

**Biological Assessment for Effects of Federal Columbia
River Power System and Mainstem Effects of Other
Tributary Actions on Anadromous Salmonid Species
Listed Under the Endangered Species Act**

U.S. Army Corps of Engineers
Bonneville Power Administration
U.S. Bureau of Reclamation

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ACRONYMS AND ABBREVIATIONS

AFEP	Anadromous Fish Evaluation Program
All-H	Hydro, Hatchery, Habitat, and Harvest
BA	biological assessment
BGS	behavioral guidance structure
BiOp	biological opinion
BMP	best management practice
BPA	Bonneville Power Administration
BRT	Biological Review Team
CA	Comprehensive Analysis
CBFWA	Columbia Basin Fish and Wildlife Authority
CFR	Code of Federal Regulations
cfs	cubic foot per second
COMPASS	Comprehensive Fish Passage Model
COP	configuration and operation plan
Corps	U.S. Army Corps of Engineers
Council	Northwest Power and Conservation Council
CRFM	Columbia River Fish Mitigation
CWA	Clean Water Act
DART	Data Access in Real Time
DPS	Distinct Population Segment
EA	environmental assessment
EFH	Essential Fish Habitat
EIS	environmental impact statement
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FCRPS	Federal Columbia River Power System
FGE	fish guidance efficiency
FONSI	Finding of No Significance
FPE	fish passage efficiency
FPOM	Fish Passage Operations and Maintenance Coordination Team
FPP	Fish Passage Plan
FR	Federal Register
FY	fiscal year
HGMP	Hatchery Genetic Management Plan
IDFG	Idaho Department of Fish and Game
ISAB	Independent Scientific Advisory Board
kcfs	thousand cubic feet per second
LCREP	Lower Columbia River Estuary Partnership
MAF	million acre-feet
MOA	Memorandum of Agreement
MOP	minimum operating pool
MOU	Memorandum of Understanding
MPG	Major Population Group
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NED	Northwest Environmental Data
NEPA	National Environmental Policy Act
NFWF	National Fish and Wildlife Foundation
NMFS	National Marine Fisheries Service

ACRONYMS AND ABBREVIATIONS

NOAA	National Oceanic and Atmospheric Administration
NPMP	Northern Pikeminnow Management Program
NTS	non-treaty storage
NWF	National Wildlife Federation
NWRFC	Northwest River Forecast Center
O&M	operation and maintenance
ODFW	Oregon Department of Fish and Wildlife
PIT	passive integrated transponder (tag)
PNAMP	Pacific Northwest Aquatic Monitoring Partnership
PWG	Policy Workgroup
Reclamation	U.S. Bureau of Reclamation
RIOG	Regional Implementation Oversight Group
RM	river mile
RM&E	research, monitoring, and evaluation
RPA	Reasonable and Prudent Alternative
RSW	removable spillway weir
SAR	smolt-to-adult return
SCT	System Configuration Team
TDG	total dissolved gas
TMT	Technical Management Team
TRT	Technical Recovery Team
UPA	Updated Proposed Action
USFWS	U.S. Fish and Wildlife Service
VARQ	variable (VAR) outflow (Q)
WDFW	Washington State Department of Fish and Wildlife
WMP	Water Management Plan
WQP	Water Quality Plan
WRDA	Water Resource Development Act

1. INTRODUCTION

1.1 GENERAL

The U.S. Army Corps of Engineers (Corps), U.S. Bureau of Reclamation (Reclamation), and Bonneville Power Administration (BPA) (collectively termed the Action Agencies) are responsible for ensuring their actions are not likely to jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of designated critical habitat. The Corps and Reclamation are authorized by Congress to operate and maintain the projects, for purposes of this consultation, as the Federal Columbia River Power System (FCRPS)¹ (Figure 1-1).

Congress authorized the construction of the FCRPS projects and directed the Corps and Reclamation to operate and maintain these projects for multiple purposes, including flood control throughout the Columbia River Basin; navigation in the Columbia and Snake rivers; hydropower generation to serve the Pacific Northwest; irrigation; fish and wildlife; water quality; municipal and industrial water supply; and recreation. BPA is responsible for the marketing and transmission of the power generated from these projects.

This Biological Assessment (BA) was prepared in response to the court-ordered Remand of the 2004 Biological Opinion (BiOp) issued by the National Marine Fisheries Service (NMFS, also called the National Oceanic and Atmospheric Administration [NOAA] Fisheries). This BA includes an assessment of the status of 13 listed salmon and steelhead, a description of the action the Action Agencies are proposing to NMFS, and a discussion of the process the Action Agencies have applied in analyzing the effects of this action. The action spans the 10-year time period from 2007 through 2017.

1.2 BACKGROUND

The Columbia River begins in Columbia Lake on the west slope of the Rocky Mountain Range in Canada. It follows a circuitous path for over 1,200 miles before emptying into the Pacific Ocean near Astoria, Oregon. The river drains about 219,000 square miles in the United States and 39,500 square miles in Canada. Its annual runoff is nearly 200 million acre-feet (MAF), as measured at the river's mouth.

The river and its tributaries form the dominant water system in the Pacific Northwest, and are a heavily used regional resource. Since the 1880s, numerous dams—both Federal and private—have been built for flood control, hydropower, fish and wildlife, navigation, recreation, irrigation, and municipal and industrial water supply and quality. As the region's population increased, the U.S. Government developed *storage* projects to capture water from rain and snowmelt for flood control, as well as for power generation, irrigation, and other purposes. The mainstem lower Columbia and Snake River projects were designed to provide for navigation from the mouth of the Columbia to the Port of Lewiston in Idaho, as well as for hydropower generation and other purposes. These *run-of-river* projects have minimal storage capacity, and are not considered flood storage projects. As the population in the basin continued to increase, the Corps and Reclamation jointly developed, and Congress approved, a comprehensive plan for development of the water resources of the Columbia River Basin.

¹ The FCRPS comprises 14 Federal multipurpose hydropower projects. The 12 projects operated and maintained by the Corps are: Bonneville, The Dalles, John Day, McNary, Chief Joseph, Albeni Falls, Libby, Ice Harbor, Lower Monumental, Little Goose, Lower Granite, and Dworshak dams. Reclamation operates and maintains the following FCRPS projects: Hungry Horse Project and the Columbia Basin Project, which includes Grand Coulee Dam. The FCRPS consultation also includes the mainstem effects of other tributary projects in the Columbia Basin.

Subsequently, the United States and Canada determined that additional storage in the upper reaches of the river would be mutually beneficial to both countries for flood control and power production. The countries signed the Columbia River Treaty in 1961. The three Canadian storage projects that were developed as part of the Treaty provide almost one-half of the water storage on the Columbia River. The increasing complexity of the hydrosystem and its uses warrants close operational coordination of the 14 U.S. projects that are referred to as the FCRPS (Figure 1-1).

The Columbia River Basin's total available storage is relatively small compared to its total average annual runoff. There is approximately 46 MAF of Federal, Canadian (subject to the terms of the Treaty with Canada), and private storage space, of which only about 16.5 MAF is contained in FCRPS projects. Therefore, the shape of the annual hydrograph for the mainstem Columbia River is similar to a natural hydrograph, whereas, other major systems in the western United States, such as the Missouri and Colorado River basins, have 2 to 4 times more storage capacity than annual runoff.

The Endangered Species Act (ESA) requires Federal agencies to consult with the U.S. Fish and Wildlife Service (USFWS) or NMFS, as appropriate, to ensure that their actions are not likely to jeopardize the continued existence of species listed as endangered or threatened or to adversely modify or destroy their designated critical habitat. The FCRPS Action Agencies have undergone ESA Section 7 consultation on the effects of the FCRPS on listed salmon and steelhead since the early 1990s. The current FCRPS litigation began in 2001 when the National Wildlife Federation et al. (NWF) challenged the adequacy of the 2000 FCRPS BiOp. In *Nat'l Wildlife Fed'n v. NMFS*, 254 F. Supp.2d 1196 (D. Or. 2003), the U.S. District Court of Oregon found the 2000 FCRPS BiOp "arbitrary and capricious" and remanded to NMFS.

NMFS completed a revised FCRPS BiOp in November 2004. The NWF challenged the 2004 FCRPS BiOp, and in October 2005, the Court ordered a Remand of the 2004 FCRPS BiOp to make a jeopardy determination that complies with the ESA and address the following: (1) correct its improper segregation of the elements of the proposed action NMFS deems to be nondiscretionary; (2) correct its improper comparison, rather than aggregation, of the effects of the proposed action on the listed salmon and steelhead; (3) the flawed critical habitat determinations; (4) the jeopardy determination did not adequately address the effects of the proposed action on both recovery and survival; and, (5) failure to correct past reliance on mitigation measures that are not reasonably certain to occur. In accordance with the Court's instructions, NMFS and the Action Agencies embarked on collaboration with four States and seven Tribes to develop actions for inclusion in the proposed action, to clarify policy issues, and to narrow areas of disagreement on scientific and technical information.

1.2.1 Consultation History

The first anadromous fish species to be listed by NMFS in the Columbia River Basin was the Snake River sockeye salmon, listed on November 20, 1991. Since then, the Action Agencies have initiated numerous Section 7 consultations to address the effects of the operation and maintenance (O&M) of the FCRPS projects. Several of these consultations occurred as a result of listing of additional species. A timeline of FCRPS ESA consultations is presented as Figure 1-2.

