow will be a second proposal. | Install Fish Passage Structure          | Design and permitting for Manastash & Keats Jensen diversions, BPA/Water User MOA signed for Barnes Road facilities |
|            |           |   | Install Fish Screen                     |   |
|            |           |   | Maintain Vegetation                     |   |
|            |           |   | Operate and Maintain Habitat/Passage    |   |
|            |           |   | Plant Vegetation                        |   |
|            |           |   | Remove/Modify Dam                       |   |
|            |           |   | Install Pipeline                        |   |

**Middle Columbia Steelhead**

| <b>Population</b> | <b>Project #</b> | <b>Project Title &amp; Short Description</b>   | <b>2007-09 Action Description</b>  | <b>FY07-08 Progress</b>   |
|-------------------|------------------|--|--|---|
|                   | 200702000        | Manastash Instream Flow Enhancement<br>This proposal seeks to enhance instream flow by working with water users to implement irrigation conveyance and onfarm water use efficiency projects, to trust water to the creek and investigate diversion timing to assist steelhead migration.   | Acquire Water Instream<br>Develop and Negotiate Water Right Transaction<br>Install Well<br>Install Pipeline<br>Install Sprinkler | Project merged into 20739800 Yakima Basinwide Tributary Passage and Flow — 0.25 mile stream complexity improved, 5 instream structures installed, fish screens installed at six sites, 0.16 mile riparian vegetation planted, Pott Dam removal/modification with 1.5 miles habitat accessed |
|                   | 200711300        | Cowiche Restoration and Protection Project (Easement/Fee Simple Acquisition)<br>The goal of this project is to protect stream and riparian habitat, and floodplain functions along the Cowiche Creek. The project will acquire conservation easements protecting more than five miles of critical, high quality, steelhead and coho habitat. | Lease Land   | Project closed — Funds transferred to Oak Flats on the Naches   |
|                   | 199705100        | Yakima Basin Side Channels<br>We will replace problematic irrigation diversions and culverts in the Lower North Fork and Mid-mainstem John Day Watersheds with fish-friendly structures that ensure fish passage and improve riparian habitat while efficiently meeting landmanagers' needs.   | Land Purchase  | Conducting real property reviews for habitat acquisitions   |
| All               | 200201301        | Water Entity (Rpa 151) Nwppc<br>Fund water right transactions that restore streamflows and focused riparian easements on critical fish-bearing Columbia  | Acquire Water Instream   | 189.77 cfs flow acquired in 2007/20008 for Middle Columbia River steelhead  |

**Middle Columbia Steelhead**

| <b>Population</b>           | <b>Project #</b> | <b>Project Title &amp; Short Description</b>   | <b>2007-09 Action Description</b>             | <b>FY07-08 Progress</b>   |
|-----------------------------|------------------|--|---|---|
|                             |                  | Basin tributaries. Implemented as the Columbia Basin Water Transactions Program (CBWTP) in a partnership between BPA and NFWF.   | Develop and Negotiate Water Right Transaction |   |
| Naches River                | 200719400        | Oak Flats Acquisition and Habitat Enhancement<br>Acquire a 357 acre multi-parcel site on the Naches River to protect from rural development and enhance 3.0 miles of streamside riparian habitat. Site supports Chinook salmon and Federally threatened mid-Columbia summer steelhead and bull trout.  | Acquire Water Instream                        | Environmental land audit completed; acquisition delayed as a result of MOA and hazardous materials work                               |
|                             |                  |  | Enhance Floodplain                            |   |
|                             |                  |  | Plant Vegetation                              |   |
|                             |                  |  | Remove/Modify Dam                             |   |
|                             |                  |  | Remove Debris                                 |   |
| Yakima River upper mainstem | 200711200        | Teanaway Watershed - Protect critical habitat from development, reduce water temperatures and increase instream flows, restore habitat forming processes in the floodplain.<br>Teanaway watershed supports viable salmonid populations with complex spatial structure and diversity. Maximizing abundance and productivity of focal species requires protecting critical habitat, augmenting instream flows, & restoring floodplain functions. | Acquire Water Instream                        | Pre-acquisition activities for North Fork Teanaway Riparian Conservation Easement; Conservation Plan for the Teanaway Tract completed |
|                             |                  |  | Develop and Negotiate Water Right Transaction |   |
|                             |                  |  | Increase Instream Habitat Complexity          |   |
|                             |                  |  | Install Fence                                 |   |
|                             |                  |  | Maintain Vegetation                           |   |
|                             |                  |  | Operate and Maintain Habitat/Passage          |   |
|                             |                  |  | Plant Vegetation                              |   |

**Table 3.1. Actions Identified for 2007-2009 Implementation in FCRPS BA, Attachment B.2.2-2, Table 3a: Snake River Steelhead**

| <b>Snake River Steelhead</b> |                  |   |   |  |
|------------------------------|------------------|---|---|--|
| <b>Population</b>            | <b>Project #</b> | <b>Project Title &amp; Short Description</b>  | <b>2007-09 Action Description</b>       | <b>FY07-08 Progress</b>  |
| Multiple                     | 200201301        | Water Entity<br>Fund water right transactions that restore streamflows and focused riparian easements on critical fish-bearing Columbia Basin tributaries. Implemented as the Columbia Basin Water Transactions Program (CBWTP) in a partnership between BPA and NFWF.  | Acquire Water Instream                  | 115.91 cfs acquired/enhanced — 17.22 cfs in Lostine/Wallowa River; 39.53 cfs in Lemhi River; 29.55 in Pahsimeroi River; 29.61 in Salmon River upper mainstem above Redfish Lake  |
|                              | 199202601        | Grand Ronde Model Watershed Program Habitat Restoration - Planning, Coordination and Implementation<br>The project coordinates BPA funded restoration activities in the Grande Ronde and Imnaha Subbasins working with tribes, agencies and landowners. The project annually implements 10-20 habitat restoration projects. Project also to consider including habitat actions proposed in Wallowa, Lostine, & Joseph Cr. watersheds (200710500, 200711600, 200724500). | Increase Instream Habitat Complexity    | 200 riparian acres restored in Meadow Creek wetland; 5.6 miles road treated in riparian zones; 162 structures installed and 9.6 miles stream complexity improved in Bear Creek, Chesnimnus Creek, and Elk Creek; 0.2 riparian mile fenced; fish passage barriers addressed to access 41.2 miles of habitat; 12 acres riparian planting; McDonald Creek channel restoration added 0.4 mile stream; 260 riparian acres treated for invasive/noxious plants; removed headgate in upper McDonald Creek to access 5.0 miles instream habitat. |
|                              |                  |   | Install Fence                           |  |
|                              |                  |   | Install Fish Passage Structure          |  |
|                              |                  |   | Plant Vegetation                        |  |
|                              | 199608300        | CTUIR Grande Ronde Subbasin Restoration Project<br>The CTUIR Grande Ronde Subbasin Restoration Project plans, designs, implements, maintains, and monitors habitat enhancement and restoration projects in the Grande Ronde Subbasin. Planned FY 2007-09 projects include Meadow Cr, End Cr, Ladd Cr, and main GR.  | Create, Restore, and/or Enhance Wetland | 62.9 riparian acres planted in Meadow Creek, End Creek, Longley Meadow, and Wallowa River  |
|                              |                  |   | Install Fence                           |  |
|                              |                  |   | Plant Vegetation                        |  |
|                              |                  |   |   | Realign, Connect, and/or Create Channel  |

| <b>Snake River Steelhead</b>                |                  |  |   |  |
|---|------------------|--|---|--|
| <b>Population</b>                           | <b>Project #</b> | <b>Project Title &amp; Short Description</b>   | <b>2007-09 Action Description</b>       | <b>FY07-08 Progress</b>  |
| Grande Ronde upper mainstem Catherine Creek | 198402500        | ODFW Blue Mountain Oregon Fish Habitat Improvement<br>This project works with landowners, and other government and quasi-governmental agencies to protect and enhance habitat for federal ESA listed fish in the Blue Mountain Province of Oregon. | Create, Restore, and/or Enhance Wetland | End Creek/McDonald Creek and Wallowa River Phase 2 improved 41 riparian acres; 584 instream structures installed and 5.1 miles stream complexity improved in End Creek, Meadow Creek, and Wallowa River; 1.5 riparian miles fenced; 14.2 miles and 77.5 acres riparian vegetation planted; 9.1 instream miles added and 341 wetland acres added through channel improvements |
|   |                  |  | Increase Instream Habitat Complexity    |  |
|   |                  |  | Install Fence                           |  |
|   |                  |  | Plant Vegetation                        |  |
| Lostine River Imnaha River Big Sheep Creek  | 200739300        | NPT Protect and Restore NE OR Funding for Coordination, Planning, Design, Implementation. Initially the funds were placed under 200724500. Established a new project for the Wallowa and Imnaha watersheds.  | Decommission Road                       | Tamarack Creek culvert removal scheduled for FY09 implementation   |
|   |                  |  | Enhance Floodplain                      |  |
|   |                  |  | Increase Instream Habitat Complexity    |  |
|   |                  |  | Install Fence                           |  |
|   |                  |  | Install Fish Passage Structure          |  |
|   |                  |  | Maintain Vegetation                     |  |
|   |                  |  | Plant Vegetation                        |  |
|   |                  |  | Realign, Connect, and/or Create Channel |  |
|   |                  |  | Remove vegetation                       |  |

| <b>Snake River Steelhead</b>                      |                  |  |   |   |
|---|------------------|--|---|---|
| <b>Population</b>                                 | <b>Project #</b> | <b>Project Title &amp; Short Description</b>   | <b>2007-09 Action Description</b>                 | <b>FY07-08 Progress</b>   |
| Asotin Creek (extirpated)                         | 199401805        | Continued Implementation of Prioritized Asotin Creek Watershed Habitat Projects<br>On-going project for prioritizing & implementing on-the-ground habitat projects for wild steelhead & Chinook salmon in Asotin watershed. Bull trout also benefit from this ridge-top-to-ridge-top approach with match from private landowners & other grants.                           | Install Fence                                     | 2.36 riparian miles fenced; 12.5 riparian acres planted/maintained; 2,778.2 upland acres improved through no-till conservation systems  |
|   |                  |  | Plant Vegetation                                  |   |
| Practice No-till and Conservation Tillage Systems |                  |  |   |   |
|   | 200205000        | Continued Riparian Buffer Projects on Couse/Tenmile and other Salmonid Bearing Streams in Asotin County<br>On-going project to continue implementation of prioritized habitat protection on private property for ESA listed steelhead, Chinook salmon and bull trout as identified in the Asotin Subbasin Plan. Cost share provided by private landowners & other sources. | Install Fence                                     | 3.17 miles riparian fencing installed; 89.3 riparian acres planted; 1,272.4 upland acres improved with no-till conservation systems; erosion and sedimentation control on 95.6 upland acres |
|   |                  |  | Plant Vegetation                                  |   |
|   |                  |  | Practice No-till and Conservation Tillage Systems |   |
|   |                  |  | Upland Erosion and Sedimentation Control          |   |
| Tucannon River                                    | 199401806        | Tucannon Stream and Riparian Protection, Enhancement, and Restoration<br>Implement habitat protection, enhancement, and recovery strategies to support Subbasin Plan identified ESA focal, cultural significant and species of interest recovery within the Tucannon Subbasin.   | Increase Instream Habitat Complexity              | Fish screens installed at 5 diversions; 369.8 riparian acres/17.8 riparian miles protected through CREP extensions  |
|   |                  |  | Lease Land  |   |

| <b>Snake River Steelhead</b> |                  |   |  |  |
|------------------------------|------------------|---|--|--|
| <b>Population</b>            | <b>Project #</b> | <b>Project Title &amp; Short Description</b>  | <b>2007-09 Action Description</b>  | <b>FY07-08 Progress</b>  |
|                              | 199401807        | <p>Improve Habitat For Fall Chinook, Steelhead in the Lower Snake and Tucannon Sub basins</p> <p>To obtain funding to continue with the districts effort to reduce soil erosion on the uplands and along the streams of Garfield County to improve water quality and fish habitat.</p>  | Plant Vegetation<br>Remove vegetation<br>Upland Erosion and Sedimentation Control  | 3,787 upland acres improved through erosion and sediment control and no-till conservation systems  |
| All                          | 199401500        | <p>Idaho Fish Screening and Passage Improvements</p> <p>Provide management and operational support for a capital construction program dedicated to the protection of anadromous fish from loss in water diversions, improve fish passage at diversions for juvenile and adult anadromous fish, and improve stream flow conditions where possible.</p>                       | Install Fish Screen<br>Remove/Install Diversion                                    | New headgates and fish screens installed at four sites on Wimpy and Big Spring creeks; two unscreened diversions consolidated into one screened ditch and accessed 3 miles of habitat                            |
| Little Salmon River          | 200706500        | <p>Coordinate and implement tributary habitat restoration in the Little Salmon River and lower Salmon River Idaho</p> <p>Implement fish habitat restoration on private lands dominated by agricultural practices using cost sharing by Bonneville, Idaho Pacific Coast Salmon Recovery Funds, Idaho Water Quality Program for Agriculture, and landowner participation.</p> | Install Fence<br>Plant Vegetation<br>Remove vegetation<br>Remove/Install Diversion | Squaw Creek culvert replacement accessed 11 miles of habitat   |
| Little Salmon River          | 200706400        | <p>Protect and Restore Slate Creek</p> <p>Restore and protect the Slate Creek Watershed for the benefit of both resident and anadromous fish using an overall watershed approach. Restoration and</p>   | Decommission Road<br>Plant Vegetation<br>Remove vegetation                         | Completed a Barrier Assessment and Prioritization Report for the Little Slate sub-watershed summarizing the assessment procedure, total number of sites assessed, condition of all sites, total miles of habitat |

| <b>Snake River Steelhead</b>  |                  |   |  |  |
|---|------------------|---|--|--|
| <b>Population</b>   | <b>Project #</b> | <b>Project Title &amp; Short Description</b>  | <b>2007-09 Action Description</b>        | <b>FY07-08 Progress</b>  |
|   |                  | protection efforts will be done cooperatively with the Nez Perce National Forest.   | Upland Erosion and Sedimentation Control | blocked, and top priorities for fish passage restoration. Barriers were prioritized for replacement beginning in FY09.   |
| Secesh River<br>South Fork<br>Salmon River  | 200712700        | Reestablish Connectivity and Restore Fish Habitat in the East Fork of the South Fork Salmon River Watershed<br>This project will reestablish fish passage through a 30-foot tall cascade using natural channel design and rehabilitate one mile of fish habitat through an anthropogenically degraded reach of the upper mainstem East Fork of the South Fork Salmon River. | Enhance Floodplain                       | Fish barrier removal and instream habitat complexity contracted for FY09 implementation.   |
|   |                  |   | Increase Instream Habitat Complexity     |  |
|   |                  |   | Install Fish Passage Structure           |  |
|   |                  |   | Plant Vegetation                         |  |
| East Fork<br>Salmon River<br>Pahsimeroi<br>River<br>Salmon River<br>upper<br>mainstem | 200726800        | Idaho Watershed Habitat Restoration Project via Custer Soil and Water Conservation District<br>The project scope is to implement high priority action items to maintain, enhance and restore fish habitat and fish passage in the priority stream segments of the Upper Salmon Basin area within the administrative boundaries of the Custer SWCD.                          | Install Fence                            | 2.1 miles stream complexity improved and nine instream structures installed in Herd Creek and Slate Creek; 6.15 riparian miles fenced; 5 riparian acres planted; Challis Creek diversion relocation accessed 2 miles habitat; one screen addressed at Highline Canal |
|   |                  |   | Remove/Install Diversion                 |  |
|   |                  |   | Remove/Modify Dam                        |  |
| Lemhi River   | 200739400        | Idaho Watershed Habitat Restoration Lemhi County<br>Move funds for coordination, planning, design and implementation from 1992-026-03, Upper Salmon Basin Watershed Project.  | Acquire Water Instream                   | 0.2 riparian mile fenced; diversion modifications at three sites accessed 2.5 miles habitat  |
|   |                  |   | Install Fence                            |  |
|   |                  |   | Install Fish Passage Structure           |  |
|   |                  |   | Install Fish Screen                      |  |

| <b>Snake River Steelhead</b> |                  |  |                                   |   |
|------------------------------|------------------|--|-----------------------------------|---|
| <b>Population</b>            | <b>Project #</b> | <b>Project Title &amp; Short Description</b>   | <b>2007-09 Action Description</b> | <b>FY07-08 Progress</b>   |
| Salmon River lower mainstem  | 199901900        | Restore Salmon River (Challis, Idaho) Passive restoration by securing easements will assist restoration efforts via the Corps 206 Program. The development of side channels will help create a more naturally functioning floodplain, provide a wide array of environmental and ecological benefit.  | Investigate Trespass              | Visitation log to investigate Stark property conservation values              |
| Yankee Creek                 | 200205900        | Yankee Fork Salmon River Dredge Tailings Restoration Project<br>Restore natural river channel characteristics, floodplain function, hydraulic and sediment regimes, and aquatic habitat within the dredged reach of the YFSR, initially by redistributing dredge tailings piles from the floodplain. | Plant Vegetation                  | Inventory, assessment, monitoring being conducted prior to on-the-ground work |
|                              |                  |  | Remove Mine Tailings              |   |

**Table 3.2. Actions Identified for 2007-2009 Implementation in FCRPS BA, Attachment B.2.2-2, Table 3b: Snake River Spring/Summer Chinook**

| <b>Snake River Spring/Summer Chinook</b> |  |   |   |  |
|--|--|---|---|--|
| <b>Population</b>                        | <b>Project #</b>   | <b>Project Title &amp; Short Description</b>  | <b>2007-09 Action Description</b>   | <b>FY07-08 Progress</b>  |
| Multiple                                 | 200201301  | Water Entity<br>Fund water right transactions that restore streamflows and focused riparian easements on critical fish-bearing Columbia Basin tributaries. Implemented as the Columbia Basin Water Transactions Program (CBWTP) in a partnership between BPA and NFWF.  | Acquire Water Instream  | 115.91 cfs acquired/enhanced — 17.22 cfs n Lostine/Wallowa River; 39.53 cfs in Lemhi River; 29.55 in Pahsimeroi River; 29.61 in Salmon River upper mainstem above Redfish Lake   |
|  | 199202601  | Grand Ronde Model Watershed Program Habitat Restoration - Planning, Coordination and Implementation<br>The project coordinates BPA funded restoration activities in the Grande Ronde and Imnaha Subbasins working with tribes, agencies and landowners. The project annually implements 10-20 habitat restoration projects. Project also to consider including habitat actions proposed in Wallowa, Lostine, & Joseph Cr. watersheds (200710500, 200711600, 200724500). | Increase Instream Habitat Complexity  | 200 riparian acres restored in Meadow Creek wetland; 5.6 miles road treated in riparian zones; 162 structures installed and 9.6 miles stream complexity improved in Bear Creek, Chesnimnus Creek, and Elk Creek; 0.2 riparian mile fenced; fish passage barriers addressed to access 41.2 miles of habitat; 12 acres riparian planting; McDonald Creek channel restoration added 0.4 mile stream; 260 riparian acres treated for invasive/noxious plants; removed headgate in upper McDonald Creek to access 5.0 mile instream habitat |
|  |  |   | Install Fence   |  |
| Install Fish Passage Structure           |  |   |   |  |
| Plant Vegetation                         |  |   |   |  |
| 199608300                                | CTUIR Grande Ronde Subbasin Restoration Project<br>The CTUIR Grande Ronde Subbasin Restoration Project plans, designs, implements, maintains, and monitors habitat enhancement and restoration projects in the Grande Ronde Subbasin. Planned FY 2007-09 projects include Meadow Cr, End Cr, Ladd Cr, and main GR. | Create, Restore, and/or Enhance Wetland   | 62.9 riparian acres planted in Meadow Creek, End Creek, Longley Meadow, and Wallowa River |  |
|  |  | Install Fence   |   |  |
|  |  | Plant Vegetation  |   |  |
|  |  | Realign, Connect, and/or Create Channel   |   |  |