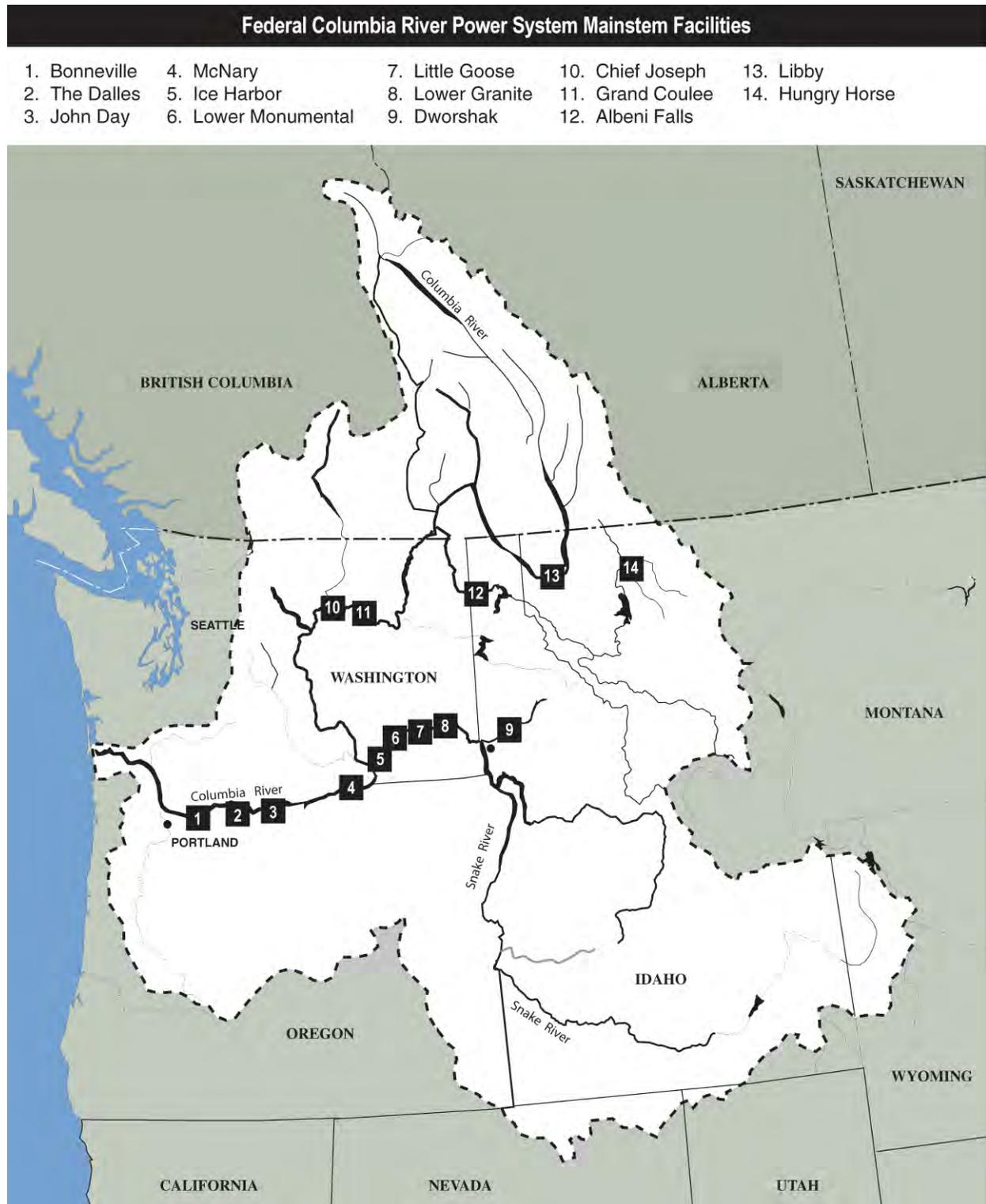


Figure 1-1. Federal Columbia River Power System Mainstem Facilities

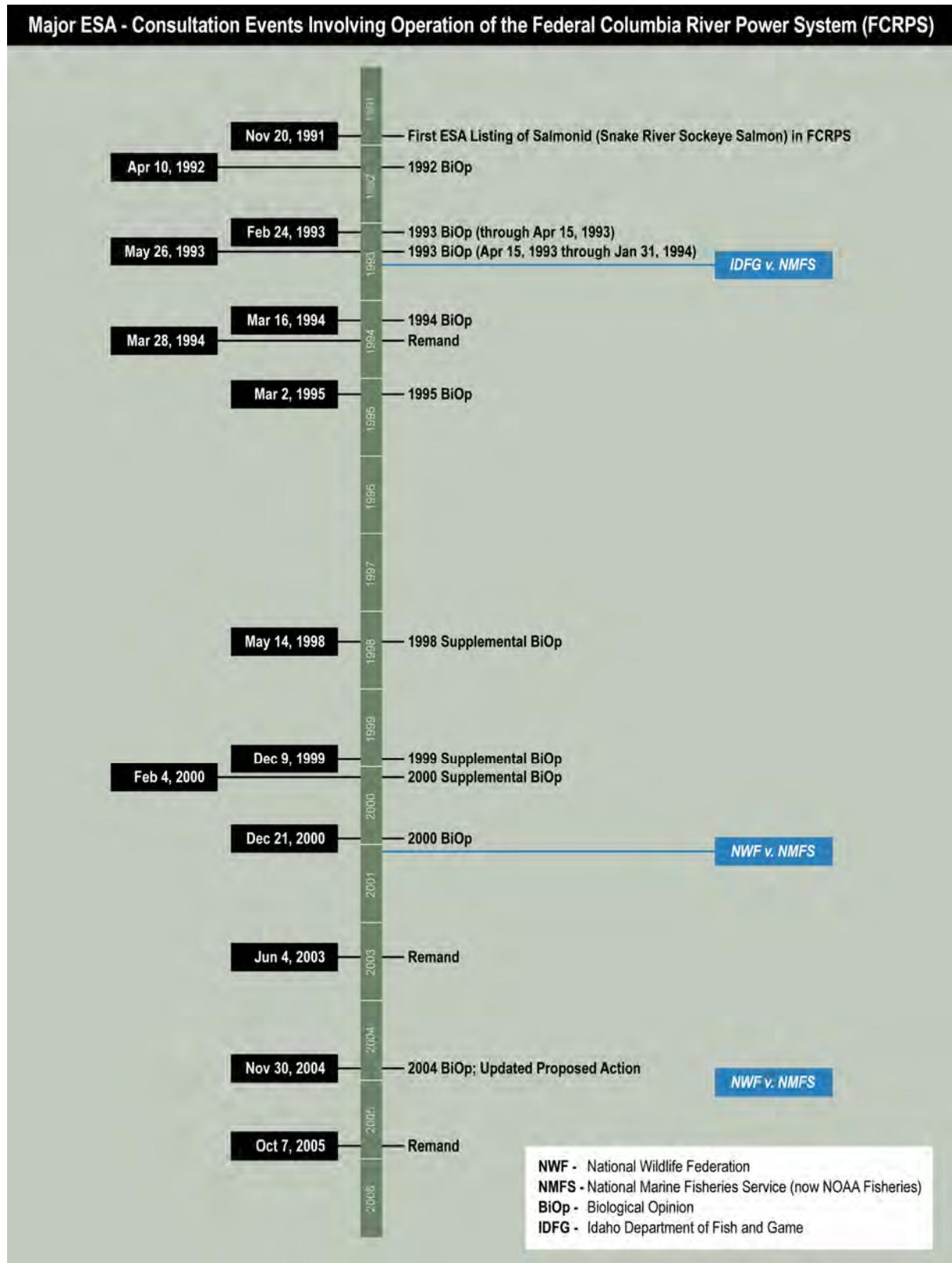


Figure 1-2. Major ESA Consultation Events

Consequently, between 1992 and 1994, NMFS issued several opinions regarding operation of the FCRPS (Figure 1-2), each finding no jeopardy to the continued existence of listed species. In response to litigation, *Idaho Department of Fish and Game v. NMFS*, 850 F. Supp. 886 (D. Or. 1994), NMFS reevaluated the 1994 BiOp in light of new information and court findings, and issued the 1995 BiOp. The 1995 BiOp found that the “impacts of the Federal Columbia River Power System (FCRPS) jeopardize the continued existence of listed Snake River salmon” and included, pursuant to Section 7 of the ESA, a reasonable and prudent alternative (RPA) to avoid jeopardy. The RPA recommended measures to increase the survival of juvenile and adult salmonids, and initiated the development of a long-term system configuration plan.

As noted above, the 2000 BiOp was challenged in *Nat’l Wildlife Fed’n. v. NMFS*, 254 F. Supp. 2d 1196 (D. Or. 2003), and the Court remanded because it relied on mitigation actions, such as improvements to habitat, hatcheries, and harvest, that were not reasonably certain to occur. Because the Action Agencies had already adopted and were implementing the measures contained in the 2000 BiOp, they determined that rather than re-analyzing the proposed action considered in the 2000 BiOp, it would be appropriate to update the 2000 BiOp RPA by developing the Updated Proposed Action (UPA). The 2004 UPA more accurately described current and planned future operations of the FCRPS, including most of the 2000 RPA actions identified in the 2000 BiOp.

NMFS submitted a revised BiOp (2004 BiOp) on the operation of the FCRPS and 19 Reclamation projects in the Columbia River Basin on November 30, 2004. The analytical approach used by NMFS in the 2004 BiOp, attempted to isolate the discretionary aspects of FCRPS operations from the non-discretionary aspects consistent with 50 CFR § 402.03. This approach was rejected by the Court (*see, Nat’l Wildlife Fed’n v. NMFS*, No. CV 01-640-RE (D.Or. May 26, 2005), resulting in the October 2005 court-ordered Remand.

1.2.2 Remand Process and Collaboration, Development of Action, and the Comprehensive Analysis of Effects of the Operation of the FCRPS and Upper Snake River Projects

1.2.2.1 Remand Process and Collaboration

As described above, the Court remanded the 2004 BiOp, and ordered NMFS and the Action Agencies to collaborate with sovereign States and Tribes to develop items to be included in the proposed action, clarify policy issues, and reach agreement or narrow the areas of disagreement on scientific and technical information. The parties to the Collaboration Process include NMFS, the Action Agencies, four States (Idaho, Montana, Oregon, and Washington), and Native American Tribes (the Nez Perce Tribe, the Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes of the Warm Springs Reservation of Oregon, the Confederated Tribes and Bands of the Yakama Indian Nation, the Confederated Tribes of the Colville Reservation, the Spokane Tribe of Indians, and Kootenai Tribe of Idaho). NMFS and the Action Agencies filed quarterly status reports throughout the collaboration. The First Remand Report, filed on January 3, 2006, outlined the collaboration structure, which is summarized in Figure 1-3.

This Collaboration effort included frequent policy and technical meetings with involved parties in the form of a Policy Working Group (PWG). The PWG (Figure 1-3) addressed hydropower, habitat, hatchery, and harvest activities within the emerging Proposed RPA. These discussions linked closely to the *Conceptual Framework for the Remand Process Including the Jeopardy Analysis* (Exhibit 3, First Remand Report) because they were part of the iterative process the Action Agencies and others used when identifying and selecting actions.

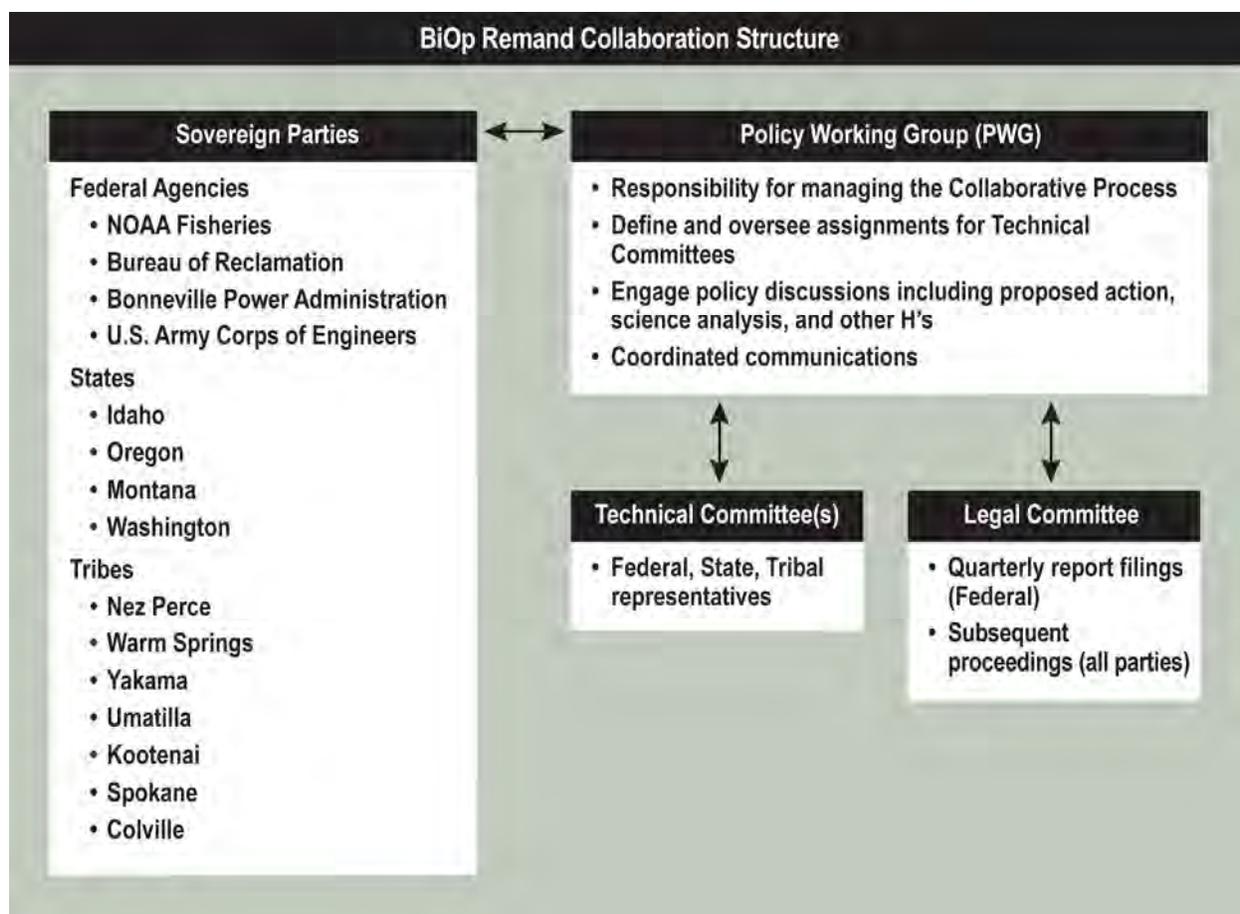


Figure 1-3. BiOp Remand Collaboration Structure

A goal of the collaborating sovereign parties was to identify priority actions to guide the identification of specific habitat, hatchery, and harvest actions for implementation and funding as mitigation actions for inclusion by the Action Agencies in the Proposed RPA, and also for use by other entities contributing to regional recovery efforts.

1.2.2.2 Development of Action

The Action Agencies, through the Remand Collaboration Process, developed a draft proposed action that was shared with the parties to the litigation and the Court on May 21, 2007. This BA is the culmination of the objective of collaboratively developing items for incorporation into the action submitted for analysis by NMFS. In this BA, the agencies have generally returned to the approach used in the 2000 BiOp, paying particular attention to ensuring that the proposed mitigation satisfies the reasonably certain to occur standard.

Although substantial improvements have been made in the operation and configuration of the hydrosystem, and survival rates at the projects have improved significantly, the existence and operation of the FCRPS alone without mitigation is likely to result in a jeopardy finding for all Evolutionarily Significant Units (ESUs) (also referred to as Distinct Population Segments [DPSs] for steelhead) absent improvements in tributary and estuary habitat, predator management and hatcheries management. Accordingly, rather than engaging in an iterative process of submitting a proposed hydro operation and then having NMFS suggest mitigation in the form of a RPA, the Action Agencies have instead proposed a RPA that includes the hydro operation and a full mitigation package, which the Action Agencies believe exceeds the minimal requirements of § 7(a)(2).

By the Action Agencies providing input on the RPA up front, the Action Agencies ensure that Judge Redden’s direction for the Remand that the Federal agencies should collaborate with the sovereign entities in developing the proposed action is honored. Moreover, proceeding in this manner facilitates the development of a new BiOp for a RPA designed through such collaboration within the limited time remaining in the Remand. Finally, this approach also addresses Judge Redden’s concern in *American Rivers et al. vs. Fisheries* regarding possible differences between the “certainty” requirements for a RPA versus and proposed action. *American Rivers v. NOAA Fisheries*, 2006 WL 1455629, *8 n.7 (D. Or. May 23, 2006).

The Action Agencies recognize that under 16 U.S.C. § 1536(b)(3)(A), NMFS is responsible for suggesting a RPA. However, neither the ESA nor the consultation regulations, prohibit the Action Agencies from suggesting a RPA. Moreover, the Action Agencies offer that the RPA was developed in collaboration with State and Tribal sovereigns to facilitate developing the suggested RPA was consistent with the requirement in 50 CFR § 402.14(g)(5) (requiring NMFS to “utilize the expertise of the Federal Agency” in developing any RPA). This Proposed RPA can be implemented consistent with intended purposes of the operation and maintenance of the FCRPS projects, is within the scope of the Action Agencies’ legal authority and jurisdiction, and is economically and technologically feasible.

1.2.2.3 Comprehensive Analysis of the Effects of the Operation of the FCRPS and Upper Snake River Projects

In accordance with the U.S. District Court of Oregon Order to ensure a “comprehensive analysis” of the effects of the two separate actions on the listed species and designated critical habitat in the lower Snake and Columbia rivers, the Action Agencies have considered the combined effects of: (a) the operation and maintenance of the FCRPS; and, (b) the operation and maintenance of the Reclamation’s Upper Snake River Projects².

In *American Rivers et al. v. NOAA Fisheries*, the Court ordered the analysis of effects occurring in the Upper Snake River BiOp Remand be integrated with the analysis of effects for the Remand of the 2004 FCRPS BiOp to ensure a “comprehensive analysis” of the effects of the two actions on the listed species and designated critical habitat. The Court also affirmed that the agencies were not required to address FCRPS and Upper Snake River actions in one BiOp and allowed for separate consultations and separate BiOps. Because the Upper Snake River projects and the FCRPS are operated independently of one other, two separate BiOps will be prepared – one addressing the effects attributed to the operation of the FCRPS, and one that addresses the effects of the independent operation of 12 Upper Snake River projects. However, because both of these independent actions hydrologically influence flows in the Snake and Columbia rivers, it is reasonable to analyze these effects comprehensively.

The Action Agencies are working together to implement the Court’s instructions, and have developed this BA and the accompanying Comprehensive Analysis to evaluate the effects of Reclamation’s operation of the Upper Snake River projects together with the effects of the operation of the FCRPS projects. This comprehensive analysis considers the combined effects of the:

1. FCRPS Proposed RPA;
2. Upper Snake River Proposed Actions (PA);
3. environmental baseline; and
4. cumulative effects.

² The projects, collectively referred to as the Upper Snake River projects, are Minidoka, Palisades, Michaud Flats, Ririe, Little Wood River, Boise, Lucky Peak, Mann Creek, Owyhee, Vale, Burnt River, and Baker.

This analysis evaluates all of these effects, factoring in the status of the species, and applies the jeopardy framework described in memoranda prepared by Robert Lohn, NMFS Regional Administrator, dated July 12, 2006, and September 11, 2006 (Lohn 2006a and 2006b). For additional information, please refer to the Comprehensive Analysis.