**Snake River Spring/Summer Chinook**

| <b>Population</b>                           | <b>Project #</b> | <b>Project Title &amp; Short Description</b>   | <b>2007-09 Action Description</b>       | <b>FY07-08 Progress</b>  |
|---|------------------|--|---|--|
| Grande Ronde upper mainstem Catherine Creek | 198402500        | ODFW Blue Mountain Oregon Fish Habitat Improvement<br>This project works with landowners, and other government and quasi-governmental agencies to protect and enhance habitat for federal ESA listed fish in the Blue Mountain Province of Oregon. | Create, Restore, and/or Enhance Wetland | End Creek /McDonald Creek, and Wallowa River Phase 2 improved 41 riparian acres; 584 instream structures installed and 5.1 miles stream complexity improved in End Creek, Meadow Creek, and Wallowa River; 1.5 riparian miles fenced; 14.2 miles and 77.5 acres riparian vegetation planted; 9.1 instream miles added and 341 wetland acres added through channel improvements |
|   |                  |  | Increase Instream Habitat Complexity    |  |
|   |                  |  | Install Fence                           |  |
|   |                  |  | Plant Vegetation                        |  |
| Lostine River Imnaha River Big Sheep Creek  | 200739300        | NPT Protect and Restore NE OR Funding for Coordination, Planning, Design, Implementation. Initially the funds were placed under 200724500. Established a new project for the Wallowa and Imnaha watersheds.  | Decommission Road                       | Tamarack Creek culvert removal scheduled for FY09 implementation   |
|   |                  |  | Enhance Floodplain                      |  |
|   |                  |  | Increase Instream Habitat Complexity    |  |
|   |                  |  | Install Fence                           |  |
|   |                  |  | Install Fish Passage Structure          |  |
|   |                  |  | Maintain Vegetation                     |  |
|   |                  |  | Plant Vegetation                        |  |
|   |                  |  | Realign, Connect, and/or Create Channel |  |
|   |                  |  | Remove vegetation                       |  |

**Snake River Spring/Summer Chinook**

| <b>Population</b>         | <b>Project #</b> | <b>Project Title &amp; Short Description</b>   | <b>2007-09 Action Description</b>                 | <b>FY07-08 Progress</b>   |
|---------------------------|------------------|--|---|---|
| Asotin Creek (extirpated) | 199401805        | Continued Implementation of Prioritized Asotin Creek Watershed Habitat Projects<br>On-going project for prioritizing & implementing on-the-ground habitat projects for wild steelhead & Chinook salmon in Asotin watershed. Bull trout also benefit from this ridge-top-to-ridge-top approach with match from private landowners & other grants.                           | Install Fence                                     | 2.36 riparian miles fenced; 12.5 riparian acres planted/maintained; 2,778.2 upland acres improved through no-till conservation systems  |
|                           |                  |  | Plant Vegetation                                  |   |
|                           | 200205000        | Continued Riparian Buffer Projects on Couse/Tenmile and other Salmonid Bearing Streams in Asotin County<br>On-going project to continue implementation of prioritized habitat protection on private property for ESA listed steelhead, Chinook salmon and bull trout as identified in the Asotin Subbasin Plan. Cost share provided by private landowners & other sources. | Install Fence                                     | 3.17 miles riparian fencing installed; 89.3 riparian acres planted; 1,272.4 upland acres improved with no-till conservation systems; erosion and sedimentation control on 95.6 upland acres |
|                           |                  |  | Plant Vegetation                                  |   |
|                           |                  |  | Practice No-till and Conservation Tillage Systems |   |
|                           |                  |  | Upland Erosion and Sedimentation Control          |   |
| Tucannon River            | 199401806        | Tucannon Stream and Riparian Protection, Enhancement, and Restoration<br>Implement habitat protection, enhancement, and recovery strategies to support Subbasin Plan identified ESA focal, cultural significant and species of interest recovery within the Tucannon Subbasin.   | Increase Instream Habitat Complexity              | Fish screens installed at five diversions; 369.8 riparian acres/17.8 riparian miles protected through CREP extension  |
|                           |                  |  | Lease Land  |   |
|                           | 199401807        | Improve Habitat For Fall Chinook, Steelhead in the Lower Snake and Tucannon Sub basins<br>To obtain funding to continue with the districts effort to reduce soil erosion on the uplands and along the streams of Garfield County to improve water quality and fish habitat.  | Plant Vegetation                                  | 3,787 upland acres improved through erosion and sediment control and no-till conservation systems   |
|                           |                  |  | Remove vegetation                                 |   |
|                           |                  |  | Upland Erosion and Sedimentation Control          |   |

**Snake River Spring/Summer Chinook**

| <b>Population</b>                    | <b>Project #</b> | <b>Project Title &amp; Short Description</b>   | <b>2007-09 Action Description</b>        | <b>FY07-08 Progress</b>   |
|--------------------------------------|------------------|--|--|---|
| All                                  | 199401500        | Idaho Fish Screening and Passage Improvements<br>Provide management and operational support for a capital construction program dedicated to the protection of anadromous fish from loss in water diversions, improve fish passage at diversions for juvenile and adult anadromous fish, and improve stream flow conditions where possible.                       | Install Fish Screen                      | New headgates and fish screens installed at four sites on Wimpy and Big Spring creeks; two unscreened diversions consolidated into one screened ditch and accessed 3 miles of habitat   |
|                                      |                  |  | Remove/Install Diversion                 |   |
| Little Salmon River                  | 200706500        | Coordinate and implement tributary habitat restoration in the Little Salmon River and lower Salmon River Idaho<br>Implement fish habitat restoration on private lands dominated by agricultural practices using cost sharing by Bonneville, Idaho Pacific Coast Salmon Recovery Funds, Idaho Water Quality Program for Agriculture, and landowner participation. | Install Fence                            | Squaw Creek culvert replacement accessed 11 miles of habitat  |
|                                      |                  |  | Plant Vegetation                         |   |
|                                      |                  |  | Remove vegetation                        |   |
|                                      |                  |  | Remove/Install Diversion                 |   |
|                                      | 200706400        | Protect and Restore Slate Creek<br>Restore and protect the Slate Creek Watershed for the benefit of both resident and anadromous fish using an overall watershed approach. Restoration and protection efforts will be done cooperatively with the Nez Perce National Forest.   | Decommission Road                        | Completed a Barrier Assessment and Prioritization Report for the Little Slate sub-watershed summarizing the assessment procedure, total number of sites assessed, condition of all sites, total miles of habitat blocked, and top priorities for fish passage restoration; barriers prioritized for replacement beginning in FY09 |
|                                      |                  |  | Plant Vegetation                         |   |
|                                      |                  |  | Remove vegetation                        |   |
|                                      |                  |  | Upland Erosion and Sedimentation Control |   |
| Secesh River South Fork Salmon River | 200712700        | Reestablish Connectivity and Restore Fish Habitat in the East Fork of the South Fork Salmon River Watershed<br>This project will reestablish fish passage through a 30-foot tall cascade using natural channel design and rehabilitate one mile of fish habitat through an anthropogenically   | Enhance Floodplain                       | Fish barrier removal and instream habitat complexity contracted for FY09 implementation   |
|                                      |                  |  | Increase Instream Habitat Complexity     |   |
|                                      |                  |  | Install Fish Passage Structure           |   |

**Snake River Spring/Summer Chinook**

| <b>Population</b>   | <b>Project #</b> | <b>Project Title &amp; Short Description</b>   | <b>2007-09 Action Description</b> | <b>FY07-08 Progress</b>  |
|---|------------------|--|-----------------------------------|--|
|   |                  | degraded reach of the upper mainstem East Fork of the South Fork Salmon River.   | Plant Vegetation                  |  |
| East Fork Salmon River Pahsimeroi River Salmon River upper mainstem | 200726800        | Idaho Watershed Habitat Restoration Project via Custer Soil and Water Conservation District<br>The project scope is to implement high priority action items to maintain, enhance and restore fish habitat and fish passage in the priority stream segments of the Upper Salmon Basin area within the administrative boundaries of the Custer SWCD. | Install Fence                     | 2.1 miles stream complexity improved and nine instream structures installed in Herd Creek and Slate Creek; 6.15 riparian miles fenced; 5 riparian acres planted; Challis Creek diversion relocation accessed 2 miles habitat; one screen addressed at Highline Canal |
|   |                  |  | Remove/Install Diversion          |  |
|   |                  |  | Remove/Modify Dam                 |  |
| Lemhi River   | 200739400        | Idaho Watershed Habitat Restoration Lemhi County<br>Move funds for coordination, planning, design and implementation from 1992-026-03, Upper Salmon Basin Watershed Project.   | Acquire Water Instream            | 0.2 riparian mile fenced; diversion modifications at three sites accessed 2.5 miles habitat  |
|   |                  |  | Install Fence                     |  |
|   |                  |  | Install Fish Passage Structure    |  |
|   |                  |  | Install Fish Screen               |  |
| Salmon River lower mainstem   | 199901900        | Restore Salmon River (Challis, Idaho)<br>Passive restoration by securing easements will assist restoration efforts via the Corps 206 Program. The development of side channels will help create a more naturally functioning floodplain, provide a wide array of environmental and ecological benefit.   | Investigate Trespass              | Visitation log to investigate Stark property conservation values   |
| Yankee Creek  | 200205900        | Yankee Fork Salmon River Dredge Tailings Restoration Project<br>Restore natural river channel characteristics,   | Plant Vegetation                  | Inventory, assessment, and monitoring being conducted prior to on-the-ground work  |

**Snake River Spring/Summer Chinook**

| <b>Population</b> | <b>Project #</b> | <b>Project Title &amp; Short Description</b>  | <b>2007-09 Action Description</b> | <b>FY07-08 Progress</b> |
|-------------------|------------------|---|-----------------------------------|-------------------------|
|                   |                  | floodplain function, hydraulic and sediment regimes, and aquatic habitat within the dredged reach of the YFSR, initially by redistributing dredge tailings piles from the floodplain. | Remove Mine Tailings              |                         |

**Tables 4.1, 4.2, and 4.3 — Actions Identified for 2008-2009 Implementation in FCRPS BA, Attachment B.2.2-2, Tables 4a-c**

Tables 4a-c in the FCRPS BA indicated tributary habitat actions the Action Agencies could implement in the 2008 and 2009 timeframe if funding was expanded beyond the initial 2007–2009 Fish and Wildlife Program funding levels. The expanded funding was targeted to address specific limiting factors for populations with the greatest biological needs for improvement. Tables 4.1, 4.2, and 4.3 list the projects that received expanded funding levels to implement these or similar suites of actions and any actual metrics that were completed.

**Table 4.1. Actions Identified for 2007-2009 Implementation in FCRPS BA, Attachment B.2.2-2, Table 4a: Snake River spring/summer Chinook**

| <b>Snake River Spring/Summer Chinook</b>     |                   |   |  |  |
|--|-------------------|---|--|--|
| <b>MPG</b>                                   | <b>Population</b> | <b>Primary Limiting Factor(s) by AU</b> | <b>Action Description</b>  | <b>FY07-08 Progress</b>  |
| Grande Ronde                                 | Catherine Creek   | In-channel characteristics              | In-stream enhancement, LWD, modify/enhance channel   | GRMW/Umatilla Tribe contract, End Creek Restoration Project. McDonald Creek restoration channel segments and spring channels added 0.4 mile stream habitat.  |
|  |                   |   | Opportunistic channel enhancement  |  |
|  |                   | Riparian / Floodplain                   | livestock exclusion/reveg/weed control/expand streamside buffers/levee or road mod/restore meadows | GRMW/USFS contract, Riparian Fencing and Water Development project. Permitting and design in FY08, implementation in FY09.   |
|  |                   |   | wetland project development  |  |
|  |                   |   | riparian fencing (FS)  |  |
|  |                   |   | road obliteration/sediment reduction (FS)  |  |
|  |                   | Fish Passage                            | culverts/irrigation diversion improvements   | GRMW contract, Catherine Creek State Diversion Fish Passage project: fish ladder construction and diversion modification to access 22 miles habitat. Smutz Draw culvert replacement to access 1.5 miles habitat. |
| Catherine Creek State Diversion Fish Passage |                   |   |  |  |
|  |                   |   | Catherine Creek Diversion Townley-Dobin  | GRMW contract, Townley-Dobbin and Mill Creek Fish Passage Project: permitting and design in FY09, implementation in FY10.  |

| <b>Snake River Spring/Summer Chinook</b> |                            |   |   |   |
|--|----------------------------|---|---|---|
| <b>MPG</b>                               | <b>Population</b>          | <b>Primary Limiting Factor(s) by AU</b> | <b>Action Description</b>   | <b>FY07-08 Progress</b>   |
|  |                            |   | Catherine Creek Davis Dams Fish Passage (design)  | GRMW contract, permitting and design initiated.   |
|  |                            |   | Scout Creek Culvert Replacement (design)  | GRMW contract, design pending completion of USFS review.  |
|  | Upper Grande Ronde         | In-channel characteristics              | End Creek Restoration - Phase IV  | GRMW/Umatilla Tribe contract, End Creek Restoration. McDonald Creek restoration channel segments and spring channels added 0.4 mile stream habitat. |
|  |                            |   | Willow Ck channel improvement /wetland restoration (new)                                      |   |
|  |                            |   | Indian Ck channel enhancement and wetland restoration   |   |
|  |                            | Riparian / Floodplain                   | Indian/Little Indian riparian fencing/water development-start in 09, continue through 15 (FS) | GRMW/Umatilla Tribe contract, End Creek Restoration project: 0.64 acre riparian planting.   |
|  |                            | Passage                                 | culverts/irrigation diversion improvements  | GRMW/Umatilla Tribe contract, End Creek Restoration Project — McDonald Creek Headgate removal accessed 5 miles habitat.                             |
| <b>Grande Ronde (con't)</b>              | Upper Grande Ronde (con't) | In-channel characteristics              | Upper GR River mine tailings (FS)   | GRMW/USFS contract: planning, permitting, design, and implementation in FY09.   |
|  |                            |   | Fly Ck (FS)   | GRMW/USFS contract, Fly Creek Stream Restoration: planning, permitting, design in FY09, implementation in FY10.                                     |
|  |                            |   | UGR/Fly/Sheep Ck riparian fencing + water development- 2009 (FS)                              | GRMW/USFS contract, Riparian Fencing and Water Development project: permitting and design in FY08, implementation in FY09.                          |
|  |                            |   | Camp Carson erosion control 2008 (FS)   | Cancelled — lack of fish benefits.  |

| <b>Snake River Spring/Summer Chinook</b> |                                  |  |   |  |
|--|----------------------------------|--|---|--|
| <b>MPG</b>                               | <b>Population</b>                | <b>Primary Limiting Factor(s) by AU</b>  | <b>Action Description</b>   | <b>FY07-08 Progress</b>  |
|  | Wallowa                          | Lack of passage - Lack of access to diversity of habitats,   | Fish Passage Improvements   | GRMW contract, Deer Creek Culvert Replacement to access 5 miles habitat.   |
| <b>Middle Fork Salmon</b>                | Big Creek                        | Sediment effects on rearing and spawning success - lack of interstitial space, reduced pool volume, reduced spawning success | Road Decommissioning, Road Improvement, Culvert Removal / Replacement, Riparian Restoration near Mining Sites, Weed Management, Silvicultural BMPs  | BPA funding for project 200726800, Idaho Watershed Restoration to implement high-priority action items to maintain, enhance, and restore fish habitat and fish passage in the priority stream segments of the Upper Salmon Basin. 0.4 mile riparian fencing; 0.08 miles stream complexity improved in Herd Creek.  |
|  |                                  | Migration Barriers associated with roads and mining activities   | Assess stream crossings and anthropogenic migration barriers to determine actions necessary for salmonid passage. Provide for salmonid passage at identified passage barriers (e.g., culvert replacement)                             |  |
| <b>South Fork Salmon River</b>           | South Fork Salmon River mainstem | Sediment effects on rearing and spawning success - lack of interstitial space, reduced pool volume, reduced spawning success | Road Decommissioning, Road Improvement, Culvert Removal / Replacement, Riparian Restoration, Mine rehabilitation  | BPA expanded funding to project 200712700, Reestablish Connectivity and Restore Fish Habitat in the East Fork of the South Fork Salmon River Watershed. Conducted assessment, inventory, and prioritization of habitat opportunities in FY08. Implementation to follow pending planning, design, environmental review, and permitting.   |
|  |                                  | Migration Barriers   | Assess stream crossings and anthropogenic migration barriers to determine actions necessary for salmonid passage. Provide for salmonid passage at identified passage barriers. The Stibnite-Glory Hole passage project is a priority. | Funding through 200712700 (see above). Stibnite-Glory Hole passage project cancelled, replaced with watershed-scale assessment of passage barriers (culverts), channel complexity, and floodplain reconnection opportunities, and prioritized road decommissioning. Implementation in FY09 and beyond based on inventory and assessment and pending environmental review and permitting. |

| <b>Snake River Spring/Summer Chinook</b> |                   |  |  |   |
|--|-------------------|--|--|---|
| <b>MPG</b>                               | <b>Population</b> | <b>Primary Limiting Factor(s) by AU</b>  | <b>Action Description</b>  | <b>FY07-08 Progress</b>                                       |
|  | Secesh River      | Sediment effects on rearing and spawning success - lack of interstitial space, reduced pool volume, reduced spawning success | Road Decommissioning, Road Improvement, Culvert Removal / Replacement, Weed Management, Silvicultural BMPs | Funding included in expanded funding to 200712700. See above. |

**Table 4.2. Actions Identified for 2007-2009 Implementation in FCRPS BA, Attachment B.2.2-2, Table 4b: Snake River summer/winter steelhead**

| <b>Snake River Steelhead</b> |                                  |   |   |   |
|------------------------------|----------------------------------|---|---|---|
| <b>Population</b>            | <b>Assessment Unit (AU)</b>      | <b>Primary Limiting Factor(s) (PLF) by AU</b> | <b>Action Description</b>   | <b>FY07-08 Progress</b>   |
| Upper Grande Ronde           | Mid Grande Ronde River and Tribs | In-channel characteristics                    | End Creek Restoration - Phase IV  | GRMW contract, End Creek Restoration. McDonald Creek restoration channel segments and spring channels added 0.4 mile stream habitat.                        |
|                              |                                  |   | Willow Ck channel improvement /wetland restoration (new)                |   |
|                              |                                  |   | Indian Ck channel enhancement and wetland restoration                   |   |
|                              |                                  | Riparian / Floodplain                         | Indian/Little Indian Riparian fencing/water development 2009 start (FS) | GRMW/Umatilla Tribe End Creek Restoration project: 0.64 acres riparian planting   |
|                              | Upper Grande Ronde and Tribs     | In-channel characteristics                    | Upper GR River mine tailings (FS)                                       | GRMW/USFS contract: planning, permitting, design, and implementation in FY09.   |
|                              |                                  |   | Fly Ck (FS)   | GRMW/USFS contract, Fly Creek Stream Restoration: planning, permitting, design in FY09, implementation in FY10  |
| Sediment                     |                                  | Camp Carson erosion control (FS)              | Cancelled — lack of fish benefits.                                      |   |
| Upper Grande Ronde (con't)   | Catherine Creek                  | In-channel characteristics                    | In-stream enhancement, LWD, modify/enhance channel                      | GRMW/Umatilla Tribe contract, End Creek Restoration Project. McDonald Creek restoration channel segments and spring channels added 0.4 mile stream habitat. |

| <b>Snake River Steelhead</b> |                             |   |  |  |                                |   |
|------------------------------|-----------------------------|---|--|--|--------------------------------|---|
| <b>Population</b>            | <b>Assessment Unit (AU)</b> | <b>Primary Limiting Factor(s) (PLF) by AU</b> | <b>Action Description</b>  | <b>FY07-08 Progress</b>  |                                |   |
|                              |                             | Riparian / Floodplain                         | livestock exclusion/reveg/weed control/expand streamside buffers/levee or road mod/restore meadows | GRMW/USFS contract, Riparian Fencing and Water Development project. Permitting and design in FY08, implementation in FY09.   |                                |   |
|                              |                             |   | wetland project development  |  |                                |   |
|                              |                             |   | Catherine Ck road obliteration/sediment reduction 2009 start (FS)                                  |  |                                |   |
|                              |                             | Fish Passage                                  | culverts/irrigation diversion improvements   | GRMW contract, Catherine Creek State Diversion Fish Passage project: fish ladder construction and diversion modification to access 22 miles habitat. Smutz Draw culvert replacement to access 1.5 miles habitat. |                                |   |
|                              |                             |   | Catherine Creek State Diversion Fish Passage   |  |                                |   |
|                              |                             |   | Catherine Creek Diversion Townley-Dobin  | GRMW contract, Townley-Dobbin and Mill Creek Fish Passage Project: permitting and design in FY09, implementation in FY10.  |                                |   |
|                              |                             |   | Catherine Creek Davis Dams Fish Passage (design)   | GRMW contract, permitting and design initiated.  |                                |   |
|                              |                             |   | Scout Creek Culvert Replacement (design)   | Design pending completion of USFS review.  |                                |   |
|                              |                             | Lochsa  | Crooked Fork   | Connectivity - Lack of access to diversity of habitats   | Culvert Replacement or Removal | BPA funding for project 200739500, Protect and Restore the Lochsa River beginning in 2007; budget expanded by \$756k/year beginning in FY09. Implementation through Nez Perce Tribe, Watershed Program and the Clearwater National Forest.<br>In Upper Lochsa, treated 1 mile road, 3.5 riparian acres revegetated. |

| <b>Snake River Steelhead</b> |  |  |  |   |
|------------------------------|--|--|--|---|
| <b>Population</b>            | <b>Assessment Unit (AU)</b>  | <b>Primary Limiting Factor(s) (PLF) by AU</b>  | <b>Action Description</b>  | <b>FY07-08 Progress</b>   |
|                              |  | Sediment effects on rearing and spawning success - lack of interstitial space, reduced pool volume, reduced spawning success | Road Removal and Improvement/ Land Acquisition   |   |
|                              |  | Temperature and Instream Habitat-poor quality pools and structure  | Revegetation to allow for woody debris recruitment and riparian area cover. Land Acquisition |   |
|                              | Middle Lochsa North Face Tribs (from Post Office to Bald Mountain) | Loss of riparian vegetation and complexity, lack of shade, loss of nutrients   | Riparian Rehabilitation  | Project 200739500: Culvert and bridge replacements to access 3.5 miles of habitat in Lower and Middle Lochsa. |
|                              |  | Lack of passage - Lack of access to diversity of habitats,   | Culvert Replacement or Removal   | Project 200739500: Culvert and bridge replacements to access 3.5 miles of habitat in Lower and Middle Lochsa. |
|                              |  | Sediment effects on rearing and spawning success - lack of interstitial space, reduced pool volume, reduced spawning success | Road Decommissioning, Culvert Removal / Replacement, Noxious Weed Control                    | Project 200739500: Decommissioned 2.7 riparian miles and 15.7 miles of road in Lower and Middle Lochsa.       |
|                              |  | Temperature  | Road Removal, Riparian Rehabilitation  | Project 200739500: 8.5 riparian acres planted in Lower and Middle Lochsa.                                     |
|                              | Lower Lochsa (Fish Creek to Pete King Creek)                       | Loss of riparian vegetation and complexity, lack of shade, loss of nutrients   | Riparian Rehabilitation  | Project 200739500: 8.5 riparian acres planted in Lower and Middle Lochsa.                                     |

| <b>Snake River Steelhead</b> |                             |   |   |  |
|------------------------------|-----------------------------|---|---|--|
| <b>Population</b>            | <b>Assessment Unit (AU)</b> | <b>Primary Limiting Factor(s) (PLF) by AU</b>   | <b>Action Description</b>   | <b>FY07-08 Progress</b>  |
|                              |                             | Lack of passage - Lack of access to diversity of habitats   | Culvert Replacement or Removal, Remove engineered instream structures     | Project 200739500: Culvert and bridge replacements to access 3.5 miles of habitat in Lower and Middle Lochsa.  |
|                              |                             | Temperature   | Road Removal, Riparian Rehabilitation                                     | Project 200739500: 8.5 riparian acres planted in Lower and Middle Lochsa.  |
|                              |                             | Sediment effects on rearing and spawning success - lack of interstitial space, reduced pool volume, reduced spawning success                            | Road Decommissioning, Culvert Removal / Replacement, Noxious Weed Control | Project 200739500: Decommissioned 2.7 riparian miles and 15.7 miles of road in Lower and Middle Lochsa.  |
| Lolo Creek                   | Musselshell Creek           | Sediment from roads, timber harvest, cattle grazing, and historic mining - effects on rearing and spawning success, interstitial space and pool volume. | Road Decommissioning and road drainage improvements, Weed Control         | BPA funding for project 199607702, Protect and Restore the Lolo Creek Watershed — budget expanded by \$100K/year beginning in FY09: 20 upland acres treated for exotic invasive plants in Musselshell Meadows. |
|                              |                             | Loss of riparian vegetation and complexity - lack of stream shading resulting in elevated temperatures  | Riparian Rehabilitation & Large Woody Debris                              |  |
|                              |                             | Lack of passage - Lack of access to diversity of habitats,  | Musselshell Tunnel/ Stream Relocation, Culvert Replacement                |  |

| <b>Snake River Steelhead</b> |                             |   |   |  |
|------------------------------|-----------------------------|---|---|--|
| <b>Population</b>            | <b>Assessment Unit (AU)</b> | <b>Primary Limiting Factor(s) (PLF) by AU</b>   | <b>Action Description</b>   | <b>FY07-08 Progress</b>  |
|                              | Yoosa Creek                 | Sediment from roads, timber harvest, cattle grazing, and historic mining - effects on rearing and spawning success, interstitial space and pool volume. | Road Decommissioning and road drainage improvements, Weed Control | Project 199607702: Mox Creek culvert design.   |
|                              | Lolo Creek                  | Sediment from roads, timber harvest, cattle grazing, - effects on rearing and spawning success, interstitial space and pool volume                      | Road obliteration and road drainage improvements                  | Project 199607702: Decommissioned 2 miles of riparian roads and 5 miles of upland roads.             |
|                              |                             | Reduced channel complexity from streamside roads, reduced LWD & historic dredge mining  | Riparian Rehabilitation & Large Woody Debris                      | Project 199607702: 0.1 mile stream complexity increased in Jim Brown Creek.                          |
|                              |                             | Loss of riparian vegetation and complexity - lack of stream shading resulting in elevated temperatures  | Riparian planting   | Project 199607702: two culvert replacements to access 5.2 miles instream habitat.                    |
|                              |                             | Lack of passage - Lack of access to diversity of habitats.  | Culvert Replacement, Eldorado Falls Adjustment                    | Project 199607702: 3 miles riparian vegetation planted.  |
| Selway River                 | O'Hara Creek                | Sediment from roads, timber harvest, cattle grazing - effects on rearing and spawning success, interstitial space and pool volume.                      | Road Decommissioning and road drainage improvements, Weed Control | No tributary habitat improvement projects funded by BPA for 2008 implementation in the Selway River. |

| <b>Snake River Steelhead</b>        |                             |  |   |   |
|-------------------------------------|-----------------------------|--|---|---|
| <b>Population</b>                   | <b>Assessment Unit (AU)</b> | <b>Primary Limiting Factor(s) (PLF) by AU</b>  | <b>Action Description</b>   | <b>FY07-08 Progress</b>   |
|                                     |                             | Loss of riparian vegetation and complexity - lack of stream shading resulting in elevated temperatures               | Riparian Rehabilitation & Large Woody Debris                          |   |
|                                     | Lower Selway River          | Sediment from roads - effects on rearing and spawning success, interstitial space and pool volume.                   | Riparian Rehabilitation & Sediment Filters                            |   |
|                                     |                             | Lack of passage - Lack of access to diversity of habitats,   | Culvert Replacement   |   |
| South Fork Clearwater River         | Newsome Creek               | Channel Morphology - Channel straightened, lack of pools, lack of pool depth, lack of complexity, lack of cover      | Channel / Riparian Rehabilitation                                     | BPA funding for Project 200003500, Rehabilitate Newsome Creek — budget expanded by \$321k/year beginning in FY08: design and preparation for the restoration of Stream Reach 5. |
| South Fork Clearwater River (con't) |                             | Loss of riparian vegetation and complexity - dredge mine effects, lack of shade, loss of nutrients                   | Channel / Riparian Rehabilitation                                     | Project 200003500: Mare Creek and Mule Creek culvert replacements to access 6 miles instream habitat.   |
|                                     |                             | Lack of passage - Lack of access to diversity of habitats,   | Culvert Replacement   |   |
|                                     |                             | Sediment effects on rearing and spawning success - lack of interstitial space, reduced pool volume, reduced spawning | Road Decommissioning, Road Improvement, Culvert Removal / Replacement |   |

| <b>Snake River Steelhead</b>        |                             |  |   |   |
|-------------------------------------|-----------------------------|--|---|---|
| <b>Population</b>                   | <b>Assessment Unit (AU)</b> | <b>Primary Limiting Factor(s) (PLF) by AU</b>  | <b>Action Description</b>   | <b>FY07-08 Progress</b>   |
|                                     |                             | success  |   |   |
|                                     | Meadow Creek                | Sediment effects on rearing and spawning success - lack of interstitial space, reduced pool volume, reduced spawning success | Road Decommissioning, Soil Restoration, Culvert Removal / Replacement, Weed Control | BPA funding for Project 199607705, Restore McComas Meadows/Meadow Creek Watershed — budget expanded by \$200k/year beginning in FY08: 2 riparian miles and 17 upland miles of road treated/removed along Orchard Creek. |
|                                     |                             | Lack of passage - Lack of access to diversity of habitats,   | Culvert Replacement   | Project 199607705: Covert Creek culvert replacement to access 2 miles instream habitat.   |
|                                     |                             | Loss of riparian vegetation and complexity - lack of large woody debris recruitment resulting in lack of habitat complexity  | Riparian Rehabilitation   | Project 199607705: 6 miles riparian vegetation planted in Orchard Creek, McComas Meadows, and Mill Creek.   |
| South Fork Clearwater River (con't) |                             | Loss of riparian vegetation and complexity - lack of stream shading resulting in elevated temperatures                       | Riparian Rehabilitation   |   |
|                                     | Mill Creek                  | Lack of passage - Lack of access to diversity of habitats,   | Culvert Replacement   | BPA funding for Project 200003600, Protect and Restore Mill Creek — budget expanded by \$150k/year beginning in FY08: Hepner Creek and Merton Creek culvert replacement to access 8 miles instream habitat.             |

| <b>Snake River Steelhead</b> |                             |  |   |  |
|------------------------------|-----------------------------|--|---|--|
| <b>Population</b>            | <b>Assessment Unit (AU)</b> | <b>Primary Limiting Factor(s) (PLF) by AU</b>  | <b>Action Description</b>   | <b>FY07-08 Progress</b>  |
|                              |                             | Loss of riparian vegetation and complexity - lack of large woody debris recruitment resulting in lack of habitat complexity  | Riparian Rehabilitation   | Project 200003600: 0.5 mile riparian vegetation planted.   |
|                              |                             | Loss of riparian vegetation and complexity - lack of stream shading resulting in elevated temperatures                       | Riparian Rehabilitation   |  |
|                              | American River              | Channel Morphology - Channel straightened, lack of pools, lack of pool depth, lack of complexity, lack of cover              | Channel / Riparian Rehabilitation on Telephone, Whitaker, & Queen Creeks. BLM proposed restoration of American River. | No tributary habitat improvement projects funded by BPA for 2007-09 implementation in the American River AU. |
|                              |                             | Loss of riparian vegetation and complexity - dredge mine effects, lack of shade, loss of nutrients                           | Channel / Riparian Rehabilitation on Telephone, Whitaker, & Queen Creeks  |  |
|                              |                             | Lack of passage - Lack of access to diversity of habitats  | Culvert Replacement   |  |
|                              |                             | Sediment effects on rearing and spawning success - lack of interstitial space, reduced pool volume, reduced spawning success | Road Decommissioning, Road Improvement, Culvert Removal / Replacement, Weed Control                                   |  |

| <b>Snake River Steelhead</b>        |                             |  |   |  |
|-------------------------------------|-----------------------------|--|---|--|
| <b>Population</b>                   | <b>Assessment Unit (AU)</b> | <b>Primary Limiting Factor(s) (PLF) by AU</b>  | <b>Action Description</b>   | <b>FY07-08 Progress</b>  |
|                                     |                             | Riparian and channel alteration from floodplain/riparian development   | Maines Estate Land Acquisition / Conservation Easements                                   | No tributary habitat improvement projects funded by BPA for 2007-09 implementation in the Crooked River AU.  |
|                                     | Crooked River               | Channel Morphology - Channel straightened, lack of pools, lack of pool depth, lack of complexity, lack of cover              | Channel / Riparian Rehabilitation, includes both BPA proposals and FS Stewardship actions |  |
|                                     |                             | Loss of riparian vegetation and complexity - dredge mine effects, lack of shade, loss of nutrients                           | Channel / Riparian Rehabilitation, includes both BPA proposals and FS Stewardship actions |  |
|                                     |                             | Lack of passage - Lack of access to diversity of habitats  | Culvert Replacement   |  |
| South Fork Clearwater River (con't) |                             | Sediment effects on rearing and spawning success - lack of interstitial space, reduced pool volume, reduced spawning success | Road Decommissioning, Road Improvement, Culvert Removal / Replacement, Weed Control       | BPA funding for Project 200207200, Protect and Restore Red River Watershed — budget expanded by \$198k/year beginning in FY08.<br><br>Project 200207200: 15.6 miles decommissioned roads reseeded in riparian zones. |
|                                     | Red River                   | Channel Morphology - Channel straightened, lack of pools, lack of pool depth, lack of complexity, lack of cover              | Channel / Riparian Rehabilitation   |  |
|                                     |                             | Loss of riparian vegetation and complexity - dredge  | Channel / Riparian Rehabilitation   |  |

| <b>Snake River Steelhead</b> |                             |  |  |  |
|------------------------------|-----------------------------|--|--|--|
| <b>Population</b>            | <b>Assessment Unit (AU)</b> | <b>Primary Limiting Factor(s) (PLF) by AU</b>  | <b>Action Description</b>  | <b>FY07-08 Progress</b>  |
|                              |                             | mine effects, lack of shade, loss of nutrients   |  |  |
|                              |                             | Lack of passage - Lack of access to diversity of habitats,   | Culvert Replacement  | Project 200207200: Culvert #1709 replaced to open 12 miles instream habitat.   |
|                              |                             | Sediment effects on rearing and spawning success - lack of interstitial space, reduced pool volume, reduced spawning success | Road Decommissioning, Road Improvement, Culvert Removal / Replacement, Weed Control  | Project 200207200: 1.0 mile road decommissioned in riparian zones; 20 miles road decommissioned in upland area; 139 acres upland erosion and sedimentation control on decommissioned roads.  |
|                              |                             | Riparian and channel alteration from floodplain/riparian development.  | Red River Meadows Land Acquisition / Conservation Easements  | Project 200207200: Red River Meadows stream restoration planned for FY09 implementation.   |
| Big Creek                    | Entire Big Creek Watershed  | Chemical Pollution From Mining Activities  | Mine Rehabilitation and Riparian Restoration   | BPA funding for Project 200726800, Idaho Watershed Restoration to implement high-priority action items to maintain, enhance, and restore fish habitat and fish passage in the priority stream segments of the Upper Salmon Basin. 0.4 mile riparian fencing; 0.08 mile stream complexity improved in Herd Creek. |
|                              |                             | Sediment effects on rearing and spawning success - lack of interstitial space, reduced pool volume, reduced spawning success | Road Decommissioning, Road Improvement, Culvert Removal / Replacement, Riparian Restoration near Mining Sites, Weed Management, Silvicultural BMPs |  |

| <b>Snake River Steelhead</b> |                             |  |   |   |
|------------------------------|-----------------------------|--|---|---|
| <b>Population</b>            | <b>Assessment Unit (AU)</b> | <b>Primary Limiting Factor(s) (PLF) by AU</b>  | <b>Action Description</b>   | <b>FY07-08 Progress</b>   |
|                              |                             | Migration Barriers associated with roads and mining activities   | Assess stream crossings and anthropogenic migration barriers to determine actions necessary for salmonid passage. Provide for salmonid passage at identified passage barriers (e.g., culvert replacement)                             | Project 200726800: Replaced Squaw Creek and Little Salmon River culverts to access 11 miles instream habitat.   |
| Secesh River                 | Entire Secesh Basin         | Sediment effects on rearing and spawning success - lack of interstitial space, reduced pool volume, reduced spawning success | Road Decommissioning, Road Improvement, Culvert Removal / Replacement, Weed Management, Silvicultural BMPs  | BPA expanded funding to Project 200712700, Reestablish Connectivity and Restore Fish Habitat in the East Fork of the South Fork Salmon River Watershed. Conducted assessment, inventory, and prioritization of habitat opportunities in FY08. Implementation to follow pending planning, design, environmental review, and permitting.  |
| South Fork Salmon            | EFSF Salmon and tribs       | Sediment effects on rearing and spawning success - lack of interstitial space, reduced pool volume, reduced spawning success | Road Decommissioning, Road Improvement, Culvert Removal / Replacement, Riparian Restoration, Mine rehabilitation  | BPA expanded funding to Project 200712700, Reestablish Connectivity and Restore Fish Habitat in the East Fork of the South Fork Salmon River Watershed. Conducted assessment, inventory, and prioritization of habitat opportunities in FY08. Implementation to follow pending planning, design, environmental review, and permitting.  |
|                              |                             | Migration Barriers   | Assess stream crossings and anthropogenic migration barriers to determine actions necessary for salmonid passage. Provide for salmonid passage at identified passage barriers. The Stibnite-Glory Hole passage project is a priority. | Funding through 200712700 (see above). Stibnite-Glory Hole passage project cancelled, replaced with watershed-scale assessment of passage barriers (culverts), channel complexity and floodplain reconnection opportunities, and prioritized road decommissioning. Implementation in FY09 and beyond based on inventory and assessment and pending environmental review and permitting. |

| <b>Snake River Steelhead</b> |                             |   |   |                         |
|------------------------------|-----------------------------|---|---|-------------------------|
| <b>Population</b>            | <b>Assessment Unit (AU)</b> | <b>Primary Limiting Factor(s) (PLF) by AU</b> | <b>Action Description</b>   | <b>FY07-08 Progress</b> |
|                              |                             | Heavy Metal Contamination                     | Mine oversight and management to protect and restore water quality and fish habitat. Riparian, floodplain, and wetland restoration. |                         |