1.2.3 Overhaul of the System—Structural and Operational Changes for Fish Since 1994

In reference to actions taken for fish protection at the FCRPS projects, Judge Marsh declared in 1994 “the situation literally cries out for a major overhaul.” Since then, the Action Agencies made significant changes, including a number of improvements and additions to fish passage facilities, operational changes in flow, spill and the juvenile transportation program, and aggressive predator management. This BA focuses on actions from 2007 to 2017; however, much has been done since 1994.

Primarily through the Corps’s Columbia River Fish Mitigation (CRFM) Project, structural improvements at the dams have been added to improve fish passage resulting in significant survival improvements³. Over \$1 billion has been invested from the mid-1990s through 2006 in baseline research, development and testing of prototype improvements, and construction of new facilities and upgrades. The improvements in the physical facilities, along with improvements in the flow and spill programs, have delivered substantial improvements in both juvenile survival numbers and adult returns. For instance, Figure 1-4 illustrates the changes in juvenile Snake River Spring and Summer Chinook Salmon and Steelhead in-river survivals during this period. Increases in juvenile survival will likely improve adult returns over the long term. Recent adult returns are shown in Figure 1-5.

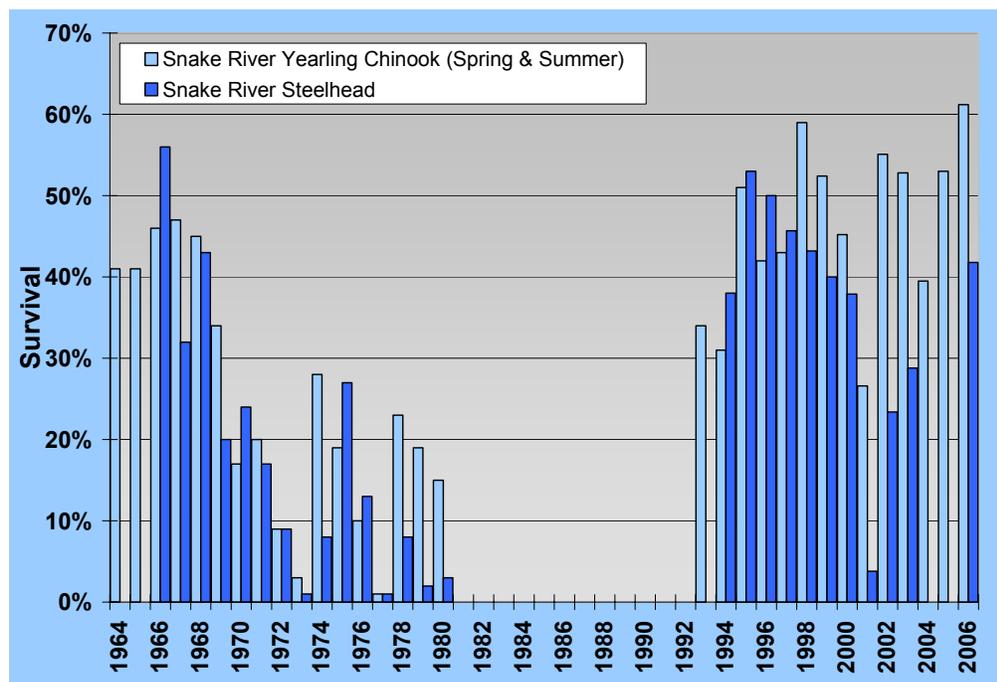


Figure 1-4. Estimates of In-River Survival of Snake River Chinook Salmon and Steelhead from 1964 to 2006⁴

³ The overhaul of the system is discussed in more detail in Appendix A.

⁴ Data were not collected in some years for both species. Returns from 1964 to 1980 were obtained using a different methodology from the passive integrated transponder (PIT)-tag-based returns in 1993 to 2006. Trends within the two groups of data are accurate, but caution should be exercised when making direct comparisons between groups.

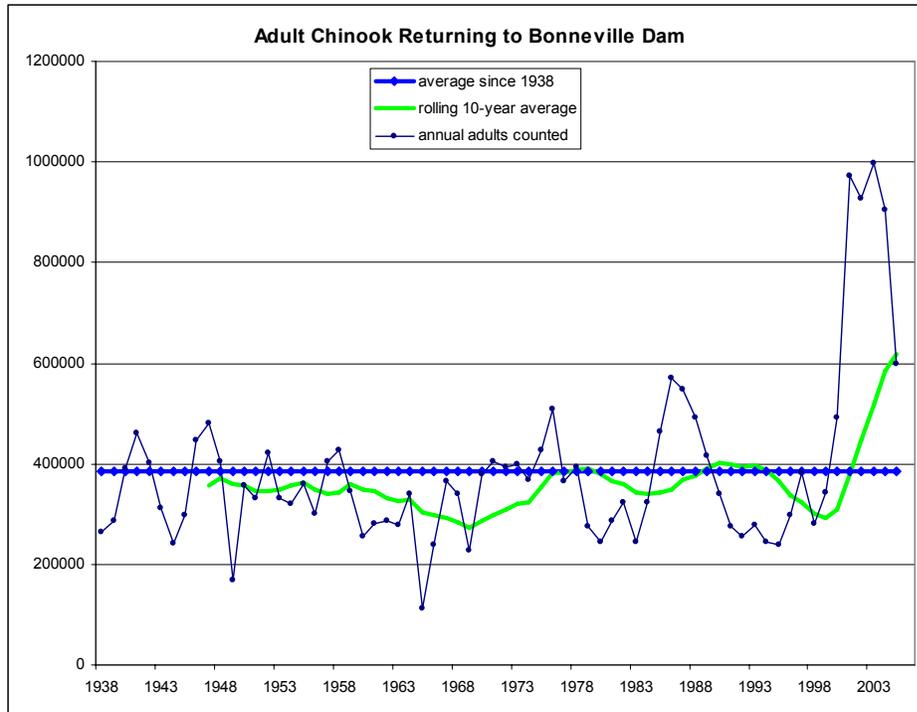


Figure 1-5. Numbers of Adult Chinook Salmon Returning to Bonneville Dam, 1938 to 2005

1.2.3.1 Structural and Operational Changes for Fish Passage at Mainstem Dams

The following outlines the major modifications to dams and fish facilities for improving juvenile and adult salmon passage during this period:

- Addition of surface collectors or surface bypass systems, exemplified by the highly effective juvenile salmon bypass collectors (Corner Collector) and flumes at Bonneville Dam, and the removable spillway weirs (RSWs) at Lower Granite and Ice Harbor dams;
- Improvements to the existing juvenile fish guidance screens, bypass facilities and outfalls, transport collection and handling facilities, and state-of-the-art monitoring systems;
- Installation of spillway flow deflectors on most spillbays at all projects, except The Dalles Dam⁵, to reduce the harmful effects of total dissolved gas (TDG) and increase spill passage of juvenile fish;
- Improved adult fish ladders, auxiliary water supplies as well as more effective PIT-tag monitoring systems for both adults and juveniles, including the state-of-the-art facilities at Little Goose and Bonneville dams;
- Developing and testing behavioral guidance structures (BGS) to influence the horizontal travel of juvenile fish toward bypass facilities at the dams;
- Tailrace egress improvements such as the new “spill wall,” in year two of testing at The Dalles Dam; and
- Powerhouse turbine unit operational priorities to enhance juvenile egress and adult passage.

See Appendix A for additional details.

⁵ Flow deflectors have not been installed at The Dalles Dam due to the shallow stilling basin.

1.2.3.2 Regulating Flow to Assist Juvenile Salmon Migration

Managing water in the Columbia River system for its many purposes is particularly challenging given the relatively small portion of the annual runoff volume that can actually be stored in reservoirs. The runoff produces an annual average of about 200 MAF of water, but only about 20 percent of it can be impounded in storage reservoirs and regulated for useful purposes. By contrast, the Colorado River system can store about three times as much runoff as it normally receives in a given year. The Missouri River system has about two times more useable storage than average annual runoff.

The notably larger storage capacities of the Colorado and Missouri River systems present much different management considerations than the Columbia River system. These systems have the capacity to store water for subsequent years' use, whereas the Columbia River system, with its large annual volume to usable storage ratio, has to evacuate on a yearly basis to accommodate water supply conditions in the Columbia River Basin. This means that operators cannot use stored water to transform a dry year's water supply into an average flow year. Operators of the hydropower system must deal with the variability in annual rain and snowpack, relying on professional judgment.

Providing flows for fish is an important component of water management in the Columbia River Basin. Fish operations draw on up to 5 MAF of stored water annually—about one-sixth of the 32 MAF of storage in U.S. reservoirs in the FCRPS and Treaty storage in Canadian reservoirs. Because much of the available storage is in Treaty projects in Canada, its use downstream is governed by the Columbia River Treaty. Use of Treaty storage for fishery purposes is contingent on development of mutually beneficial agreements between the United States and Canada. Use of space in Canadian reservoirs not included in the Treaty, referred to as non-Treaty storage, requires negotiating additional agreements.

In recent Treaty agreements, Canada has allowed storage of flow augmentation water (1 MAF) for U.S. fishery benefits in exchange for flow shaping to meet fishery objectives in Canada. The 1 MAF is released within the May through July period to assist juvenile migration in the United States. If this flow augmentation water is released across one month, it equates to an additional flow of 16,000 thousand cubic feet per second (kcfs) for that month, equal to about 6 percent of spring flow objective, or about 8 percent of the summer flow objective of 200 kcfs at McNary Dam.

With the issuance of the 1995 BiOp, the RPA “substantially alters the operation of the reservoirs in the FCRPS compared to the 1993 and 1994 BiOps” (1995 BiOp, p. 96). The Action Agencies were to henceforth operate the FCRPS during fall and winter months at high confidence levels that refill would be accomplished by April 20. Flows were to be released in the spring while ensuring sufficient storage of water to be available by June 30 to provide for summer flow augmentation.

An objective of fish operations today is to provide flows in a more natural pattern or hydrograph, to the extent that the design of the system, to meet multiple purpose responsibilities, will allow. Figure 1-6 illustrates how flows are shaped to more closely approximate a natural, unregulated river to assist fish migration. This figure compares the “regulated” flow in October 2005 to September 2006 (the 2006 water year) to what would have been a natural flow, absent the hydrosystem, in that same water year. In this year, precipitation was measured at about 100 percent of the 71-year average.

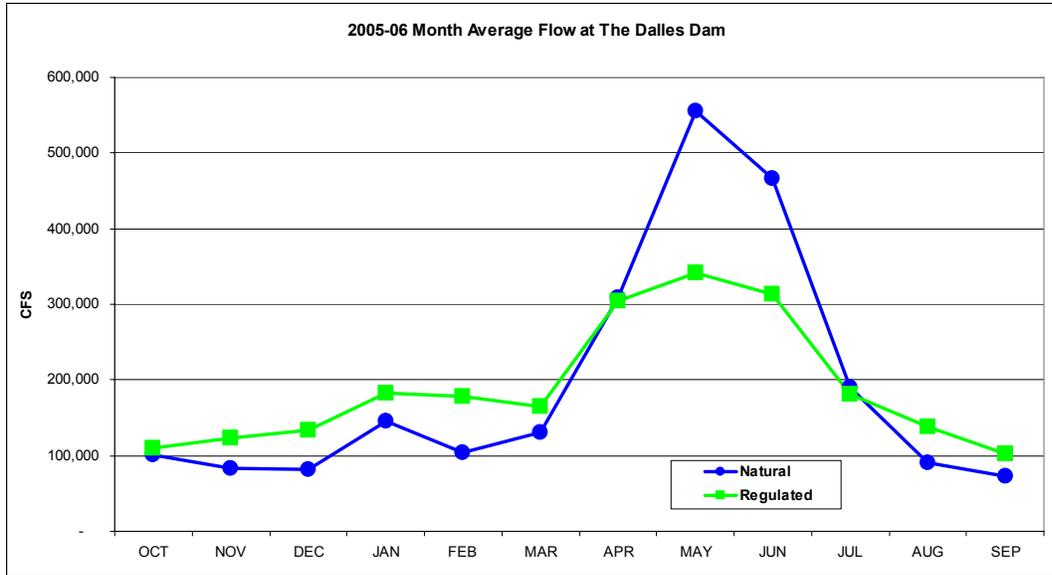


Figure 1-6. Natural and Regulated Monthly Average Flow at The Dalles Dam for the 2006 Water Year

Another way of looking at the available flow due to changes in reservoir operations to benefit fish, is noting the millions of acre-feet of water passing The Dalles Dam. Figure 1-7 shows the additional flow at The Dalles during the juvenile migration period (April through August) as a result of reservoir operations for fish (60-year average) under the 2004 BiOp. Operations for fish flows shape 8.3 MAF on average — 4.6 to 13.2 MAF, depending on annual precipitation.

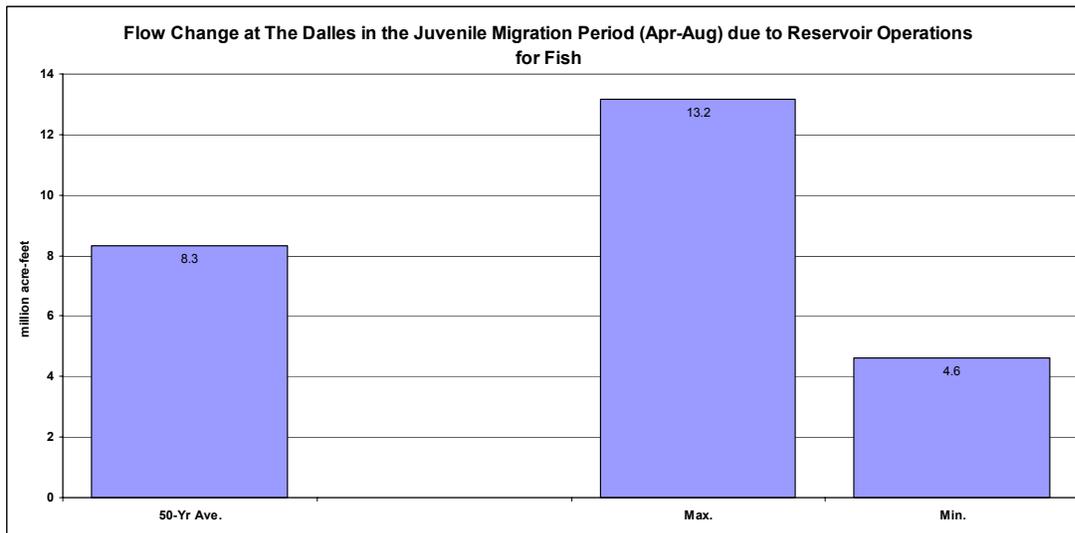


Figure 1-7. Flow Change at The Dalles Dam during the Juvenile Migration Period (April through August) Due to Reservoir Operations for Fish (60-year average)

As mentioned above, the volume of water in the river each year is as variable as the weather. Figure 1-8 depicts a 60-year average regulated flow at The Dalles Dam, with and without fish operations. Given the limited storage available in the hydro system and other constraints to provide for multiple uses, these operations represent a substantial improvement in providing flows for fish within the design capabilities of the system.

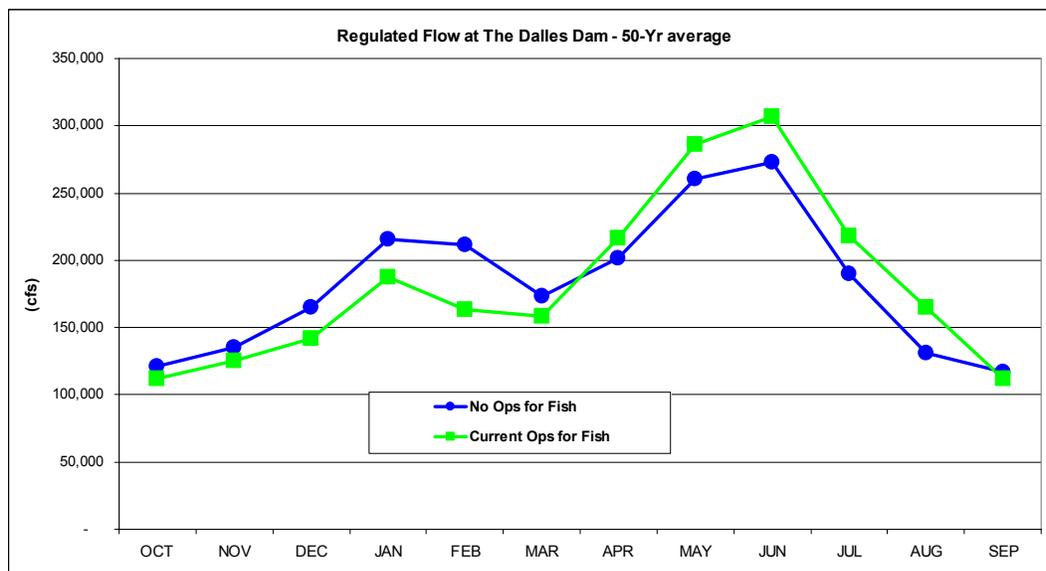


Figure 1-8. Sixty-Year Average Regulated Flow at The Dalles Dam, With and Without Fish Operations

Flood control procedures have been closely evaluated and modified to the extent possible. At storage reservoirs behind Libby and Hungry Horse dams, operators adopted new flood control procedures with the objective of having more water available for spring flow augmentation, while maintaining flood control objectives. This new flood control criteria is called VARQ (variable outflow). It entails a new set of storage reservation diagrams (SRD) and upper rule curves (URC) for both Libby and Hungry Horse dams, which allows for higher water levels in the reservoirs from January through April when the runoff is forecasted to be about average or less. As the reservoir pools may be higher in spring than previously, releases must be increased during the refill period (April, May, and June). By this means, operators can provide the same level of flood protection, while ensuring that more water is available for adult Kootenai River white sturgeon and juvenile salmon and steelhead migration in spring and summer.

The summer flow management objective is to draft reservoirs within specific limits in attempt to meet flow targets and to manage water temperatures to benefit migrating juvenile salmon. Cooler water is also thought to assist adult migration.

The eight Federal dams on the mainstem lower Columbia and Snake rivers are “run of the river” dams, that is, low head dams that have little or no storage capacity and essentially pass inflows⁶. Nevertheless, these reservoirs impede flow and affect the progress of juvenile salmon through the system in several ways: slowing travel, increasing exposure to warmer water temperature, and increasing exposure to predators among them. In 1995, the Corps began operating the lower Snake reservoirs within 1 foot of minimum operating pool (MOP), the level required to provide safe navigation, operate fish facilities within design criteria, and operate turbines. The 1995 BiOp also called for John Day pool to be operated

⁶ John Day Dam has approximately 500 thousand acre-feet of flood control storage.

within 1.5 feet of MOP from April 20 through the summer. These drawdowns reduce the width or the cross-section of the reservoir, thereby increasing water velocity.

Finally, the water managers strive to provide flow conditions for mainstem habitat suitable for spawning chum and fall Chinook salmon. They maintain sufficient flow below Bonneville Dam to keep spawning redds submerged until juvenile fish hatch in the spring.