**Table 4.3. Actions Identified for 2007-2009 Implementation in FCRPS BA, Attachment B.2.2-2, Table 4c: Upper Columbia River Summer/Winter Steelhead**

| <b>Upper Columbia River Steelhead</b> |                                |   |                                      |   |   |
|---------------------------------------|--------------------------------|---|--------------------------------------|---|---|
| <b>Population</b>                     | <b>Assessment Unit (AU)</b>    | <b>Primary Limiting Factor(s) by AU</b> | <b>Action Description</b>            | <b>FY08 Progress</b>  |   |
| Okanogan River                        | Omak Creek MSA                 | Passage-culverts                        | provide passage at barriers          | Colville Tribe Accord Agreement: approximately \$850k budget increase in FY08 (Projects 2000-00-100 Omak Creek Anadromous Fish Habitat and Passage, 1996-042-00 Restore Salmon Creek Anadromous Fish, 2007-224-00 Okanogan Subbasin Habitat Implementation Program). 100 acres riparian acres purchased along Omak Creek, 20 riparian acres planted, 0.3 instream mile instream habitat complexity in Wildhorse Spring Creek. |   |
|                                       | Small Trib Creeks Combined mSA | Riparian and floodplain function        | land acquisition                     |   |   |
|                                       | Salmon Creek                   | Low stream flow                         |                                      |   | water acquisition   |
|                                       |                                |   | In-channel habitat quantity*         |   | Salmon Creek Project funded under 2007-09 F&W Pgm Funding Decision. Potential to fund water acquisition through the Water Entity/CBWTP. |
|                                       |                                |   | Passage-flow barrier in lower reach  |   | improve water management/channel reconstruction   |
|                                       | Loup Loup Creek                | Low stream flow                         |                                      |   | improve water management  |
|                                       |                                |   | Riparian and floodplain function     |   | water conservation  |
|                                       |                                |   | Passage- flow barrier in lower reach |   | provide passage at barriers   |

**Table 5.1. Status of Completed and Ongoing 2007 FCRPS Biological Assessment Table 5a Tributary Habitat Actions Performed with Reclamation Technical Assistance**

Table 5.1 contains metric and metric values for actions completed in 2007-2008 and ongoing actions that will continue into 2009 and later with technical assistance provided by Reclamation. Ongoing actions are those with no date in the "Action End" column. Some of the projects listed in this Table *complement* BPA-funded projects listed in Attachment 3, Tables 1 to 4. The following abbreviations apply. Streamflow: streamflow protected under state law. Stream length: stream length affected. Extent of barrier: P, partial (upstream access seasonably inaccessible prior to action); F (absolutely no passage prior to action), full. Access: miles made accessible to next upstream full or partial barrier. Stream length affected by screen: miles between action location and next diversion. Complexity miles: length of instream habitat treated after action completed.

| BiOp ID | Subbasin             | Limiting Factor | Project Title               | Short Description   | ESU/DPS                         | Lat. (north) | Long. (west) | Action Start | Action End | Stream flow (cfs) | Stream Length (mi.) | Extent of Barrier | Access miles | # of screens | Screen discharge (cfs) | Screen discharge (A-F/yr) | Stream Miles affected | Complexity (Miles) |
|---------|----------------------|-----------------|-----------------------------|---|---------------------------------|--------------|--------------|--------------|------------|-------------------|---------------------|-------------------|--------------|--------------|------------------------|---------------------------|-----------------------|--------------------|
| 4292    | John Day Middle Fork | Channel Access  | North Ditch Diversion       | Project purpose is to provide fish passage. The diversion has an 18 inch, open ended CMP pipe for a headgate which is regulated by placing boards and plastic across the opening. The instream part of the structure is composed of large rocks and gravels. The diversion will be replaced by a lay-flat stanchion dam by the GSWCD.   | Middle Columbia River Steelhead | 44 35 18     | 118 26 27    | 10/11/2006   | 8/15/2007  |                   |                     | P                 | 24           |              |                        |                           |                       |                    |
| 4293    | John Day Middle Fork | Channel Access  | Upper Clear Creek Diversion | Project purpose is to provide fish passage. The diversion has an 18 inch, open ended CMP pipe for a headgate which is regulated by placing boards and plastic across the opening. The instream part of the structure is composed of large rocks, boards, and plastic supported by steel fence posts. The diversion will be replaced by a lay-flat stanchion dam by the GSWCD. | Middle Columbia River Steelhead | 44 34 37     | 118 29 35    | 10/13/2006   | 8/15/2007  |                   |                     | P                 | 14           |              |                        |                           |                       |                    |

| BiOp ID | Subbasin             | Limiting Factor | Project Title                 | Short Description  | ESU/DPS                         | Lat. (north) | Long. (west) | Action Start | Action End | Stream flow (cfs) | Stream Length (mi.) | Extent of Barrier | Access miles | # of screens | Screen discharge (cfs) | Screen discharge (A-F/yr) | Stream Miles affected | Complexity (Miles) |
|---------|----------------------|-----------------|-------------------------------|--|---------------------------------|--------------|--------------|--------------|------------|-------------------|---------------------|-------------------|--------------|--------------|------------------------|---------------------------|-----------------------|--------------------|
| 4294    | John Day Middle Fork | Channel Access  | Vinegar Creek Diversion       | Project purpose is to provide fish passage. The instream part of the structure is composed of 2-4 foot boulders on the permanent part of the structure with smaller rocks, debris, boards, and plastic on the part that is hand built each year. The diversion will be replaced by a modified version of a lay-flat stanchion dam by the GSWCD                                 | Middle Columbia River Steelhead | 44 37 49     | 118 29 59    | 10/13/2006   | 8/15/2007  |                   |                     | P                 | 7            |              |                        |                           |                       |                    |
| 4295    | John Day Middle Fork | Channel Access  | South Ditch Diversion (MFJDR) | Project purpose is to provide fish passage. The diversion has an 18 inch, open ended CMP pipe for a headgate which is regulated by placing boards and plastic across the opening. The instream part of the structure is composed of large rocks. The diversion will be replaced by a lay-flat stanchion dam by the GSWCD.  | Middle Columbia River Steelhead | 44 35 53     | 118 28 10    | 10/13/2006   | 8/15/2007  |                   |                     | F                 | 2            |              |                        |                           |                       |                    |
| 4296    | John Day Middle Fork | Channel Access  | Smith Ditch Diversion         | Project purpose is to provide fish passage. Historically a pushup dam was required for the irrigator to divert a the full water right rate. A concrete headgate structure with two slide headgates, control the flow into the ditch. The Grant SWCD anticipates installing a typical lay-flat stanchion dam at this site with fish passage. Construction is targeted for 2008. | Middle Columbia River Steelhead | 44 40 57     | 118 45 47    | 10/18/2006   | 8/1/2008   |                   |                     | P                 | 1            |              |                        |                           |                       |                    |

| BiOp ID | Subbasin             | Limiting Factor | Project Title                         | Short Description  | ESU/DPS                         | Lat. (north)i | Long. (west) | Action Start | Action End | Stream flow (cfs) | Stream Length (mi.) | Extent of Barrier | Access miles | # of screens | Screen discharge (cfs) | Screen discharge (A-F/yr) | Stream Miles affected | Complexity (Miles) |
|---------|----------------------|-----------------|---------------------------------------|--|---------------------------------|---------------|--------------|--------------|------------|-------------------|---------------------|-------------------|--------------|--------------|------------------------|---------------------------|-----------------------|--------------------|
| 4345    | John Day Middle Fork | Channel Access  | Boulder Creek Ranch Diversion         | Project purpose is to provide fish passage. The Boulder Creek Ranch Diversion is about 15 miles Northwest of Austin Junction, Oregon on Big Boulder Creek. Big Boulder Creek is a major tributary to the Middle Fork John Day River. The instream part of the structure is composed of large cobble, and traps.  | Middle Columbia River Steelhead | 44 40 26      | 118 43 01    | 7/25/2008    |            |                   |                     | P                 | 13           |              |                        |                           |                       |                    |
| 4278    | John Day Upper Main  | Channel Access  | GSWCD-North Diversion, Reynolds Creek | Grant SWCD is proposing to build a lay-flat stanchion type dam to replace the current dam. The new structure would incorporate fish passage meeting current criteria.  | Middle Columbia River Steelhead | 44 24 40      | 118 34 04    | 10/7/2005    | 8/15/2007  |                   |                     | F                 | 0.2          |              |                        |                           |                       |                    |
| 4297    | John Day Upper Main  | Channel Access  | Axe Ditch Diversion-Reynolds Creek    | Project purpose is to provide fish passage. There is not a functioning headgate and the instream part of the structure is composed of large rocks, tarps, steel posts, and logs. The diversion will be replaced by a lay-flat stanchion dam by the GSWCD.  | Middle Columbia River Steelhead | 44 25 01      | 118 32 40    | 1/19/2007    | 8/15/2007  |                   |                     | F                 | 11           |              |                        |                           |                       |                    |
| 4299    | John Day Upper Main  | Channel Access  | Blue Mountain Diversion               | Project purpose is to provide fish passage. The structure consists of concrete wing walls and a concrete sill about 15 feet wide and 80-100 feet long, with a total vertical drop 6-7 at low flow. The GSWCD is proposing to rebuild the channel grade using a series of weirs to raise the water level to the sill of the dam and then creating a passageway over or through the flash board part of the dam. | Middle Columbia River Steelhead | 44 24 39      | 119 07 42    | 10/11/2006   | 8/15/2007  |                   |                     | F                 | 0.5          |              |                        |                           |                       |                    |

| BiOp ID | Subbasin            | Limiting Factor | Project Title                           | Short Description  | ESU/DPS                         | Lat. (north) | Long. (west) | Action Start | Action End | Stream flow (cfs) | Stream Length (mi.) | Extent of Barrier | Access miles | # of screens | Screen discharge (cfs) | Screen discharge (A-F/yr) | Stream Miles affected | Complexity (Miles) |
|---------|---------------------|-----------------|---|--|---------------------------------|--------------|--------------|--------------|------------|-------------------|---------------------|-------------------|--------------|--------------|------------------------|---------------------------|-----------------------|--------------------|
| 4303    | John Day Upper Main | Channel Access  | Morgan Ditch Diversion (Reynolds Creek) | Project purpose is to provide fish passage. There is a functioning slide headgate and the instream part of the structure is composed of large rocks and logs. The diversion will be replaced by a lay-flat stanchion dam by the GSWCD.   | Middle Columbia River Steelhead | 44 24 42     | 118 33 34    | 10/11/2006   | 8/15/2007  |                   |                     | P                 | 0.85         |              |                        |                           |                       |                    |
| 4301    | John Day Upper Main | Channel Access  | Hufstader Pump Station                  | Project purpose is to provide fish passage. The pump station will serve lands at the far end of the Eddington Ditch. Eddington Ditch diverts water from the John Day River 4.3 river miles upstream from the site of the proposed pump station. The Grant SWCD anticipates installing a pump station and associated delivery piping. Construction is targeted for 2008.              | Middle Columbia River Steelhead | 44 43 24     | 119 27 37    | 10/18/2006   | 4/15/2008  |                   |                     | P                 |              |              |                        |                           |                       |                    |
| 4298    | John Day Upper Main | Channel Access  | Beech Creek Crossing                    | Project purpose is to provide fish passage. A dam in Beech Creek allows the water in Panama Ditch to flow into and back out of Beech Creek. The Grant SWCD anticipates installing an inverted siphon to carry the Panama Ditch water under Beech Creek and modifications to the dam in Beech Creek to divert Beech Creek water and allow passage. Construction is targeted for 2008. | Middle Columbia River Steelhead | 44 25 32     | 119 06 35    | 10/18/2006   | 8/15/2008  |                   |                     | F                 | 6            |              |                        |                           |                       |                    |

| BiOp ID | Subbasin            | Limiting Factor | Project Title                              | Short Description   | ESU/DPS                         | Lat. (north) | Long. (west) | Action Start | Action End | Stream flow (cfs) | Stream Length (mi.) | Extent of Barrier | Access miles | # of screens | Screen discharge (cfs) | Screen discharge (A-F/yr) | Stream Miles affected | Complexity (Miles) |
|---------|---------------------|-----------------|--|---|---------------------------------|--------------|--------------|--------------|------------|-------------------|---------------------|-------------------|--------------|--------------|------------------------|---------------------------|-----------------------|--------------------|
| 4300    | John Day Upper Main | Channel Access  | Bower's/Lemon's Ditch Diversion            | Project purpose is to provide fish passage. The diversion structure is a typical gravel pushup dam which has to be constructed and maintained with heavy equipment. The Grant SWCD anticipates installing a typical lay-flat stanchion dam at this site with fish passage. Construction is targeted for 2008  | Middle Columbia River Steelhead | 44 24 40     | 119 07 02    | 10/18/2006   | 8/15/2008  |                   |                     | F                 | 10.5         |              |                        |                           |                       |                    |
| 4302    | John Day Upper Main | Channel Access  | Long Box Diversion                         | Project purpose is to provide fish passage. The diversion structure is a gravel and large rock pushup dam. The Grant SWCD anticipates installing a typical lay-flat stanchion dam at this site with fish passage. Construction is targeted for 2008.  | Middle Columbia River Steelhead | 44 27 18     | 119 25 33    | 10/18/2006   | 8/15/2008  |                   |                     | P                 | 1            |              |                        |                           |                       |                    |
| 4304    | John Day Upper Main | Channel Access  | Panama Ditch Diversion                     | Project purpose is to provide fish passage. The diversion structure is a typical gravel pushup dam which has to be constructed and maintained with heavy equipment. The Grant SWCD anticipates installing a typical lay-flat stanchion dam at this site with fish passage. Construction is targeted for 2008. | Middle Columbia River Steelhead | 44 25 00     | 119 03 18    | 10/18/2006   | 8/15/2008  |                   |                     | F                 | 7            |              |                        |                           |                       |                    |
| 4314    | John Day Upper Main | Channel Access  | Grant SWCD-Stout Diversion (UPJD RM 214.3) | Project purpose is to provide fish passage.   | Middle Columbia River Steelhead | 44 27 54     | 119 29 32    | 3/31/2008    |            |                   |                     | F                 | 1            |              |                        |                           |                       |                    |

| BiOp ID | Subbasin            | Limiting Factor | Project Title   | Short Description   | ESU/DPS                         | Lat. (north) | Long. (west) | Action Start | Action End | Stream flow (cfs) | Stream Length (mi.) | Extent of Barrier | Access miles | # of screens | Screen discharge (cfs) | Screen discharge (A-F/yr) | Stream Miles affected | Complexity (Miles) |
|---------|---------------------|-----------------|---|---|---------------------------------|--------------|--------------|--------------|------------|-------------------|---------------------|-------------------|--------------|--------------|------------------------|---------------------------|-----------------------|--------------------|
| 4323    | John Day Upper Main | Channel Access  | Kennedy (UPJD RM 209) and Murray (UPJD RM 210.2) Ditch Diversions               | Project purpose is to provide fish passage.   | Middle Columbia River Steelhead | 44 29 13     | 119 33 21    | 1/24/2008    |            |                   |                     | F                 | 1            |              |                        |                           |                       |                    |
| 4349    | John Day Upper Main | Channel Access  | Eddington Ditch Diversion (Page Pump Station-UPJD RM 231.7)                     | Project purpose is to provide fish passage. The Eddington Ditch Diversion project is located 6 miles west of Mt. Vernon on the John Day River at river mile 233. The diversion structure is a typical gravel pushup dam which has to be constructed and maintain with heavy equipment. One partially functioning slide headgate controls flow into the ditch. | Middle Columbia River Steelhead | 44 25 44     | 119 12 44    | 7/28/2008    |            |                   |                     | F                 | 1            |              |                        |                           |                       |                    |
| 4350    | John Day Upper Main | Channel Access  | Oliver Ditch # 47 (UPJD RM 253.3) Diversion (combined with Oliver #48 in 2008)  | Project purpose is to provide fish passage. The Oliver Ditch # 47 Diversion project is located 4.5 miles east of John Day on the John Day River at river mile 253.3   | Middle Columbia River Steelhead | 44 25 25     | 118 51 50    | 7/28/2008    |            |                   |                     | F                 | 1            |              |                        |                           |                       |                    |
| 4351    | John Day Upper Main | Channel Access  | Oliver Ditch # 48 (UPJD RM 253.2) Diversion (combined with Oliver # 47 in 2008) | Project purpose is to provide fish passage. The Oliver Ditch # 48 Diversion project is located 4.5 miles east of John Day on the John Day River at river mile 253.2   | Middle Columbia River Steelhead | 44 25 19     | 118 51 50    | 7/28/2008    |            |                   |                     | P                 | 0.1          |              |                        |                           |                       |                    |