1.2.3.3 Spill Operations to Assist Juvenile Fish Passage

Spill operations are a method of guiding juvenile salmon and steelhead through spillways rather than through turbines. The objective of the spill program is to achieve maximum passage survival, along with other passage routes, at each dam. Survival is measured by detecting the PIT-tagged fish as they pass from the forebay above the dam to the tailwater below the dam.

Prior to the 1995 BiOp, the operators' objective was to attain a fish passage efficiency⁷ (FPE) of 70 percent for spring migrants and 50 percent for summer migrants. To accomplish this, spill was provided at three dams. The other dams met this goal without spill. In the longer term, the plan was to complete structural bypass systems at the four lower Snake River and four lower Columbia River dams to boost in-river survival.

In the 1995 BiOp, the objective was raised to achieve 80 percent FPE at all eight projects by spilling water through the spring months at each project. Timing and volume of spill at each project was designed to achieve biological benefits with a cap to avoid harmful levels of TDG. Limited spill was to be provided in summer months, primarily at Ice Harbor on the lower Snake River and the three lower Columbia dams.

With the 2000 BiOp, the focus was shifted to dam survival estimates instead of FPE due to advancements in radio and acoustic tracking technologies. This has allowed for better assessment of passage improvements at mainstem dams. For instance, bypass facilities of various types have been added to dams with survival of juvenile fish increasing to 90 to 95 percent at each dam. As discussed earlier, surface passage modifications such as RSWs and the Bonneville Dam Corner Collector can achieve higher survival rates (97 percent or higher with RSWs, and 100 percent with the Corner Collector), while spilling less water.

The various routes of juvenile passage notwithstanding, most juvenile fish in the river find their way through juvenile bypass facilities, spillways, and surface bypass facilities. The 2000 BiOp based annual spill programs on “the best available monitoring and evaluation data concerning project passage, spill, and system survival research” (2000 BiOp, pp. 9-88). This principle was extended to the 2004 BiOp, further increasing the reliance on biological performance to set spill levels at each project.

In 2004, emphasis turned to 24-hour surface spill through RSWs and the Corner Collector at Bonneville Dam. The Court Order in 2005 required summer spill at Lower Granite, Little Goose, and Lower Monumental dams on the Snake River, and at McNary Dam on the Columbia River, which was continued in 2006 and 2007. Monitoring in 2005 and 2006 showed nearly all of the Snake River fall Chinook salmon (both hatchery and wild) passed Little Goose and Lower Monumental dams by late July or early August.

⁷ Fish Passage Efficiency (FPE) is a measure of percent of juvenile fish that are diverted away from turbine passage, either via spill or through the juvenile bypass facilities.

1.2.3.4 Transportation of Juvenile Fish

Research on the most effective ways to transport juvenile fish began in 1968. Today, millions of juvenile fish are collected and transported each year from facilities located at Lower Granite, Little Goose, Lower Monumental, and McNary dams. Utilizing transportation is a component of the “spread the risk” strategy, given the uncertainties surrounding both in-river migration and transportation.

Operations since 1995 dictate transport during summer flow and other low-flow periods, when juveniles face the highest risk if left in the river to migrate. Ninety-eight percent of transported fish survive to be released in the river below Bonneville Dam. While researchers have collected substantial data on the risks of leaving juvenile fish in the river to migrate, they have not been able to quantify any latent or delayed mortality that might occur among transported fish.

The returns of adult fish are an indicator of the success of transportation. During the drought of 2000-2001, virtually all spring and summer migrants in the Snake River were transported. When those fish returned as adults to Ice Harbor Dam as adults in 2003 and 2004, their numbers were among the highest of record (University of Washington Data Access in Real Time [DART] Program). Transportation, along with other mitigating measures, helped ensure that a large number of healthy juvenile fish entered the Pacific Ocean to benefit from favorable ocean conditions. Since 1995, two additional large transport barges went into service, bringing the total to eight.

1.2.3.5 Predation Management

Federal and State agencies are cooperating in efforts to reduce predation on juvenile listed species. Programs to redistribute Caspian terns in the estuary, drive away and block sea lions from the Bonneville Dam fish ladders, and reduce the northern pikeminnow population by a sport-reward program have been successful in reducing loss to predation. The Federal agencies are now preparing to address growing populations of double-crested cormorants nesting in the estuary and Caspian terns and double crested Cormorants in the Mid-Columbia River that also prey on juvenile salmonids.

1.2.3.6 Hatcheries

With the exception of Lower Columbia River Chum Salmon ESU and the Mid-Columbia River Steelhead and Upper Willamette River Steelhead DPSs, 50 percent or more of the anadromous salmonids in the basin today originate in hatcheries. In the Snake River Basin, 60 to 85 percent of steelhead and salmon begin their lives in hatcheries (NMFS 2005). BPA funds, in whole or in part, 75 anadromous fish propagation programs out of a total of 189 programs in the Columbia River Basin. The remaining facilities are supported by other State and Federal funding. Since the first ESA listing of Columbia River salmon in 1991, BPA has increasingly reoriented programs toward recovery of weak natural stocks.

BPA began funding the development of over 200 Hatchery and Genetic Management Plans (HGMPs) in 2000, continued funding this action under the 2004 UPA, and recently completed the project in 2006. The HGMPs facilitate the application of hatchery reforms to specific artificial production programs, thus providing a standardized approach and consistent body of relevant information about hatchery programs. According to the 2000 BiOp, the HGMP would comprehensively address facility and operational details relevant to reform measures and the menu of potential hatchery reform actions.

Work continues on establishing the optimal mix of hatchery and natural stocks. The Action Agencies have funded and completed HGMPs for all basin hatcheries to address the number of hatchery fish and balance the ratio of wild-to-hatchery stocks over time.

1.2.3.7 Habitat Improvements

The Federal effort to improve tributary and estuary habitat for listed stocks began in 2000 with a program based on priority subbasins plus the estuary. Accomplishments between 2000 and 2005 on the ground include:

- Restoring fish access to more than 1,280 miles of tributary habitat. In 2005, 19 barriers or obstructions were removed to restore access to more than 180 miles.
- Securing more than 300 cubic feet per second (cfs) of water in tributaries in 2005 alone. Seventeen cfs were delivered in the Wenatchee, Entiat, and Methow river subbasins. Another 230 cfs secured since 2000 were maintained.
- Installing or retrofitting fish screens at more than 85 water diversions, 15 of them installed in 2005. Federal funding supports three screen shops in the region to manufacture screens and work with farmers in making their irrigation systems safe for fish.
- Acquiring more than 660 acres of habitat in the estuary at Crims Island, Crooked Creek, and Germany Creek.
- Increasing focus on the estuary, where more than 300 acres are now returning to natural condition and another 900 acres are in restoration plans.

Transactions with water districts and individual landowners have secured additional water for tributaries subject to heavy irrigation withdrawals that can be left in stream to provide flow and habitat for fish. With Federal funding, the National Fish and Wildlife Foundation (NFWF) operates the Columbia Basin Water Transaction Program. It seeks voluntary, grass roots water transactions to improve flows. Last year, its third full year of operation, the program completed 42 voluntary transactions. More than 100 have been recorded since inception, totaling 530 cfs in 2005 (Columbia Basin Water Transactions Program, 2006, p. 9).

1.2.3.8 Harvest

Several programs have been implemented to make fishing methods more selective and less harmful to ESA-listed stocks. The Columbia River Spring Chinook Salmon Tanglenet Fishery, for example, provided river fishers with nets that snared fish by their teeth rather than by their gills. Fishers can extricate natural (non-hatchery reared) salmon from nets with less harm, and then revive them in special tanks on the boats before releasing them back into the river. Investment from 2001 to 2003 in this successful program was \$1.5 million per year.

In the late 1990s, the Federal system also funded introduction of salmon gillnets with mesh large enough to allow steelhead to slip through. Such nets are now an accepted tool. Funding is also provided for the program to collect coded wire tags from fish caught by commercial and recreational fishers.

The Action Agencies will address potential alternative/terminal fishing locations and seasonal time periods where targeted fish can be accessed with minimal impacts to listed salmon and steelhead. The Select Areas Fisheries Evaluation, now a perennial operation in Youngs Bay near Astoria, Oregon, provides a terminal fishery to bolster salmon harvest, especially in years when the return of other stocks is down. The cost is about \$1.5 million a year.

1.3 ACTION AREA

The Action Area is defined as those areas directly or indirectly affected by the Proposed RPA. Therefore, the proposed Action Area for this BA is as follows:

- The Columbia River, including Libby and Hungry Horse reservoirs and downstream rivers receiving releases from these dams and reservoirs; Dworshak reservoir and downstream of the dam - the North Fork of the Clearwater, flowing into the Clearwater River to the confluence with the lower Snake River; the Snake River below the confluence with the Salmon River to the confluence with the Columbia River; and, down to and including the Columbia River estuary and plume;
- The estuary and plume, which includes the area immediately off the mouth of the Columbia River influenced by freshwater discharge, up to the limit of tidal influence at Bonneville Dam [approximately river mile (RM) 146];
- The subbasins that are the focus of the Action Agencies proposed tributary habitat actions;
- Redfish, Alturas, and Pettit lakes and the tributaries that connect them to the Snake River, due to the activities associated with the safety-net hatchery programs for Snake River Sockeye Salmon;
- Lower South Fork Clearwater River and Lower Selway River downstream to the confluence with the North Fork Clearwater River, due to the activities associated with the Nez Perce Tribal Hatchery for Snake River Fall Chinook Salmon; and
- All areas directly or indirectly affected by Reclamation projects included in this consultation.

1.4 SPECIES AND CRITICAL HABITAT ADDRESSED

1.4.1 Species

The ESA status of West Coast species of salmon and steelhead are shown Table 1-1. However, many of these species are not present in the Action Area of the FCRPS, and thus would not be affected by operations and maintenance of FCRPS facilities. The ESA-listed species that are addressed in this BA are identified in Table 1-2.