| BiOp ID | Subbasin             | Limiting Factor    | Project Title   | Short Description   | ESU/DPS                         | Lat. (north) | Long. (west) | Action Start | Action End | Stream flow (cfs) | Stream Length (mi.) | Extent of Barrier | Access miles | # of screens | Screen discharge (cfs) | Screen discharge (A-F/yr) | Stream Miles affected | Complexity (Miles) |
|---------|----------------------|--------------------|---|---|---------------------------------|--------------|--------------|--------------|------------|-------------------|---------------------|-------------------|--------------|--------------|------------------------|---------------------------|-----------------------|--------------------|
| 4353    | John Day Upper Main  | Channel Access     | Oliver Ditch # 49 Diversion (UPJD RM 252.2)               | Project purpose is to provide fish passage. The Oliver Ditch # 49 Diversion project is located 4 miles east of John Day the John Day River at river mile 252.3. Preliminary review of the water rights indicates this diversion has a water right for diversion of 2.3 cfs. This structure is a full barrier at low flow to all life stages but at higher flows when the dam is partially washed out , it is partially barrier. | Middle Columbia River Steelhead | 44 25 14     | 118 52 36    | 7/28/2008    |            |                   |                     | F                 | 1            |              |                        |                           |                       |                    |
| 4369    | John Day Upper Main  | Channel Access     | Grant SWCD-Cummings River Ditch Diversion (UPJD RM 222.5) | Project purpose is to provide fish passage. The Cummings River Diversion project is located 12 miles west of Mt.Vernon on the John Day River at river mile 226. The diversion structure is a typical gravel and large rock pushup dam which has to be constructed and maintain with heavy equipment.  | Middle Columbia River Steelhead | 44 26 07     | 119 18 56    | 2/4/2008     |            |                   |                     | F                 | 1            |              |                        |                           |                       |                    |
| 4272    | John Day Middle Fork | Channel Complexity | TNC MF John Day Habitat Improvement Project-Phase I       | The Nature Conservancy has asked Reclamation for technical assistance in design and planning for a variety of habitat improvements on their Dunstan Homestead Preserve property on the Middle Fork John Day. Phase I of the project will be to determine the feasibility and then the ultimate design and planning for three side channel projects.   | Middle Columbia River Steelhead | 44 40 00     | 118 42 34    | 5/23/2005    | 8/15/2007  | 0.64              |                     |                   |              |              |                        |                           |                       | 0.2                |

| BiOp ID | Subbasin             | Limiting Factor    | Project Title  | Short Description   | ESU/DPS                         | Lat. (north) | Long. (west) | Action Start | Action End | Stream flow (cfs) | Stream Length (mi.) | Extent of Barrier | Access miles | # of screens | Screen discharge (cfs) | Screen discharge (A-F/yr) | Stream Miles affected | Complexity (Miles) |
|---------|----------------------|--------------------|--|---|---------------------------------|--------------|--------------|--------------|------------|-------------------|---------------------|-------------------|--------------|--------------|------------------------|---------------------------|-----------------------|--------------------|
| 4273    | John Day Middle Fork | Channel Complexity | Dead Cow Gulch Access and Habitat Improvement Project  | Dead Cow Gulch is currently blocked to fish passage near its mouth by two culverts. The channel has also been moved to a different path which further limits access and available habitat. This project would reroute the stream into a more natural alignment and eliminate the culverts as a barrier.   | Middle Columbia River Steelhead | 44 36 27     | 118 32 50    | 2/14/2005    | 10/30/2007 | 0.2               |                     |                   |              |              |                        |                           |                       | 1.25               |
| 4368    | John Day Middle Fork | Channel Complexity | TNC MF John Day Habitat Improvement Project - Phase II | TNC has asked Reclamation for technical assistance for design of a subset of projects proposed in the Aquatic and Flood Restoration Plan for Dustan Homestead Preserve (Claire Fields, 2004) in order to build partnerships and refine designs, permitting process, construction techniques, construction costs, and monitoring protocols for these restoration elements. Each element has future application elsewhere on the Dustan Preserve, as well as elsewhere in the upper Middle Fork John Day watershed. | Middle Columbia River Steelhead | 44 40 00     | 118 42 34    | 5/20/2005    | 10/30/2007 | 1.25              |                     |                   |              |              |                        |                           |                       | 0.83               |
| 4283    | John Day Middle Fork | Channel Complexity | Big Boulder Habitat Improvement Project                | The Nature Conservancy and the Oregon Department of Fish and Wildlife has asked Reclamation for technical assistance in design and planning for channel reconfiguration and large wood placements on Big Boulder Creek.   | Middle Columbia River Steelhead | 44 40 22     | 118 42 59    | 9/6/2005     | 7/15/2008  | 0.83              |                     |                   |              |              |                        |                           |                       | 0.15               |

| BiOp ID | Subbasin            | Limiting Factor    | Project Title                            | Short Description  | ESU/DPS  | Lat. (north)i | Long. (west) | Action Start | Action End | Stream flow (cfs) | Stream Length (mi.) | Extent of Barrier | Access miles | # of screens | Screen discharge (cfs) | Screen discharge (A-F/yr) | Stream Miles affected | Complexity (Miles) |
|---------|---------------------|--------------------|--|--|--|---------------|--------------|--------------|------------|-------------------|---------------------|-------------------|--------------|--------------|------------------------|---------------------------|-----------------------|--------------------|
| 4305    | John Day Upper Main | Channel Complexity | CTWSRO Reach 8 Habitat Design            | The work will involve design of features to improve habitat. The river is partially constrained by levees resulting in a fairly straight, wide, and shallow cross section. The proposed project is to remove the levees and strategically place large wood to increase channel complexity, narrow the channel, and stimulate natural increases in sinuosity. | Middle Columbia River Steelhead                                | 44 27 33      | 118 41 52    | 10/13/2006   | 8/1/2007   | 0.15              |                     |                   |              |              |                        |                           |                       | 1                  |
| 4298    | John Day Upper Main | Entrainment        | Beech Creek Crossing                     | A dam in Beech Creek allows the water in Panama Ditch to flow into and back out of Beech Creek. The Grant SWCD anticipates installing an inverted siphon to carry the Panama Ditch water under Beech Creek and modifications to the dam in Beech Creek to divert Beech Creek water and allow passage. Construction is targeted for 2008.                     | Middle Columbia River Steelhead                                | 44 25 32      | 119 06 35    | 10/18/2006   |            | 1                 |                     |                   |              | 1            |                        |                           |                       |                    |
| 4209    | Lemhi               | Channel Access     | Lemhi River-L-44 Diversion Consolidation | The L-44 and 45 irrigation diversions on the upper Lemhi River are typical rock, push up diversion structures. Elimination of one diversion berm (L-44) and replacement of the other (L-45) with a single, consolidated structure will ensure fish passage during variable flows.  | Snake River Spring/Summer Chinook Salmon Snake River Steelhead | 44 49 46      | 113 36 37    | 5/13/2004    | 8/13/2007  |                   |                     | P                 | 0.5          |              |                        |                           |                       |                    |

| BiOp ID | Subbasin     | Limiting Factor | Project Title                             | Short Description   | ESU/DPS  | Lat. (north) | Long. (west) | Action Start | Action End | Stream flow (cfs) | Stream Length (mi.) | Extent of Barrier | Access miles | # of screens | Screen discharge (cfs) | Screen discharge (A-F/yr) | Stream Miles affected | Complexity (Miles) |
|---------|--------------|-----------------|---|---|--|--------------|--------------|--------------|------------|-------------------|---------------------|-------------------|--------------|--------------|------------------------|---------------------------|-----------------------|--------------------|
| 4328    | Lemhi        | Channel Access  | L-1 Diversion                             | Project purpose is to provide fish passage. Evaluation of alternatives and development of conceptual design for a pump system and/or diversion weir is requested.   | Snake River Spring/Summer Chinook Salmon Snake River Steelhead | 45 10 69     | 113 53 15    | 4/1/2008     |            |                   |                     | P                 | 1            |              |                        |                           |                       |                    |
| 4335    | Pahsimero i  | Channel Access  | Big Springs Creek 1 Diversion Enhancement | This project proposes to remove the existing wooden check structure and replace it with a structure that would allow fish passage at all times , while allowing the irrigators to continue diverting the water.   | Snake River Spring/Summer Chinook Salmon Snake River Steelhead | 44 36 33     | 113 57 33    | 7/1/2008     |            |                   |                     |                   |              |              |                        |                           |                       |                    |
| 4239    | Upper Salmon | Channel Access  | East Fork Salmon River-EF 13 Diversion    | This project would construct a permanent diversion structure. Fish passage around the site will be provided.  | Snake River Spring/Summer Chinook Salmon Snake River Steelhead | 44 08 45     | 114 23 26    | 3/9/2004     |            |                   |                     | P                 | 1            |              |                        |                           |                       |                    |
| 4247    | Upper Salmon | Channel Access  | East Fork Salmon River-EF 14 Diversion    | Project purpose is to provide fish passage. EF 14 is an irrigation diversion with a gravel push-up dame. The diversion is unstable and must be re-built several times each year. This project would construct a more permanent rock diversion structure, along with a fish screen that meets NOAA criteria. | Snake River Spring/Summer Chinook Salmon Snake River Steelhead | 44 08 33     | 114 24 07    | 2/16/2006    |            |                   |                     | P                 | 1.2          |              |                        |                           |                       |                    |

| BiOp ID | Subbasin     | Limiting Factor | Project Title                          | Short Description  | ESU/DPS   | Lat. (north) | Long. (west) | Action Start | Action End | Stream flow (cfs) | Stream Length (mi.) | Extent of Barrier | Access miles | # of screens | Screen discharge (cfs) | Screen discharge (A-F/yr) | Stream Miles affected | Complexity (Miles) |
|---------|--------------|-----------------|--|--|---|--------------|--------------|--------------|------------|-------------------|---------------------|-------------------|--------------|--------------|------------------------|---------------------------|-----------------------|--------------------|
| 4249    | Upper Salmon | Channel Access  | East Fork Salmon River EF 16 Diversion | Project purpose is to provide fish passage. EF 16 is an irrigation diversion with a gravel push-up dam. The diversion is unstable and must be rebuilt several times each year. This project would consolidate three diversions by building a more permanent rock diversion structure, building a new fish screen and new headgate structure. | Snake River Spring/Summer Chinook Salmon Snake River Steelhead            | 44 07 31     | 114 25 39    | 2/16/2006    |            |                   |                     | P                 | 1.9          |              |                        |                           |                       |                    |
| 4342    | Upper Salmon | Channel Access  | Pole Creek Diversion Enhancement       | Project purpose is to provide fish passage. Pole Creek diversion is a wooden structure check board to raise the level of the creek for diversion into an irrigation ditch. There is a fish ladder associated with the diversion that local biologists feel is a barrier to fish movement.  | Snake River Spring/Summer Chinook Salmon Snake River Steelhead            | 43 54 35     | 114 45 26    | 9/10/2008    |            |                   |                     |                   |              |              |                        |                           |                       |                    |
| 4034    | Methow       | Channel Access  | MVID East Canal Diversion Dam          | Project purpose is to provide fish passage. Will replace the structure with a new one located at the original point of diversion. The upstream location will allow a much less obtrusive structure that will not require a constructed fishway for passage.  | Upper Columbia River Spring Chinook Salmon Upper Columbia River Steelhead | 48 25 08     | 120 08 25    | 9/13/2002    |            |                   |                     | P                 | 246.3        |              |                        |                           |                       |                    |
| 4035    | Methow       | Channel Access  | MVID West Canal Diversion Dam          | Project purpose is to provide fish passage. Design and construct a new diversion structure and headgate that would prevent entry and minimize the effects of MVID's operations on listed salmonids.  | Upper Columbia River Spring Chinook Salmon Upper Columbia River Steelhead | 48 22 13     | 120 11 38    | 9/13/2002    |            |                   |                     | P                 | 120.3        |              |                        |                           |                       |                    |

| BiOp ID | Subbasin | Limiting Factor    | Project Title                                | Short Description   | ESU/DPS   | Lat. (north) | Long. (west) | Action Start | Action End | Stream flow (cfs) | Stream Length (mi.) | Extent of Barrier | Access miles | # of screens | Screen discharge (cfs) | Screen discharge (A-F/yr) | Stream Miles affected | Complexity (Miles) |
|---------|----------|--------------------|--|---|---|--------------|--------------|--------------|------------|-------------------|---------------------|-------------------|--------------|--------------|------------------------|---------------------------|-----------------------|--------------------|
| 4260    | Methow   | Channel Complexity | Jennings Habitat Complexity Project          | The purpose of the project is to reconnect the floodplain to the river and establish off-channel habitat.   | Upper Columbia River Spring Chinook Salmon Upper Columbia River Steelhead | 48 22 03     | 120 18 39    | 1/23/2006    | 10/11/2006 | 1                 |                     |                   |              |              |                        |                           |                       | 0.5                |
| 4261    | Methow   | Channel Complexity | Elbow Coulee Side Channel Restoration        | The objective of this geomorphology project is to restore off-channel rearing habitat in a side channel off the mainstem Twisp River.   | Upper Columbia River Spring Chinook Salmon Upper Columbia River Steelhead | 48 22 47     | 120 14 20    | 5/4/2005     | 9/29/2008  | 0.5               |                     |                   |              |              |                        |                           |                       | 0.5                |
| 4263    | Methow   | Channel Complexity | Upper Beaver Creek Side Channel Reconnection | This geomorphology project involves re-connecting a former beaver pond area and channel to the existing Beaver Creek channel in the Methow subbasin, with the objective of providing off-channel rearing habitat and floodplain connectivity. | Upper Columbia River Spring Chinook Salmon Upper Columbia River Steelhead | 48 23 45     | 120 02 45    | 5/3/2005     |            | 0.5               |                     |                   |              |              |                        |                           |                       | 0.3                |

**Table 5.2. Status of Completed and Ongoing 2007 FCRPS Biological Assessment Table 5b Tributary Habitat Actions Performed with Reclamation Technical Assistance**

Table 5.2 contains metric and metric values for actions completed in 2007-2008 and ongoing actions that will continue into 2009 and later with technical assistance provided by Reclamation. Ongoing actions are those with no date in the "Action End" column. Actions in Table 5.2 *supplement* the projects funded by BPA in 2007-2009. The following abbreviations apply. Streamflow: streamflow protected under state law. Stream length: stream length affected. Extent of barrier: P, partial (upstream access seasonably inaccessible prior to action); F (absolutely no passage prior to action), full. Access: miles made accessible to next upstream full or partial barrier. Stream length affected by screen: miles between action location and next diversion. Complexity miles: length of instream habitat treated after action completed. Status of Completed and Ongoing 2007 FCRPS Biological Assessment Table 5b Tributary Habitat Actions Performed with Reclamation Technical Assistance.

| BiOp ID | Subbasin             | Limiting Factor    | Project Title                               | Short Description   | ESU/DPS                         | Lat. (north) | Long. (west) | Action Start | Action End | Stream flow (cfs) | Stream Length (mi.) | Extent of Barrier | Access miles | # of screens | Screen Discharge |          | Stream Miles affected | Complexity (Miles) |
|---------|----------------------|--------------------|---|---|---------------------------------|--------------|--------------|--------------|------------|-------------------|---------------------|-------------------|--------------|--------------|------------------|----------|-----------------------|--------------------|
|         |                      |                    |   |   |                                 |              |              |              |            |                   |                     |                   |              |              | cfs              | Ac-ft/yr |                       |                    |
| 4318    | John Day Middle Fork | Channel Complexity | CTWSRO Middle Fork Forrest Reach Assessment | Channel Reconfiguration.<br>The ultimate goal of this reach assessment is a diagnostic investigation of the main processes that transport and store water, wood, and sediment at the habitat reach scale of the river system; and an integration of hydrologic, hydraulic, geomorphic, and biologic conditions of the system to establish an environmental baseline through a matrix of pathways of effects and indicators of those effects. The proximate goal is to formulate a multiple working hypothesis for guiding restoration and protection activities at the reach scale based on an established baseline of environmental conditions quantified through channel conditions and dynamics indicators and the reach sequencing of restoration and preservation project areas. This assessment | Middle Columbia River Steelhead |              |              | 9/18/2007    |            |                   |                     |                   |              |              |                  |          |                       |                    |

|         |                      |                    |                               |  |                                 |              |              |              |            |                   |                     |                   |              |              | Screen Discharge |          |                       |                    |
|---------|----------------------|--------------------|-------------------------------|--|---------------------------------|--------------|--------------|--------------|------------|-------------------|---------------------|-------------------|--------------|--------------|------------------|----------|-----------------------|--------------------|
| BiOp ID | Subbasin             | Limiting Factor    | Project Title                 | Short Description  | ESU/DPS                         | Lat. (north) | Long. (west) | Action Start | Action End | Stream flow (cfs) | Stream Length (mi.) | Extent of Barrier | Access miles | # of screens | cfs              | Ac-ft/yr | Stream Miles affected | Complexity (Miles) |
|         |                      |                    |                               | effort will serve as a foundation for subsequent project design packages.  |                                 |              |              |              |            |                   |                     |                   |              |              |                  |          |                       |                    |
| 4319    | John Day Middle Fork | Channel Complexity | CTWSRO Oxbow Reach Assessment | Channel Reconfiguration. The ultimate goal of this reach assessment is a diagnostic investigation of the main processes that transport and store water, wood, and sediment at the habitat reach scale of the river system; and an integration of hydrologic, hydraulic, geomorphic, and biologic conditions of the system to establish an environmental baseline through a matrix of pathways of effects and indicators of those effects. The proximate goal is to formulate a multiple working hypothesis for guiding restoration and protection activities at the reach scale based on an established baseline environmental conditions quantified through channel conditions and dynamics indicators and the reach sequencing of restoration and preservation project areas | Middle Columbia River Steelhead |              |              | 9/5/2007     |            |                   |                     |                   |              |              |                  |          |                       |                    |

| BiOp ID | Subbasin  | Limiting Factor | Project Title  | Short Description  | ESU/DPS  | Lat. (north) | Long. (west) | Action Start | Action End | Stream flow (cfs) | Stream Length (mi.) | Extent of Barrier | Access miles | # of screens | Screen Discharge |          | Stream Miles affected | Complexity (Miles) |
|---------|-----------|-----------------|--|--|--|--------------|--------------|--------------|------------|-------------------|---------------------|-------------------|--------------|--------------|------------------|----------|-----------------------|--------------------|
|         |           |                 |  |  |  |              |              |              |            |                   |                     |                   |              |              | cfs              | Ac-ft/yr |                       |                    |
| 4331    | Methow    | Channel Access  | Redshirt Project   | Project purpose is to provide fish passage. This project will address an irrigation related barrier on Beaver Creek by constructing a rock weir structure.   | Upper Columbia River Spring Chinook Salmon<br>Upper Columbia River Steelhead | 48 23 01     | 120 02 58    | 7/20/2006    | 10/26/2007 |                   |                     | P                 | 4            |              |                  |          |                       |                    |
| 4330    | Methow    | Channel Access  | Poorman Cutoff Road Culvert                                | Replacement of culvert. Project purpose is to provide fish passage.  | Upper Columbia River Spring Chinook Salmon<br>Upper Columbia River Steelhead | 48 21 50     | 120 20 19    | 2/15/2008    |            |                   |                     | F                 | 3            |              |                  |          |                       |                    |
| 4284    | Wenatchee | Channel Access  | Three Mission Creek Projects: Miller, Turnbull and Jurgins | Project purpose is to provide fish passage. Miller and Turnbull- Repair and installation of low stage log weirs to re-establish plunge pool habitat and thalweg, and increase complexity.<br><br>Jurgins- Install a low stage rock weir with large woody debris to provide plunge pool habitat, control bank erosion, increase complexity, and re-establish thalweg. | Upper Columbia River Spring Chinook Salmon<br>Upper Columbia River Steelhead | 47 27 58     | 120 29 30    | 6/26/2006    | 10/15/2006 |                   |                     | P                 |              |              |                  |          |                       |                    |
| 4308    | Wenatchee | Channel Access  | WPP Alder Creek 2 & 3                                      | This project proposes to replace a culvert on Alder Creek that doesn't meet current WDFW and NOAA passage criteria. It carries a paved county road over Alder Creek, and will be analyzed as both a retrofit and replacement.  | Upper Columbia River Spring Chinook Salmon<br>Upper Columbia River Steelhead | 47 50 56     | 120 39 27    | 1/18/2007    | 7/23/2007  |                   |                     | P                 | 1            |              |                  |          |                       |                    |

|         |           |                    |  |  |  |              |              |              |            |                   |                     |                   |              |              | Screen Discharge |          |                       |                    |
|---------|-----------|--------------------|--|--|--|--------------|--------------|--------------|------------|-------------------|---------------------|-------------------|--------------|--------------|------------------|----------|-----------------------|--------------------|
| BiOp ID | Subbasin  | Limiting Factor    | Project Title  | Short Description  | ESU/DPS  | Lat. (north) | Long. (west) | Action Start | Action End | Stream flow (cfs) | Stream Length (mi.) | Extent of Barrier | Access miles | # of screens | cfs              | Ac-ft/yr | Stream Miles affected | Complexity (Miles) |
| 4255    | Wenatchee | Channel Access     | Alder Creek Culvert Passage Project # 1                            | This culvert is a barrier to fish passage because of the outfall velocities associated with it. This project will consist of a detailed analysis of the culvert using WDFW protocol and replacing it as necessary. | Upper Columbia River Spring Chinook Salmon<br>Upper Columbia River Steelhead | 47 51 09     | 120 39 36    | 2/17/2006    | 8/23/2007  |                   |                     | P                 | 4.3          |              |                  |          |                       |                    |
| 4306    | Wenatchee | Channel Access     | WPP Beaver Creek 3 Culvert Replacements                            | This project will address 3 barrier culverts on Beaver Creek by replacing the existing culverts with modular bridges with a span less than 30 feet.  | Upper Columbia River Spring Chinook Salmon<br>Upper Columbia River Steelhead | 47 49 24     | 120 37 22    | 1/19/2007    | 10/15/2008 |                   |                     | P                 | 2            |              |                  |          |                       |                    |
| 4340    | Entiat    | Channel Complexity | Milne Diversion Project ( Bridge to Bridge and Beyond Project # 1) | This is the first project in the Lower Entiat resulting from TSC's Reach Study. It will be multiple instream habitat structures including one that also replaces an irrigation push-up dam.                        | Upper Columbia River Spring Chinook Salmon<br>Upper Columbia River Steelhead | 47 39 57     | 120 16 36    | 8/25/2006    | 10/15/2007 | 0.3               |                     |                   |              |              |                  |          |                       | 0.5                |
| 4329    | Entiat    | Channel Complexity | Harrison Side Channel  | The purpose of this project is to connect secondary channels at about 3 locations at varying elevations along the main channel.  | Upper Columbia River Spring Chinook Salmon<br>Upper Columbia River Steelhead | 47 40 12     | 120 17 29    | 6/26/2007    | 11/15/2008 | 0.5               |                     |                   |              |              |                  |          |                       | 0.3                |
| 4288    | Entiat    | Channel Complexity | Stillwater Complexity Project                                      | The intended impacts of this measure are to increase LWD density and habitat diversity, as well as the amount of backwater pool and tool tail-out habitat.   | Upper Columbia River Spring Chinook Salmon<br>Upper Columbia River Steelhead | 47 57 43     | 120 25 13    | 7/21/2006    |            | 0.3               |                     |                   |              |              |                  |          |                       | 0.2                |
| 4326    | Entiat    | Channel            | Keystone   | This project consists of   | Upper Columbia   | 47 39 54     | 120 16 05    | 1/29/2007    |            | 0.2               |                     |                   |              |              |                  |          |                       |                    |

|         |          |                 |                |  |   |              |              |              |            |                   |                     |                   |              |              | Screen Discharge |          |                       |                    |
|---------|----------|-----------------|----------------|--|---|--------------|--------------|--------------|------------|-------------------|---------------------|-------------------|--------------|--------------|------------------|----------|-----------------------|--------------------|
| BiOp ID | Subbasin | Limiting Factor | Project Title  | Short Description  | ESU/DPS   | Lat. (north) | Long. (west) | Action Start | Action End | Stream flow (cfs) | Stream Length (mi.) | Extent of Barrier | Access miles | # of screens | cfs              | Ac-ft/yr | Stream Miles affected | Complexity (Miles) |
|         |          | Complexity      | Canyon Project | an existing push-up diversion structure replacement and habitat improvement/floodplain connectivity features. The goal of this project is to meet the BiOp Metric requirement for adding habitat complexity to the Entiat to improve spawning and rearing habitat quantity and quality for native endangered fish species. The habitat need identified in the Sub-basin plan and by local biologists for the lower Entiat is deep, slow water habitat (pools), localized pockets of depth, velocity and substrate diversity leading to increased habitat diversity, and retention of spawning size gravels on the channel edges for steelhead (Water Resource Inventory Area (WRIA) 46 Management Plan). The objective of the work under this scope of work is to provide an evaluation of a selected alternative through an Alternative Evaluation Report (AER) for floodplain reconnection and/or in-channel restoration structures, which will provide sufficient analysis results to | River Spring Chinook<br>Salmon<br>Upper Columbia<br>River Steelhead |              |              |              |            |                   |                     |                   |              |              |                  |          |                       |                    |

| BiOp ID | Subbasin | Limiting Factor    | Project Title               | Short Description   | ESU/DPS  | Lat. (north) | Long. (west) | Action Start | Action End | Stream flow (cfs) | Stream Length (mi.) | Extent of Barrier | Access miles | # of screens | Screen Discharge |          | Stream Miles affected | Complexity (Miles) |
|---------|----------|--------------------|-----------------------------|---|--|--------------|--------------|--------------|------------|-------------------|---------------------|-------------------|--------------|--------------|------------------|----------|-----------------------|--------------------|
|         |          |                    |                             |   |  |              |              |              |            |                   |                     |                   |              |              | cfs              | Ac-ft/yr |                       |                    |
|         |          |                    |                             | complete a construction funding proposal.   |  |              |              |              |            |                   |                     |                   |              |              |                  |          |                       |                    |
| 4325    | Methow   | Channel Complexity | Big Valley Reach Assessment | This study will address cumulative project impacts,, river stability and habitat assessment for a 6 to 10 mile reach of the mainstem Methow River.  | Upper Columbia River Spring Chinook Salmon<br>Upper Columbia River Steelhead |              |              | 10/2/2006    | 3/31/2008  |                   |                     |                   |              |              |                  |          |                       | 1                  |
| 4333    | Methow   | Channel Complexity | Big Valley Light Heath      | This project will provide better connection and access from the Methow River to a spring creek and pond on the Heath Property. The project will create a crossing point, probably culverts, for an access road that crosses two springs creeks just downstream of a 4 to 5 foot earth dam that creates a springfed pond. The access road currently drives through the creeks and has caused widening of the creeks creating a fish barrier. Fish passage will also be installed at the earth dam to provide access to the pong for salmonids , primary juveniles. | Upper Columbia River Spring Chinook Salmon<br>Upper Columbia River Steelhead | 48 30 28     | 120 15 33    | 1/19/2007    | 8/29/2008  | 1                 |                     |                   |              |              |                  |          |                       | 0.25               |

| BiOp ID | Subbasin  | Limiting Factor    | Project Title   | Short Description  | ESU/DPS  | Lat. (north) | Long. (west) | Action Start | Action End | Stream flow (cfs) | Stream Length (mi.) | Extent of Barrier | Access miles | # of screens | Screen Discharge |          | Stream Miles affected | Complexity (Miles) |
|---------|-----------|--------------------|---|--|--|--------------|--------------|--------------|------------|-------------------|---------------------|-------------------|--------------|--------------|------------------|----------|-----------------------|--------------------|
|         |           |                    |   |  |  |              |              |              |            |                   |                     |                   |              |              | cfs              | Ac-ft/yr |                       |                    |
| 4262    | Methow    | Channel Complexity | Rockview-Fender Mills Phase I Side Channel Reconnection       | The objective of this side channel restoration project is to provide approximately 1/4 mile of off-channel rearing habitat and restore floodplain connectivity.  | Upper Columbia River Spring Chinook Salmon<br>Upper Columbia River Steelhead | 48 32 34     | 120 19 20    | 5/12/2005    |            | 0.25              |                     |                   |              |              |                  |          |                       | 0.2                |
| 4265    | Wenatchee | Channel Complexity | Gagnon CMZ Project  | This project proposes to create (excavate) a backchannel feature (along the floodplain of the Gagnon CMZ Site) to link the existing pond to the main stream, thus providing high flow salmonid refuge habitat. | Upper Columbia River Spring Chinook Salmon<br>Upper Columbia River Steelhead | 47 32 00     | 120 30 19    | 11/14/2005   | 11/15/2007 | 0.2               |                     |                   |              |              |                  |          |                       | 0.2                |
| 4193    | Wenatchee | Channel Complexity | Jones Shotwell Ditch  | This project would bring the Jones Shotwell Ditch Company's fish screen into compliance with NOAA Fisheries criteria.  | Upper Columbia River Spring Chinook Salmon<br>Upper Columbia River Steelhead | 47 29 36     | 120 25 27    | 2/2/2004     | 2/15/2008  | 0.2               |                     |                   |              |              |                  |          |                       |                    |
| 4258    | Wenatchee | Channel Complexity | Wenatchee Watershed Fluvial Habitat Restoration Plan (WWFHRP) | The deliverable of this RFP will be a Wenatchee Watershed Fluvial Habitat Restoration Plan Scope of Work . A draft of the plan will be required by May 31, 2007  | Upper Columbia River Spring Chinook Salmon<br>Upper Columbia River Steelhead |              |              | 9/26/2005    |            |                   |                     |                   |              |              |                  |          |                       | 0.2                |

| BiOp ID | Subbasin  | Limiting Factor | Project Title  | Short Description  | ESU/DPS  | Lat. (north) | Long. (west) | Action Start | Action End | Stream flow (cfs) | Stream Length (mi.) | Extent of Barrier | Access miles | # of screens | Screen Discharge |          | Stream Miles affected | Complexity (Miles) |
|---------|-----------|-----------------|--|--|--|--------------|--------------|--------------|------------|-------------------|---------------------|-------------------|--------------|--------------|------------------|----------|-----------------------|--------------------|
|         |           |                 |  |  |  |              |              |              |            |                   |                     |                   |              |              | cfs              | Ac-ft/yr |                       |                    |
| 4284    | Wenatchee | Entrainment     | Three Mission Creek Projects: Miller, Turnbull and Jurgins | Miller and Turnbull- Repair and installation of low stage log weirs to re-establish plunge pool habitat and thalweg, and increase complexity.<br><br>Jurgins- Install a low stage rock weir with large woody debris to provide plunge pool habitat, control bank erosion, increase complexity, and re-establish thalweg. | Upper Columbia River Spring Chinook Salmon<br>Upper Columbia River Steelhead | 47 29 13     | 120 29 00    | 6/26/2006    | 10/15/2006 | 2                 |                     |                   |              | 2            |                  |          |                       |                    |
| 4193    | Wenatchee | Entrainment     | Jones Shotwell Ditch                                       | This project would bring the Jones Shotwell Ditch Company's fish screen into compliance with NOAA Fisheries criteria.  | Upper Columbia River Spring Chinook Salmon<br>Upper Columbia River Steelhead | 47 29 36     | 120 25 27    | 2/2/2004     | 2/15/2008  | 1                 |                     |                   |              | 1            |                  |          |                       |                    |

**Table 5.3. Status of Completed and Ongoing 2007 FCRPS Biological Assessment Table 5a and 5b Replacement and Additional Actions Performed with Reclamation Technical Assistance**

The actions listed in Table 5.3 are *in addition* to those identified in the 2007 FCRPA BA. The following abbreviations apply. Streamflow: streamflow protected under state law. Stream length: stream length affected. Extent of barrier: P, partial (upstream access seasonably inaccessible prior to action); F (absolutely no passage prior to action), full. Access: miles made accessible to next upstream full or partial barrier. Stream length affected by screen: miles between action location and next diversion. Complexity miles: length of instream habitat treated after action completed. Status of Completed and Ongoing 2007 FCRPS Biological Assessment Table 5a and 5b Replacement and Additional Actions Performed with Reclamation Technical Assistance.

| BiOp ID | Subbasin             | Limiting Factor | Project Title   | Short Description  | ESU/DPS                         | Lat. (north) | Long. (west) | Action Start | Action End | Stream flow (cfs) | Stream Length (mi.) | Extent of Barrier | Access miles | # of screens | Screen Discharge |          | Stream Miles affected | Complexity (Miles) |
|---------|----------------------|-----------------|---|--|---------------------------------|--------------|--------------|--------------|------------|-------------------|---------------------|-------------------|--------------|--------------|------------------|----------|-----------------------|--------------------|
|         |                      |                 |   |  |                                 |              |              |              |            |                   |                     |                   |              |              | cfs              | Ac-ft/yr |                       |                    |
| 4273    | John Day Middle Fork | Channel Access  | Dead Cow Gulch Access and Habitat Improvement Project | Dead Cow Gulch is currently blocked to fish passage near its mouth by two culverts. The channel has also been moved to a different path which further limits access and available habitat. This project would reroute the stream into a more natural alignment and eliminate the culverts as a barrier.  | Middle Columbia River Steelhead | 44 36 27     | 118 32 50    | 2/11/2005    | 10/30/2007 |                   |                     | F                 | 1.5          |              |                  |          |                       |                    |
| 4347    | John Day Upper Main  | Channel Access  | Fry-Ingle Diversion                                   | Project purpose is to provide fish passage. The Fry-Ingle Diversion is about 6 miles west of John Day, Oregon on the John Day River near river mile 241.5. Large boulders appear to stay in place year around with additional gravels pushed up to complete the dam at lower flows. This structure is a full barrier at low flows to all life stages but at higher flows when the dam is partially washed out , it is partial barrier. | Middle Columbia River Steelhead | 44 24 54     | 119 04 05    | 7/28/2008    |            |                   |                     | F                 | 1            |              |                  |          |                       |                    |

|         |                      |                    |   |  |                                 |              |              |              |            |                   |                     |                   |              |              | Screen Discharge |          |                       |                    |
|---------|----------------------|--------------------|---|--|---------------------------------|--------------|--------------|--------------|------------|-------------------|---------------------|-------------------|--------------|--------------|------------------|----------|-----------------------|--------------------|
| BiOp ID | Subbasin             | Limiting Factor    | Project Title                                       | Short Description  | ESU/DPS                         | Lat. (north) | Long. (west) | Action Start | Action End | Stream flow (cfs) | Stream Length (mi.) | Extent of Barrier | Access miles | # of screens | cfs              | Ac-ft/yr | Stream Miles affected | Complexity (Miles) |
| 4348    | John Day Upper Main  | Channel Access     | Cummings Creek Pump                                 | Project purpose is to provide fish passage. Cummings Creek is a small tributary entering the Upper John Day River near river mile 224. This project facilitates the transfer of a point of diversion from Cummings Creek to the John Day River.  | Middle Columbia River Steelhead | 44 66 47     | 119 22 19    | 6/28/2008    |            |                   |                     | P                 | 3.5          |              |                  |          |                       |                    |
| 4317    | John Day Middle Fork | Channel Complexity | Middle Fork Rock Replacement Projects               | Channel Reconfiguration  | Middle Columbia River Steelhead | 44 35 43     | 118 31 28    | 9/17/2007    | 7/25/2008  | 0.95              |                     |                   |              |              |                  |          |                       | 5.75               |
| 4271    | John Day Upper Main  | Channel Complexity | CTWSRO John Day Habitat Improvement Project-Phase 1 | The John Day Basin Office of the Confederated Tribes Warm Spring Reservation of Oregon has asked Reclamation for technical assistance to restore instream habitat for anadromous and resident fisheries on the Oxbow and Forest conservation areas on the Middle Fork and Forrest Conservation Area on the Upper John Day River. | Middle Columbia River Steelhead | 44 27 31     | 118 41 31    | 6/15/2005    | 7/15/2007  | 5.75              |                     |                   |              |              |                  |          |                       | 1.15               |
| 4320    | John Day Upper Main  | Channel Complexity | Forrest-Emmel Habitat Improvement Program           | Channel Reconfiguration  | Middle Columbia River Steelhead | 44 27 12     | 118 40 18    | 8/27/2007    | 8/15/2008  | 1.15              |                     |                   |              |              |                  |          |                       | 1                  |

| BiOp ID | Subbasin             | Limiting Factor | Project Title                                       | Short Description  | ESU/DPS                         | Lat. (north) | Long. (west) | Action Start | Action End | Stream flow (cfs) | Stream Length (mi.) | Extent of Barrier | Access miles | # of screens | Screen Discharge |          | Stream Miles affected | Complexity (Miles) |
|---------|----------------------|-----------------|---|--|---------------------------------|--------------|--------------|--------------|------------|-------------------|---------------------|-------------------|--------------|--------------|------------------|----------|-----------------------|--------------------|
|         |                      |                 |   |  |                                 |              |              |              |            |                   |                     |                   |              |              | cfs              | Ac-ft/yr |                       |                    |
| 4367    | John Day Middle Fork | Streamflow      | Austin Ranch Permanent Diminishment of Water Rights | The Oregon Water Trust ( OWT) has acquired a split season water use agreement for selected Austin Ranch water rights, which are served by the Middle Fork of the John Day River and tributaries. Transfer of the water rights from irrigation use to instream flow would support important salmon and steelhead spawning areas in the Middle Fork, Vinegar Creek, and Clear Creek. This project resulted in the permanent diminishment of the season of use of approximately 11.29 cubic feet per second (cfs) of natural flow water rights. | Middle Columbia River Steelhead | 44 35 31     | 118 30 41    | 6/30/2006    | 12/31/2100 | 11.3              | 30                  |                   |              |              |                  |          |                       |                    |
| 4198    | John Day Upper Main  | Streamflow      | Pauls Upper John Day Water Lease                    | Landowner located East of Dayville OR has water rights to divert water from the Upper John Day River to irrigate a total of 86.9 acres under two separate certificates. He has expressed an interest in no longer farming the majority of his irrigable land is interested in leasing the water rights to the land currently under sprinkler irrigation, for a period of 5 to 10 years. This sprinkler irrigated land amounts to about 54 acres. The result would be a lease of diversions rights of 1.36 cfs with                           | Middle Columbia River Steelhead | 44 27 18     | 119 25 28    | 10/1/2006    | 9/30/2007  | 1.36              | 195                 |                   |              |              |                  |          |                       |                    |