Table 1-1. Endangered Species Act Status of West Coast Salmon and Steelhead

Species			Current Endangered Species Act Listing Status ^{1/}
Sockeye Salmon (<i>Oncorhynchus nerka</i>)	1	Snake River	Endangered
	2	Ozette Lake	Threatened
	3	Baker River	Not Warranted
	4	Okanogan River	Not Warranted
	5	Lake Wenatchee	Not Warranted
	6	Quinalt Lake	Not Warranted
	7	Lake Pleasant	Not Warranted
Chinook Salmon (<i>O. tshawytscha</i>)	8	Sacramento River Winter-Run	Endangered
	9	Upper Columbia River Spring-Run	Endangered
	10	Snake River Spring/Summer-Run	Threatened
	11	Snake River Fall-Run	Threatened
	12	Puget Sound	Threatened
	13	Lower Columbia River	Threatened
	14	Upper Willamette River	Threatened

Table 1-1. Endangered Species Act Status of West Coast Salmon and Steelhead (continued)

Species			Current Endangered Species Act Listing Status ^{1/}
Chinook Salmon (Cont.)	15	Central Valley Spring-Run	Threatened
	16	California Coastal	Threatened
	17	Central Valley Fall and Late Fall-Run	Species of Concern
	18	Upper Klamath-Trinity Rivers	Not Warranted
	19	Oregon Coast	Not Warranted
	20	Washington Coast	Not Warranted
	21	Middle Columbia River Spring-Run	Not Warranted
	22	Upper Columbia River Summer/Fall-Run	Not Warranted
	23	Southern Oregon and Northern California Coast	Not Warranted
	24	Deschutes River Summer/Fall-Run	Not Warranted
Coho Salmon (<i>O. kisutch</i>)	25	Central California Coast	Endangered
	26	Southern Oregon/Northern California	Threatened
	27	Lower Columbia River	Threatened
	28	Oregon Coast	Not Warranted
	29	Southwest Washington	Undetermined
	30	Puget Sound/Strait of Georgia	Species of Concern
	31	Olympic Peninsula	Not Warranted
Chum Salmon (<i>O. keta</i>)	32	Hood Canal Summer-Run	Threatened
	33	Columbia River	Threatened
	34	Puget Sound/Strait of Georgia	Not Warranted
	35	Pacific Coast	Not Warranted
Steelhead (<i>O. mykiss</i>)	36	Southern California	Endangered
	37	Upper Columbia River	Endangered
	38	Central California Coast	Threatened
	39	South Central California Coast	Threatened
	40	Snake River Basin	Threatened
	41	Lower Columbia River	Threatened
	42	California Central Valley	Threatened
	43	Upper Willamette River	Threatened
	44	Middle Columbia River	Threatened
	45	Northern California	Threatened
	46	Oregon Coast	Species of Concern
	47	Southwest Washington	Not Warranted
	48	Olympic Peninsula	Not Warranted
	49	Puget Sound	Threatened
	50	Klamath Mountains Province	Not Warranted
Pink Salmon (<i>O. gorbuscha</i>)	51	Even-year	Not Warranted
	52	Odd-year	Not Warranted

Notes:

^{1/} This list is current as of April 10, 2006. Updated final listing determinations for 16 salmon species were issued on June 28, 2005 (70 FR 37160). Updated final listing determination for 10 West Coast steelhead species was issued on January 5, 2006 (71 FR 834). On September 2, 2005, final critical habitat designations were issued for 19 West Coast salmon and steelhead species (70 FR 52488 and 52630).

Source: NMFS June 15, 2007

Table 1-2. Threatened and Endangered Salmon and Steelhead of Interest to the FCRPS

Species	ESA Status
Snake River Sockeye Salmon	Endangered
Upper Columbia River Spring-Run Chinook Salmon	Endangered
Snake River Spring/Summer-Run Chinook Salmon	Threatened
Snake River Fall-Run Chinook Salmon	Threatened
Lower Columbia River Chinook Salmon	Threatened
Upper Willamette River Chinook Salmon	Threatened
Lower Columbia River Coho Salmon	Threatened
Columbia River Chum Salmon	Threatened
Upper Columbia River Steelhead	Endangered
Snake River Basin Steelhead	Threatened
Lower Columbia River Steelhead	Threatened
Upper Willamette River Steelhead	Threatened
Middle Columbia River Steelhead	Threatened

1.4.2 Critical Habitat

The term “critical habitat” is defined as:

- (i) the specific areas within the geographical area occupied by the species, at the time it is listed..., on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and
- (ii) specific areas outside the geographical area occupied by the species at the time it is listed... upon a determination by the Secretary that such areas are essential for the conservation of the species.

(see, 16 U.S.C. §1532 (5) (A) (i) (ii))

The critical habitat designations for the 13 ESUs or DPSs addressed in this BA are identified in Table 1-3.

Table 1-3. Critical Habitat Designations

ESU or DPS	Critical Habitat Status⁸ (Date of Designation)
Snake River Fall Chinook Salmon ESU	12/28/1993
Snake River Spring/Summer Chinook Salmon ESU	10/25/1999
Snake River Sockeye Salmon ESU	12/28/1993
Snake River Basin Steelhead DPS	9/2/2005
Upper Columbia River Spring Chinook Salmon ESU	9/2/2005
Upper Columbia River Steelhead DPS	9/2/2005
Middle Columbia River Steelhead DPS	9/2/2005
Columbia River Chum Salmon ESU	9/2/2005
Lower Columbia River Chinook Salmon ESU	9/2/2005
Lower Columbia River Coho Salmon ESU	Under Review by NMFS
Lower Columbia River Steelhead DPS	9/2/2005
Upper Willamette River Chinook Salmon ESU	9/2/2005
Upper Willamette River Steelhead ESU	9/2/2005

⁸ See <http://www.nwr.noaa.gov/ESA-Salmon-Listings/Salmon-Populations> for additional information about critical habitat and listings.

1.5 PROJECT MULTI-PURPOSES

Various Congressional and Secretarial authorizations provide authority for the Corps and Reclamation to develop a system of water development facilities in the Columbia River Basin. Congress made clear its intent to develop and operate this coordinated system of Columbia River Basin hydropower projects as part of a comprehensive regional plan to provide for a number of uses including navigation, flood control, irrigation, hydroelectric power, fish and wildlife conservation, recreation, municipal and industrial water supply, and water quality.

For Corps projects, this comprehensive development plan is discussed in House Document No. 531.⁹ Under specific project authorizations, generally in various Flood Control Acts, the Corps was authorized to construct, operate, and maintain its Columbia River Basin projects to meet multiple uses substantially in accordance with the applicable House Documents. Reclamation received authorization for each of its projects from either Congress or the Secretary of the Interior, who had authority under the 1902 Reclamation Act to approve construction after a finding of feasibility. The Congressional and Secretarial authorizations state the purposes to be served by each project.

For purposes of this consultation, the FCRPS is defined as the operation and maintenance of 14 Federal projects, as shown in Table 1-4. Similar authorizations provide authority for BPA to market and distribute power generated by these projects. The Action Agencies continue to authorize, fund, and carry out the operation and maintenance of these projects.

The Corps and Reclamation operate the FCRPS and Reclamation projects to meet the purposes described below. The following list does not imply prioritization (which can vary seasonally and with other factors) and does not display the large numbers of significant activities that are currently taken to improve conditions for listed salmonids under the ESA:

- **Flood Control** – Management of damaging floodwaters for the protection of Portland and Vancouver was one of the original incentives for the construction of the storage projects in the Columbia River Basin. The FCRPS reservoirs operate as a system to provide flood protection from snowmelt and rain induced flooding during the spring through June. Water from rain and snowmelt is put into storage until it can be released safely without causing flooding downstream. Storage dams allow water managers to operate these projects in a manner that “shapes” the heavy spring and summer snowmelt runoffs to help prevent flooding. The Corps is authorized to direct flood control operations for specific Federal and non-Federal storage projects, including Canadian projects subject to the Treaty, in the Columbia River Basin.
- **Irrigation** – Reclamation is authorized to develop water resources for the irrigation of arid lands. Some Reclamation projects involved the development of full water supplies for the irrigation of new lands. Others involved only the rehabilitation of privately developed facilities, while still others involved various combinations of full water supplies for new lands and full or supplemental water supplies for previously irrigated lands. Water supplies for these projects may include a single source or some combination of storage, natural flow, and groundwater. The Corps projects may also have irrigation storage space; however, Reclamation generally markets the irrigation space on behalf of the Corps. The Columbia Basin Project primarily includes: 1) storage and release of water from Lake Roosevelt, Banks Lake, and other re-regulation reservoirs;

⁹ H.D. 531 authorized Libby, Albeni Falls, John Day, The Dalles, and discusses what later became Dworshak Dam as a potential project in the comprehensive system. Bonneville was authorized in 1933; McNary, Ice Harbor, Lower Monumental, Little Goose, and Lower Granite were authorized in 1938, H.D. 704; Chief Joseph was authorized in 1946, H.D. 693; and Dworshak was authorized in 1962, H.D. 403.