| BiOp ID | Subbasin            | Limiting Factor | Project Title                                      | Short Description   | ESU/DPS  | Lat. (north) | Long. (west) | Action Start | Action End | Stream flow (cfs) | Stream Length (mi.) | Extent of Barrier | Access miles | # of screens | Screen Discharge |          | Stream Miles affected | Complexity (Miles) |
|---------|---------------------|-----------------|--|---|--|--------------|--------------|--------------|------------|-------------------|---------------------|-------------------|--------------|--------------|------------------|----------|-----------------------|--------------------|
|         |                     |                 |  |   |  |              |              |              |            |                   |                     |                   |              |              | cfs              | Ac-ft/yr |                       |                    |
|         |                     |                 |  | priority dates of 1902, 1906 and 1973.  |  |              |              |              |            |                   |                     |                   |              |              |                  |          |                       |                    |
| 4198    | John Day Upper Main | Streamflow      | Pauls Upper John Day Water Lease                   | Landowner located East of Dayville OR has water rights to divert water from the Upper John Day River to irrigate a total of 86.9 acres under two separate certificates. He has expressed an interest in no longer farming the majority of his irrigable land is interested in leasing the water rights to the land currently under sprinkler irrigation, for a period of 5 to 10 years. This sprinkler irrigated land amounts to about 54 acres. The result would be a lease of diversions rights of 1.36 cfs with priority dates of 1902, 1906 and 1973. | Middle Columbia River Steelhead                                | 44 27 18     | 119 25 28    | 10/1/2007    | 9/30/2008  | 1.36              | 195                 |                   |              |              |                  |          |                       |                    |
| 4327    | Grande Ronde        | Channel Access  | Orodell Diversion Fish Passage Enhancement Project | Project purpose is to provide fish passage. This project proposes to replace an existing irrigation diversion structure that is currently being used by two ditch companies.  | Snake River Spring/Summer Chinook Salmon Snake River Steelhead | 45 20 31     | 118 06 59    | 9/24/2007    |            |                   |                     | P                 | 50           |              |                  |          |                       |                    |

| BiOp ID | Subbasin | Limiting Factor | Project Title   | Short Description   | ESU/DPS   | Lat. (north) | Long. (west) | Action Start | Action End | Stream flow (cfs) | Stream Length (mi.) | Extent of Barrier | Access miles | # of screens | Screen Discharge |          | Stream Miles affected | Complexity (Miles) |  |
|---------|----------|-----------------|---|---|---|--------------|--------------|--------------|------------|-------------------|---------------------|-------------------|--------------|--------------|------------------|----------|-----------------------|--------------------|--|
|         |          |                 |   |   |   |              |              |              |            |                   |                     |                   |              |              | cfs              | Ac-ft/yr |                       |                    |  |
| 4343    | Lemhi    | Channel Access  | Lemhi River-L-44 Diversion Repair                                 | Project purpose is to provide fish passage. This project was constructed on the upper Lemhi River in fall 2005. Shortly after completion of the new diversion structure, IDFG raised concerns about the ability of juvenile salmonids to negotiate upstream over the structure.   | Snake River Spring/Summer Chinook Salmon<br>Snake River Steelhead |              |              | 2/28/2007    | 9/28/2007  |                   |                     |                   |              |              |                  |          |                       |                    |  |
| 4378    | Lemhi    | Channel Access  | Upper Lemhi River Flow Enhancement / Eighteenmile Creek Reconnect | In September 2008, a formerly disconnected Lemhi River Tributary was seasonally re-connected to the mainstem Lemhi River by placement of an earthen berm that now blocks diversion of Eighteenmile Creek flow into an irrigation conveyance canal referred to locally as the "Whitefish Ditch". Eighteenmile Creek stream flow and spring flow water rights that were formerly conveyed to irrigated lands via the Whitefish Ditch were re-directed to now flow into the Lemhi River. Spring flow water rights out of Eighteenmile creek were transferred by IDWR to a withdrawal location out of the Lemhi River at the L-62 point of diversion. Whitefish Ditch irrigation water is now conveyed via the Lemhi River down to L-62 where the transferred Whitefish | Snake River Spring/Summer Chinook Salmon<br>Snake River Steelhead | 44 41 26     | 113 21 43    | 10/16/2006   | 9/15/2008  |                   |                     | P                 | 144          |              |                  |          |                       |                    |  |

|         |               |                 |                     |  |   |              |              |              |            |                   |                     |                   |              |              | Screen Discharge |          |                       |                    |
|---------|---------------|-----------------|---------------------|--|---|--------------|--------------|--------------|------------|-------------------|---------------------|-------------------|--------------|--------------|------------------|----------|-----------------------|--------------------|
| BiOp ID | Subbasin      | Limiting Factor | Project Title       | Short Description  | ESU/DPS   | Lat. (north) | Long. (west) | Action Start | Action End | Stream flow (cfs) | Stream Length (mi.) | Extent of Barrier | Access miles | # of screens | cfs              | Ac-ft/yr | Stream Miles affected | Complexity (Miles) |
|         |               |                 |                     | Ditch water rights are now diverted / pumped onto agricultural land. This project was funded by the Pacific Coast Salmon Recovery Fund which is provided by the National Marine Fisheries Service and is administered in Idaho by the Office of Species Conservation. Additional cost share funding was provided by the Natural Resources Conservation Service.        |   |              |              |              |            |                   |                     |                   |              |              |                  |          |                       |                    |
| 4237    | Little Salmon | Channel Access  | Squaw Creek Culvert | A culvert passage barrier is located on the Squaw Creek Road (no. 517). This road is maintained by the Idaho County Road Department. Pre-design should investigate the feasibility of replacing the culvert or modifying it to allow for fish passage. Modification could include backwatering the culvert and installing baffles to reduce velocities in the culvert. | Snake River Spring/Summer Chinook Salmon<br>Snake River Steelhead | 45 25 06     | 116 21 34    | 6/1/2005     | 9/21/2007  |                   |                     | P                 | 4.5          |              |                  |          |                       |                    |

| BiOp ID | Subbasin | Limiting Factor | Project Title   | Short Description  | ESU/DPS   | Lat. (north) | Long. (west) | Action Start | Action End | Stream flow (cfs) | Stream Length (mi.) | Extent of Barrier | Access miles | # of screens | Screen Discharge |          | Stream Miles affected | Complexity (Miles) |  |
|---------|----------|-----------------|---|--|---|--------------|--------------|--------------|------------|-------------------|---------------------|-------------------|--------------|--------------|------------------|----------|-----------------------|--------------------|--|
|         |          |                 |   |  |   |              |              |              |            |                   |                     |                   |              |              | cfs              | Ac-ft/yr |                       |                    |  |
| 4233    | Lemhi    | Streamflow      | Lemhi Basin 06 PHABSIM Studies (TSC)                              | Objectives of this study are to identify a range of stream flow needed to sustain various life-history stages of salmon, steelhead, and bull trout in Hawley and Eighteenmile Creeks in the upper Lemhi River basin. Results can be used by State and Federal regulatory agencies to identify stream flow targets which Reclamation can help meet by implementing other Habitat Program measures.  | Snake River Spring/Summer Chinook Salmon<br>Snake River Steelhead |              |              | 10/1/2005    | 7/17/2007  |                   |                     |                   |              |              |                  |          |                       |                    |  |
| 4241    | Lemhi    | Streamflow      | Lemhi River-L44 Headgate Replacement                              | Headgate replacement is necessary to allow for better control of water diverted by the proposed new diversion structure.   | Snake River Spring/Summer Chinook Salmon<br>Snake River Steelhead | 44 49 51     | 113 26 37    | 5/12/2005    | 8/13/2007  |                   |                     |                   |              |              |                  |          |                       |                    |  |
| 4378    | Lemhi    | Streamflow      | Upper Lemhi River Flow Enhancement / Eighteenmile Creek Reconnect | In September 2008, a formerly disconnected Lemhi River Tributary was seasonally re-connected to the mainstem Lemhi River by placement of an earthen berm that now blocks diversion of Eighteenmile Creek flow into an irrigation conveyance canal referred to locally as the "Whitefish Ditch". Eighteenmile Creek stream flow and spring flow water rights that were formerly conveyed to irrigated lands via the Whitefish Ditch were re-directed to now flow into | Snake River Spring/Summer Chinook Salmon<br>Snake River Steelhead | 44 41 26     | 113 21 43    | 10/16/2006   | 9/15/2008  |                   |                     |                   |              |              |                  |          |                       |                    |  |

| BiOp ID | Subbasin     | Limiting Factor | Project Title                                   | Short Description  | ESU/DPS   | Lat. (north) | Long. (west) | Action Start | Action End | Stream flow (cfs) | Stream Length (mi.) | Extent of Barrier | Access miles | # of screens | Screen Discharge |          | Stream Miles affected | Complexity (Miles) |
|---------|--------------|-----------------|---|--|---|--------------|--------------|--------------|------------|-------------------|---------------------|-------------------|--------------|--------------|------------------|----------|-----------------------|--------------------|
|         |              |                 |   |  |   |              |              |              |            |                   |                     |                   |              |              | cfs              | Ac-ft/yr |                       |                    |
|         |              |                 |   | the Lemhi River. Spring flow water rights out of Eighteenmile Creek were transferred by IDWR to a withdrawal location out of the Lemhi River at the L-62 point of diversion. Whitefish Ditch irrigation water is now conveyed via the Lemhi River down to L-62 where the transferred Whitefish Ditch water rights are now diverted / pumped onto agricultural land. This project was funded by the Pacific Coast Salmon Recovery Fund which is provided by the National Marine Fisheries Service and is administered in Idaho by the Office of Species Conservation. Additional cost share funding was provided by the Natural Resources Conservation Service. |   |              |              |              |            |                   |                     |                   |              |              |                  |          |                       |                    |
| 4180    | Upper Salmon | Streamflow      | IDWR Upper Salmon Water Budget Model            | Contract with IDWR for development of subbasin water models in the Upper Salmon will allow Reclamation to help market irrigation diversion management related projects and monitor cumulative effects of those projects.   | Snake River Spring/Summer Chinook Salmon Snake River Steelhead            |              |              | 7/21/2003    | 6/15/2007  |                   |                     |                   |              |              |                  |          |                       |                    |
| 4194    | Entiat       | Channel Access  | Knapp-Wham/Hannon Detweiler Ditch Consolidation | Consolidation of two ditches with diversions that constitute barriers with one diversion reconfigured to better pass ESA listed anadromous species.  | Upper Columbia River Spring Chinook Salmon Upper Columbia River Steelhead | 47 41 11     | 120 18 55    | 10/31/2003   | 10/15/2007 |                   |                     | P                 |              |              |                  |          |                       |                    |

|         |           |                 |  |   |  |              |              |              |            |                   |                     |                   |              |              | Screen Discharge |          |                       |                    |
|---------|-----------|-----------------|--|---|--|--------------|--------------|--------------|------------|-------------------|---------------------|-------------------|--------------|--------------|------------------|----------|-----------------------|--------------------|
| BiOp ID | Subbasin  | Limiting Factor | Project Title                              | Short Description   | ESU/DPS  | Lat. (north) | Long. (west) | Action Start | Action End | Stream flow (cfs) | Stream Length (mi.) | Extent of Barrier | Access miles | # of screens | cfs              | Ac-ft/yr | Stream Miles affected | Complexity (Miles) |
| 4009    | Methow    | Channel Access  | Fulton Diversion                           | Project purpose is to provide fish passage. The diversion structure is adequate but the fishway will be redesigned and replaced with a more effective version.  | Upper Columbia River Spring Chinook Salmon<br>Upper Columbia River Steelhead | 48 29 13     | 120 10 54    | 11/1/2002    | 2/23/2007  |                   |                     | P                 | 30.1         |              |                  |          |                       |                    |
| 4365    | Methow    | Channel Access  | Methow In-Channel Habitat Restoration Plan | This investigation will provide data on the fluvial geomorphologic characteristics of the Methow subbasin. The resulting plan will be used as a basis for implementing complex and large restoration projects that can reliably improve habitat, be sustainable over the long term, and not create undue liability for Reclamation. | Upper Columbia River Spring Chinook Salmon<br>Upper Columbia River Steelhead |              |              | 5/16/2005    | 9/30/2007  |                   |                     |                   |              |              |                  |          |                       |                    |
| 4257    | Wenatchee | Channel Access  | Mill Creek Culvert Passage Project         | This project will consist of either adding passage to the existing culvert or replacing it.   | Upper Columbia River Spring Chinook Salmon<br>Upper Columbia River Steelhead | 47 30 39     | 120 37 56    | 2/23/2006    | 5/1/2007   |                   |                     | F                 | 2.3          |              |                  |          |                       |                    |
| 4379    | Wenatchee | Channel Access  | Two Mission Creek Projects-2007            | Two culvert projects to improve passage in Mission Creek  | Upper Columbia River Spring Chinook Salmon<br>Upper Columbia River Steelhead | 47 29 18     | 120 29 05    | 6/26/2007    | 10/15/2007 |                   |                     | P                 |              |              |                  |          |                       |                    |
| 4214    | Wenatchee | Channel Access  | Pioneer Ditch                              | This project proposes to eliminate seasonal instream disturbances associated with rebuilding a diversion dam, improving fish passage, and habitat improvements.   | Upper Columbia River Spring Chinook Salmon<br>Upper Columbia River Steelhead | 47 29 42     | 120 25 17    | 7/26/2004    | 6/15/2008  |                   |                     |                   |              |              |                  |          |                       |                    |

| BiOp ID | Subbasin  | Limiting Factor    | Project Title  | Short Description  | ESU/DPS  | Lat. (north) | Long. (west) | Action Start | Action End | Stream flow (cfs) | Stream Length (mi.) | Extent of Barrier | Access miles | # of screens | Screen Discharge |          | Stream Miles affected | Complexity (Miles) |
|---------|-----------|--------------------|--|--|--|--------------|--------------|--------------|------------|-------------------|---------------------|-------------------|--------------|--------------|------------------|----------|-----------------------|--------------------|
|         |           |                    |  |  |  |              |              |              |            |                   |                     |                   |              |              | cfs              | Ac-ft/yr |                       |                    |
| 4380    | Wenatchee | Channel Access     | Two Mission Creek Projects-2008  | Two culvert projects to improve passage in Mission Creek   | Upper Columbia River Spring Chinook Salmon<br>Upper Columbia River Steelhead | 47 29 07     | 120 28 55    | 6/26/2008    | 10/15/2008 |                   |                     | P                 |              |              |                  |          |                       |                    |
| 4285    | Entiat    | Channel Complexity | Bridge to Bridge Phase 1   | Phase 1 will entail the installation of instream structures, maintenance of flow to existing irrigation canal and changes to canal water velocities,, installation of a water-tight slide gate on irrigation intake pipe, improvements to the irrigation canal outfall and planting riparian vegetation. | Upper Columbia River Spring Chinook Salmon<br>Upper Columbia River Steelhead | 47 40 09     | 120 17 05    | 6/27/2006    | 11/15/2007 | 0.2               |                     |                   |              |              |                  |          |                       | 0.95               |
| 4268    | Methow    | Channel Complexity | Methow Salmon Recovery Foundation Twisp Side Channel Reconnection (MSRF) | The purpose of this project is to design an intake structure with headgate that functions throughout the year, to provide a channel to act as a return from the ponds, and to increase the habitat value of the existing channels.   | Upper Columbia River Spring Chinook Salmon<br>Upper Columbia River Steelhead | 48 34 24     | 120 10 24    | 1/27/2005    | 9/1/2006   | 1                 |                     |                   |              |              |                  |          |                       | 0.4                |
| 4315    | Wenatchee | Channel Complexity | CMZ 12/13  | Channel Reconfiguration  | Upper Columbia River Spring Chinook Salmon<br>Upper Columbia River Steelhead | 47 32 01     | 120 32 55    | 2/26/2008    | 10/15/2008 | 0.4               |                     |                   |              |              |                  |          |                       | 0.3                |
| 4316    | Wenatchee | Channel Complexity | CMZ 11   | Channel Reconfiguration  | Upper Columbia River Spring Chinook Salmon<br>Upper Columbia River Steelhead | 47 32 04     | 120 31 25    | 2/26/2008    | 10/15/2008 | 0.3               |                     |                   |              |              |                  |          |                       |                    |

| BiOp ID | Subbasin  | Limiting Factor | Project Title                   | Short Description   | ESU/DPS  | Lat. (north) | Long. (west) | Action Start | Action End | Stream flow (cfs) | Stream Length (mi.) | Extent of Barrier | Access miles | # of screens | Screen Discharge |          | Stream Miles affected | Complexity (Miles) |
|---------|-----------|-----------------|---------------------------------|---|--|--------------|--------------|--------------|------------|-------------------|---------------------|-------------------|--------------|--------------|------------------|----------|-----------------------|--------------------|
|         |           |                 |                                 |   |  |              |              |              |            |                   |                     |                   |              |              | cfs              | Ac-ft/yr |                       |                    |
| 4379    | Wenatchee | Entrainment     | Two Mission Creek Projects-2007 | Two culvert projects to improve passage in Mission Creek  | Upper Columbia River Spring Chinook Salmon<br>Upper Columbia River Steelhead | 47 29 18     | 120 29 05    | 6/26/2007    | 10/15/2007 | 2                 |                     |                   |              | 2            |                  |          |                       |                    |
| 4162    | Methow    | Streamflow      | Chewuch Basin Water Acquisition | Compensation for curtailed irrigation water uses from the Chewuch River is a critical component of any agreement that would allow limited irrigation to continue while meeting NOAA Fisheries "ESA flows" in the Chewuch in dry years from RM 7.9 to 0.7. | Upper Columbia River Spring Chinook Salmon<br>Upper Columbia River Steelhead | 48 34 13     | 120 10 28    | 10/1/2006    | 9/30/2007  | 16.1              | 7.2                 |                   |              |              |                  |          |                       |                    |
| 4162    | Methow    | Streamflow      | Chewuch Basin Water Acquisition | Compensation for curtailed irrigation water uses from the Chewuch River is a critical component of any agreement that would allow limited irrigation to continue while meeting NOAA Fisheries "ESA flows" in the Chewuch in dry years from RM 7.9 to 0.7. | Upper Columbia River Spring Chinook Salmon<br>Upper Columbia River Steelhead | 48 34 13     | 120 10 28    | 10/1/2007    | 9/30/2008  | 18                | 7.2                 |                   |              |              |                  |          |                       |                    |
| 4214    | Wenatchee | Streamflow      | Pioneer Ditch                   | This project proposes to eliminate seasonal instream disturbances associated with rebuilding a diversion dam, improving fish passage, and habitat improvements.   | Upper Columbia River Spring Chinook Salmon<br>Upper Columbia River Steelhead | 47 29 42     | 120 25 17    | 7/26/2004    | 11/15/2007 |                   |                     |                   |              |              |                  |          |                       |                    |



**Table 6. Actions Identified for 2007-2009 Implementation in FCRPS BA, Attachment B.2.2-2, Table 6: Lower Columbia ESUs/DPSs**

| ESU/Population   | Project # | Project Title & Short Description  | 2007-09 Action Description              | FY07-08 Progress   |
|--|-----------|--|---|--|
| Lower Columbia River coho/Lower Gorge tributaries<br>Lower Columbia River steelhead (summer & winter)/Hood<br>Lower Columbia River Spring Chinook/Hood | 199802100 | <u>Hood River Fish Habitat</u><br>Implement habitat improvement actions in the Hood River subbasin that will support wild fish and supplementation efforts of the Hood River Production Program (HRPP).  | Increase Instream Habitat Complexity    | Installed pipeline to conserve instream water and improve 7 stream miles, placed large woody debris and added 1.68 stream miles of complexity. |
|  |           |  | Install Fence                           |  |
|  |           |  | Plant Vegetation                        |  |
|  |           |  | Install Fish Passage Structure          |  |
|  |           |  | Install Fish Screen                     |  |
|  |           |  | Remove/Modify Dam                       |  |
|  |           |  | Install Pipeline                        |  |
|  |           |  | Plant Vegetation                        |  |
|  |           |  | Realign, Connect, and/or Create Channel |  |
|  |           |  | Remove/Modify Dam                       |  |
| Lower Columbia River steelhead (summer & winter)/Wind  | 200707700 | <u>Hemlock Dam Removal</u><br><br>This project will remove a 26-ft high dam on Trout Creek, a tributary to the Wind River. Trout Creek provides spawning and rearing habitat for LCR steelhead. The project will restore unimpeded fish passage and improve water quality and habitat. | Plant Vegetation                        | Developed and finalized plans for Hemlock Dam removal.   |
|  |           |  | Realign, Connect, and/or Create Channel | Implementation/removal planned for 2009.   |
|  |           |  | Remove/Modify Dam                       |  |

## Attachment 4: Tributary Habitat Reports by the Bureau of Reclamation

| Report Name  | Internet address   | Date   |
|--|--|--------|
| <b><u>Washington</u></b>   |  |        |
| <u>Entiat</u>  |  |        |
| Entiat Tributary Assessment  | <a href="http://www.usbr.gov/pn/programs/fcrps/thp/ucao/entiat/tribassmt/index.html">http://www.usbr.gov/pn/programs/fcrps/thp/ucao/entiat/tribassmt/index.html</a>  | Jan-09 |
| <u>Methow</u>  |  |        |
| Completion Report: Wolf Creek Diversion Dam                            | <a href="http://www.usbr.gov/pn/programs/fcrps/thp/ucao/methow/completion/wolfcreekdiversion.pdf">http://www.usbr.gov/pn/programs/fcrps/thp/ucao/methow/completion/wolfcreekdiversion.pdf</a>  | Mar-09 |
| Methow Subbasin Geomorphic Assessment                                  | <a href="http://www.usbr.gov/pn/programs/fcrps/thp/ucao/methow/geomorphicasessment/index.htm">http://www.usbr.gov/pn/programs/fcrps/thp/ucao/methow/geomorphicasessment/index.htm</a>  | May-08 |
| Memorandum: Fulton Diversion Dam Investigations                        | <a href="http://www.usbr.gov/pn/programs/fcrps/thp/ucao/methow/fulton/geo-investigation-091807.pdf">http://www.usbr.gov/pn/programs/fcrps/thp/ucao/methow/fulton/geo-investigation-091807.pdf</a>  | Jul-06 |
| <u>Wenatchee</u>   |  |        |
| Kahler Reach Assessment  | <a href="http://www.usbr.gov/pn/programs/fcrps/thp/ucao/wenatchee/kahler/index.html">http://www.usbr.gov/pn/programs/fcrps/thp/ucao/wenatchee/kahler/index.html</a>  | Mar-09 |
| Upper White Pine Reach Assessment                                      | <a href="http://www.usbr.gov/pn/programs/fcrps/thp/ucao/wenatchee/upperwhitepine/index.html">http://www.usbr.gov/pn/programs/fcrps/thp/ucao/wenatchee/upperwhitepine/index.html</a>  | Mar-09 |
| Lower White Pine Reach Assessment                                      | <a href="http://www.usbr.gov/pn/programs/fcrps/thp/ucao/wenatchee/lowerwhitepine/index.html">http://www.usbr.gov/pn/programs/fcrps/thp/ucao/wenatchee/lowerwhitepine/index.html</a>  | Feb-09 |
| Nason Creek Tributary Assessment . Technical Appendices                | <a href="http://www.usbr.gov/pn/programs/fcrps/thp/ucao/wenatchee/nasoncreek/tributary-assmt.pdf">http://www.usbr.gov/pn/programs/fcrps/thp/ucao/wenatchee/nasoncreek/tributary-assmt.pdf</a><br><a href="http://www.usbr.gov/pn/programs/fcrps/thp/ucao/wenatchee/nasoncreek/app.pdf">http://www.usbr.gov/pn/programs/fcrps/thp/ucao/wenatchee/nasoncreek/app.pdf</a> | Jul-08 |
| <b><u>Oregon</u></b>   |  |        |
| <u>General Documents</u>   |  |        |
| <u>Middle Fork and Upper Fork John Day River Tributary Assessments</u> | <a href="http://www.usbr.gov/pn/programs/fcrps/thp/lcao/tributary-assmt/index.html">http://www.usbr.gov/pn/programs/fcrps/thp/lcao/tributary-assmt/index.html</a>  | May-08 |
| <u>Middle Fork John Day</u>  |  |        |

| Report Name   | Internet address  | Date   |
|---|---|--------|
| Rock Removal and Large Woody Debris Installation –Beaver to Ragged Specifications and Drawings  | <a href="http://www.usbr.gov/pn/programs/fcrps/thp/lcao/middlefork/drawings/index.html">http://www.usbr.gov/pn/programs/fcrps/thp/lcao/middlefork/drawings/index.html</a>                             | Jun-08 |
| <b><u>Idaho</u></b>   |   |        |
| <b><u>Lemhi</u></b>   |   |        |
| <a href="#"><i>Completion Report: Lemhi River L-3 Wasteway Diversion Fish Barrier</i></a>   | <a href="http://www.usbr.gov/pn/programs/fcrps/thp/srao/lemhi/completion/L-3.pdf">http://www.usbr.gov/pn/programs/fcrps/thp/srao/lemhi/completion/L-3.pdf</a>   | Feb-08 |
| <a href="#"><i>Completion Report: Lemhi River L-9 Diversion Replacement</i></a>   | <a href="http://www.usbr.gov/pn/programs/fcrps/thp/srao/lemhi/completion/L9.pdf">http://www.usbr.gov/pn/programs/fcrps/thp/srao/lemhi/completion/L9.pdf</a>   | Dec-07 |
| <a href="#"><i>Completion Report: Lemhi River L-13 Irrigation Fish Screen Replacement</i></a>   | <a href="http://www.usbr.gov/pn/programs/fcrps/thp/srao/lemhi/completion/L-13.pdf">http://www.usbr.gov/pn/programs/fcrps/thp/srao/lemhi/completion/L-13.pdf</a>                                       | Oct-07 |
| <a href="#"><i>Completion Report: Lemhi River L-44 Irrigation Diversion Replacement</i></a>   | <a href="http://www.usbr.gov/pn/programs/fcrps/thp/srao/lemhi/completion/L44.pdf">http://www.usbr.gov/pn/programs/fcrps/thp/srao/lemhi/completion/L44.pdf</a>   | Oct-07 |
| <a href="#"><i>Completion Report: Lemhi River L-35A Fish Screen and Headgate Replacement</i></a>  | <a href="http://www.usbr.gov/pn/programs/fcrps/thp/srao/lemhi/completion/L35A.pdf">http://www.usbr.gov/pn/programs/fcrps/thp/srao/lemhi/completion/L35A.pdf</a>                                       | Oct-07 |
| <i>Flow Characterization Study: Instream Flow Assessment, Hawley Creek and Eighteenmile Creek, Idaho</i>  | <a href="http://www.usbr.gov/pn/programs/fcrps/thp/srao/lemhi/phabsim/2006/hawley-flowassessment.pdf">http://www.usbr.gov/pn/programs/fcrps/thp/srao/lemhi/phabsim/2006/hawley-flowassessment.pdf</a> | Jun-07 |
| <a href="#"><i>Completion Report: L-3 and L-3A Irrigation Diversion Replacement</i></a>   | <a href="http://www.usbr.gov/pn/programs/fcrps/thp/srao/lemhi/completion/L3-L3A.pdf">http://www.usbr.gov/pn/programs/fcrps/thp/srao/lemhi/completion/L3-L3A.pdf</a>                                   | May-07 |
| <a href="#"><i>Memorandum: L3AO River Control Structure Survey, April 13, 2007, Columbia/Upper Salmon Recovery Project, Lemhi River Subbasin, Idaho</i></a> | <a href="http://www.usbr.gov/pn/programs/fcrps/thp/srao/lemhi/L3AO/L3AO-inspection.pdf">http://www.usbr.gov/pn/programs/fcrps/thp/srao/lemhi/L3AO/L3AO-inspection.pdf</a>                             | Apr-07 |
| <b><u>Little Salmon</u></b>   |   |        |
| <a href="#"><i>Completion Report: Squaw Creek Culvert Fish Passage Improvement Project</i></a>  | <a href="http://www.usbr.gov/pn/programs/fcrps/thp/srao/littlesalmon/completion/sqawcrk-culvert.pdf">http://www.usbr.gov/pn/programs/fcrps/thp/srao/littlesalmon/completion/sqawcrk-culvert.pdf</a>   | Feb-08 |

| Report Name  | Internet address  | Date   |
|--|---|--------|
| <u>Upper Salmon</u>  |   |        |
| Completion Report: East Fork Salmon River EF/10 and EF/11 Irrigation Diversion Consolidation Project   | <a href="http://www.usbr.gov/pn/programs/fcrps/thp/srao/uppersalmon/completion/ef1011/ef10-11.pdf">http://www.usbr.gov/pn/programs/fcrps/thp/srao/uppersalmon/completion/ef1011/ef10-11.pdf</a>   | Jul-07 |
| <a href="#">Completion Report: Garden Creek and Gini Canal Crossing Project</a>  | <a href="http://www.usbr.gov/pn/programs/fcrps/thp/srao/uppersalmon/completion/ginicanal/gini-garden.pdf">http://www.usbr.gov/pn/programs/fcrps/thp/srao/uppersalmon/completion/ginicanal/gini-garden.pdf</a>                           | Jul-07 |
| <a href="#">Memorandum: S11-12 Canal Consolidation, Diversion Berm Underwater Inspection, 04/13/2007, Upper Salmon River Water Optimization Project, Idaho</a> | <a href="http://www.usbr.gov/pn/programs/fcrps/thp/srao/uppersalmon/completion/s1314/inspection/S11-12-inspection.pdf">http://www.usbr.gov/pn/programs/fcrps/thp/srao/uppersalmon/completion/s1314/inspection/S11-12-inspection.pdf</a> | Jun-07 |

## Attachment 5: Action Agency 2008 Estuary Habitat Projects

| Project  | Description  | *Stream-Type<br>or **Ocean-<br>Type | River Reach | Status   |
|--|--|-------------------------------------|-------------|--|
| Willow Grove Acquisition & Restoration Project (BPA) | Permanently protect important intertidal wetland habitat located at River Mile 60 of the Columbia River. The wetlands provide important habitat for migrating and juvenile salmonids. Coho, chum, Chinook, and steelhead all use this habitat complex. This property has been altered by past land uses but represents an example of critical intertidal wetlands within this reach of the Columbia River. Future actions will include restoration efforts such as vegetation enhancement, control of invasive species, placement of large wood material, and enhancing fish access to the wetland complex from the mainstem Columbia River. (Acquisition D in 2008 BiOp)                      | Stream-Type and Ocean-Type          | Reach C     | Protected 304 acres  |
| Skamokawa Creek Restoration (BPA)                    | Re-establish tidal-fluvial hydrology to historical Skamokawa Creek through interior culvert retrofits and channel enhancements. When complete the project will restore 2.2 miles of meandering channel that historically was tide water. Phase 2 of this project is in design phase. (Funds were reallocated to this project from Knappton Cove, Project #4 in 2008 BiOp.)   | Ocean-Type                          | Reach B     | Phase 1 completed; when Phase 2 has been completed, 2.2 miles of channel will be restored. |
| Walluski River Tidal Restoration Project (BPA)       | The Walluski River Tidal Restoration Project was completed in August 2008 (native plantings occurred in November 2008). This was the second phase of the project and was designed to restore and enhance previously acquired floodplain and side channel habitat along the Walluski River. This was accomplished by maintaining a natural dike breach, removing an additional 100 feet of the dike, and adding large wood to the tidal channels and floodplain. The project will increase habitat complexity, enhance the hydrologic connection to the Walluski River, and improve juvenile salmonid rearing habitat. (Funds were reallocated to this project from Knappton Cove, Project #4.) | Stream-Type and Ocean-Type          | Reach A     | Restored 55 acres  |

| Project                             | Description  | *Stream-Type<br>or **Ocean-<br>Type | River Reach | Status  |
|-------------------------------------|--|-------------------------------------|-------------|---|
| Sandy River<br>(BPA)                | The Sandy River Project is part of a larger 1,500-acre long-term restoration project. The focus of this phase of the overall project is to plant native vegetation on 5 acres of riparian areas and on 1.2 riparian stream miles; plant 35 acres of riparian shrubs; and maintain native vegetation on 45 acres. Sandy River Delta historically was a wooded, riparian wetland with components of ponds, sloughs, bottomland woodland, oak woodland, prairie, and low- and high-elevation floodplain. Restoration of historical landscape components is a primary goal for this land, with current focus on restoration of riparian forest and wetlands. | Stream-Type and Ocean-Type          | Reach G     | 2008 phase completed; ongoing restoration efforts in 2009 and beyond (multi-phase project). |
| Scappoose Bottomlands 2008<br>(BPA) | This project was designed to remove riparian/wetland invasive plant species on 303 acres, plant riparian/wetland native species on 200 acres of the total 303 acres, and install fence on 5 miles in riparian area adjacent to Scappoose Creek to exclude cattle.  | Stream-Type and Ocean-Type          | Reach F     | Restored a minimum of 303 acres and 5 linear miles  |
| Stephens Creek<br>(BPA)             | Project to restore 5 acres/1 stream mile on Stephens Creek. The Stephens Creek confluence is an important off-channel habitat area for salmon within the City of Portland. It provides critical rearing and refuge habitat for native, ESA-listed Chinook and coho salmon and steelhead trout; rainbow and cutthroat trout; and Pacific and brook lamprey. This project will improve instream, streambank, and floodplain wetland habitat for the benefit of native fish and wildlife species, with an emphasis on rearing and refuge habitat for juvenile steelhead, coho, and Chinook.   | Stream-Type and Ocean-Type          | Reach F     | Restored 5 acres and 1 linear stream mile   |
| Mirror Lake Restoration<br>(BPA)    | Project to restore 57 acres/1.6 stream miles at Mirror Lake. This project was designed to increase salmonids' access to potential spawning areas, lower water temperatures, and establish native streamside vegetation. Actions include removing riprap in a newly replaced culvert, installing baffles to improve a fish passage structure through the culvert by removing angular rock, and providing hydrologic refugia in an otherwise uniform channel. Large wood with root balls will be placed along approximately 1,500 feet of Young Creek. The design will mimic historical instream habitat   | Stream-Type and Ocean-Type          | Reach H     | Restored 57 acres and 1.6 linear miles  |

| Project                            | Description   | *Stream-Type<br>or **Ocean-<br>Type | River Reach  | Status   |
|------------------------------------|---|-------------------------------------|--|--|
|                                    | conditions when riparian large woody debris recruitment and beaver activity provided holding pools, rearing habitat, and cover for salmonids. The project also involves planting and protecting native vegetation, including ash, cottonwood, red-osier dogwood, and salmonberry, along Youngs Creek.   |                                     |  |  |
| Wolf Bay<br>(BPA)                  | Purchase of 76 acres. The purpose of this land acquisition is to place this property into permanent conservation protection and implement future restoration actions with the goal of providing critical feeding, acclimatization, and off-channel refugia for juvenile salmon. The property is located adjacent to the Columbia River and is part of the Wolf Bay wetland system. The proximity of the property to the mainstem of the Columbia River ensures that the property provides important low-velocity off-channel habitat for estuary-rearing juvenile salmonids. This fairly intact marsh and tidal wetland complex provides opportunities for future restoration activities such as providing tidal influence to portions of the property where tidal influence currently is restricted. | Stream-Type and<br>Ocean-Type       | Reach B  | Purchased 76 acres   |
| Pile Structure<br>Program<br>(BPA) | The purpose of this initial stage was to produce a draft Pile Program Plan and begin to inventory and assess pile structures, develop draft criteria for establishing project priorities, and identify future possible project implementation sites.  | NA                                  | NA<br><br>(when<br>implemented<br>projects will<br>be spread<br>throughout<br>the estuary) | Draft program plan completed, pre-implementation planning/design ongoing; on-the-ground implementation will begin in 2010. |

| Project                        | Description   | *Stream-Type<br>or **Ocean-<br>Type | River Reach | Status      |
|--------------------------------|---|-------------------------------------|-------------|-------------|
| Deer Island<br>(BPA)           | Design and Landowner Outreach and 4.1 acres/0.60 linear mile of riparian plantings. The overall long-term restoration project on Deer Island seeks to partially restore historical estuarine habitat on the 4,500-acre Deer Island complex. The slough historically was a natural backwater of the Columbia River that provided salmonid rearing and foraging opportunities. Loss of connectivity has reduced access opportunities by salmonids and led to degraded water quality conditions in the form of high temperatures, low dissolved oxygen, and excessive channel aggradation. The bulk of this project is landowner outreach and project design for future projects. The restoration component of this project is an early action that includes site preparation and materials acquisition for planting that will be completed during 2009-2010. A total of 3,000 feet of riparian habitat on Tide Creek will be planted with native species. Planting will consist of red osier dogwood, Columbia willow, cottonwood, spirea, and other native riparian species found on site. | NA                                  | Reach E     | In progress |
| Julia Butler Hansen<br>(CORPS) | Restoration project planning Phase 2 of the Julia Butler Hansen restoration project.  | NA                                  | Reach B     | In progress |

\* Stream-type life histories include Snake River sockeye salmon, Lower Columbia River coho salmon, Upper Columbia River steelhead, Snake River steelhead, Lower Columbia River steelhead, Middle Columbia River steelhead, Upper Willamette River steelhead, Upper Columbia River spring Chinook salmon and Snake River spring/summer Chinook salmon.

\*\* Ocean-type life histories include Columbia River chum, Snake River Fall Chinook, Upper Willamette Chinook, and Lower Columbia fall Chinook.