Table 1-4. General Project Characteristics

Project	Operator	Location	Year Completed	Type	Authorized Purpose(s)
Libby	Corps	Kootenai near Libby, Montana	1973	Storage	Flood Control, Hydropower, Recreation, Fish and Wildlife
Hungry Horse	Reclamation	South Fork for the Flathead, near Hungry Horse, Montana	1953	Storage	Flood control, Hydropower, Irrigation, Navigation, Recreation, Fish and Wildlife
Albeni Falls	Corps	Pend Oreille, near Newport, Washington	1955	Storage	Flood control, Hydropower, Navigation, Recreation, Fish and Wildlife
Grand Coulee	Reclamation	Columbia, at Grand Coulee, Washington	1942	Storage	Flood control, Hydropower, Irrigation, Navigation, Recreation, Fish and Wildlife
Chief Joseph	Corps	Mid-Columbia, near Bridgeport, Washington	1961	Run-of-River	Hydropower, Flood Control, Navigation, Recreation, Fish and Wildlife, Emergency Preparedness
Dworshak	Corps	North Fork of the Clearwater, near Orofino, Idaho	1973	Storage	Flood control, Hydropower, Navigation, Recreation, Fish and Wildlife
Lower Granite	Corps	Lower Snake, near Almota, Washington	1975	Run-of-River	Hydropower, Navigation, Recreation, Fish and Wildlife, Irrigation
Little Goose	Corps	Lower Snake, near Starbuck, Washington	1970	Run-of-River	Hydropower, Navigation, Recreation, Fish and Wildlife, Irrigation
Lower Monumental	Corps	Lower Snake, near Kahlotus, Washington	1970	Run-of-River	Hydropower, Navigation, Recreation, Fish and Wildlife, Irrigation
Ice Harbor	Corps	Lower Snake, near Pasco, Washington	1962	Run-of-River	Hydropower, Navigation, Recreation, Fish and Wildlife, Irrigation
McNary	Corps	Lower Columbia, near Umatilla, Oregon	1957	Run-of-River	Hydropower, Navigation, Recreation, Fish and Wildlife, Irrigation, and Environmental Protection
John Day	Corps	Lower Columbia, near Rufus, Oregon	1971	Run-of-River ^{1/}	Flood Control, Hydropower, Navigation, Recreation, Fish and Wildlife, Irrigation, and Environmental Protection
The Dalles	Corps	Lower Columbia, at The Dalles, Oregon	1960	Run-of-River	Hydropower, Navigation, Recreation, Fish and Wildlife, Irrigation, Environmental Protection
Bonneville	Corps	Lower Columbia, at Bonneville, Oregon	1938	Run-of-River	Hydropower, Navigation, Recreation, Fish and Wildlife, Irrigation, Environmental Protection

Notes:

^{1/} John Day has allocated flood control storage, but is operated in a manner similar to other run-of-river mainstem dams.

Source: Table 3-1 from BPA et al. 1995

2) diversion of water at the Grand Coulee pump/generating plant; 3) power generation at Grand Coulee; and 4) routine maintenance of project facilities. The major facilities of the Columbia Basin Project are Grand Coulee Dam and its impoundment, Lake Roosevelt, the powerplant complex, the pump/generating plant, Banks Lake, and Potholes Reservoir.

- **Hydropower Generation** – The Corps and Reclamation are authorized to generate electricity at the hydropower facilities. The Federal dams in the Pacific Northwest supply more than one-third of that region’s power. The power from the dams, as well as the power produced by certain other generating plants, is marketed and transmitted by BPA. BPA also constructs, operates, and maintains the transmission lines necessary to deliver the electricity.
- **Navigation** – The Corps is authorized to provide for navigation through the lower Columbia and Snake rivers. Four lower Columbia River projects and the lower Snake River projects were constructed with navigation locks to allow passage for boats and barges to transport products from the Pacific Ocean to inland ports as far upstream as Lewiston, Idaho. Reclamation’s Grand Coulee and Hungry Horse facilities are also authorized for navigation, and provide flows in support of this function.
- **Recreation** – The reservoirs and project lands provide recreational opportunities for boaters, anglers, swimmers, hunters, hikers, and campers throughout the year.
- **Fish and Wildlife** – The Corps and Reclamation operate and maintain project facilities to support the protection and conservation of fish and wildlife species both in the reservoirs as well as downstream. These project purposes are funded by BPA.
- **Water Supply and Quality** – The Corps and Reclamation operate the FCRPS to maintain water quality by releasing water in ways to meet downstream flow and temperature objectives. Municipal and industrial water supply is supported through operation of reservoir pools within authorized operating range.

Operation of the FCRPS is very complex, and requires extensive coordination to meet the multiple authorized purposes. Congress has mandated what purposes the FCRPS projects must meet and has authorized the Corps and Reclamation to meet certain non-discretionary functions and to determine how best to serve the needs of competing interests. The project uses are interdependent, and operating for one use can affect one or more of the other uses. For example, meeting optimal flows for adult spawning or juvenile rearing chum salmon can adversely affect storage for other purposes, such as flows for other salmon species or reservoir elevations desirable for irrigation, recreation, navigation, or power production.

Additionally, the Action Agencies operate the FCRPS in coordination with several public utility districts (on the middle Columbia River, the Snake River, and other tributaries), and coordinate the operation of three Canadian projects pursuant to the Columbia River Treaty between the United States and Canada.

The Action Agencies have chosen, as a matter of administrative convenience, to address several Actions within this single BA. In addition to O&M of the FCRPS (which includes O&M of the Columbia Basin Project), this consultation addresses the mainstem effects of other Reclamation projects (Table 1-5). Tributary effects of the operation of these projects are currently addressed, or will be addressed, in separate consultations. In addition, the effects of Reclamation’s Upper Snake River projects are undergoing a separate consultation.

Table 1-5. Project, Location, and Subbasin

Project	Location	Subbasin or Stream
Upper Columbia River (Upstream of Snake River Confluence)		
Hungry Horse	Western Montana, north of Flathead Lake	South Fork Flathead River
Columbia Basin	Central Washington	Columbia River
Chief Joseph Dam	North-central Washington	Columbia River
Okanogan	North-central Washington, near Okanogan	Okanogan River
Yakima	Central Washington, near Yakima	Yakima River
Lower Columbia (Downstream of Snake River Confluence)		
Umatilla	Northeast Oregon	Umatilla and Columbia rivers
Crooked River	Central Oregon, north of Bend	Crooked River
Deschutes	Central Oregon, north of Bend	Deschutes River
Wapinitia	North-central Oregon, south of The Dalles	Deschutes River
The Dalles	North-central Oregon, near The Dalles	Columbia River
Tualatin	Northwest Oregon, west of Portland	Tualatin River (Willamette River)

More details can be found in the Facilities O&M documents (see Appendix B.1 for additional details).

2. SUMMARY OF THE PROPOSED REASONABLE AND PRUDENT ALTERNATIVE

This chapter presents a summary of the objectives, strategies, and specific actions of the Action Agencies' Proposed Reasonable and Prudent Alternative (RPA). The first section, Adaptive Management, describes the action commitments; performance standards; planning and reporting; research, monitoring, and evaluation (RM&E); oversight; and contingencies for the Proposed RPA. These will be implemented over the term of the Biological Opinion (BiOp) (2007 through 2017). They are designed to provide an established process that will lead to recovery of the 13 anadromous salmonid Evolutionarily Significant Units (ESUs) or Distinct Population Segments (DPS - which is an equivalent term often used for steelhead) listed under the Endangered Species Act (ESA), while also providing the flexibility to make changes in response to uncertainties or changing conditions that are not currently anticipated.

Following Section 2.1 - Adaptive Management, this chapter of the Biological Assessment (BA) presents summaries of the objectives, strategies, and specific actions for the following resource areas that are directly interrelated with the operation and maintenance of the Federal Columbia River Power System (FCRPS) and the 13 ESUs:

- Section 2.2 - Hydropower
- Section 2.3 - Habitat (Tributary and Estuary)
- Section 2.4 - Hatcheries
- Section 2.5 - Harvest
- Section 2.6 - Predation Management
- Section 2.7 - Research, Monitoring, and Evaluation (RM&E)

Each resource area includes strategies (Figure 2-1) that will be implemented under the Proposed RPA. Underlying each of the strategies are the specific actions, as applicable, that the Action Agencies will pursue to meet the objectives for each resource area. Each of the following resource area-specific sections provides a graphic display of the strategies and actions that will be implemented for that resource area (as applicable). In addition, a summary table (Proposed Reasonable and Prudent Alternative Table) that itemizes the objectives, strategies, specific actions, implementation plans, annual progress reporting, and comprehensive evaluations for each resource area is provided in Section 2.8. Additional information is provided in Appendix B for each resource area.

2.1 ADAPTIVE MANAGEMENT

2.1.1 Introduction

Using the Collaboration Framework, the Action Agencies identified Biological Objectives, Recovery Strategies, and Actions for ESUs affected by the operation of the FCRPS – supported by specific commitments for hydro, habitat, hatcheries, predation management, and harvest. In the biological analyses of these commitments, the Action Agencies estimated benefits to fish species listed under the ESA and considered aggregated, cumulative effects on “gravel-to-gravel” lifecycle survival and recovery under the ESA. The Action Agencies evaluated multiple measures of survival and recovery, including extinction risk, productivity (recruits per spawner), abundance trend, population growth rate or lambda (λ) (the measure primarily used in the 2000 BiOp), and the Collaboration Framework gaps (allocation of long-term recovery responsibility by sector). This analysis is addressed in the referenced Comprehensive Analysis.



Figure 2-1. Proposed RPA Strategy Overview

The Action Agencies’ analysis is based on the best available scientific information. However, as with any analysis for a species with a complex lifecycle, there is uncertainty associated with this evaluation of survival, recovery, and biological benefits. These issues are described in more detail in the discussions of the biological analyses, climate change and ocean conditions, and latent mortality.

The Action Agencies' RPA incorporates an adaptive management structure of checks and balances similar to the 2000 BiOp, to ensure accountability for results in the face of uncertainty and risk. This section summarizes the Action Agencies' performance standards and targets, reporting and adaptive management approach, continued collaboration and oversight, and contingencies.

Accountability for Results

- **Action Commitments:** The Action Agencies' specific commitments, including funding, presented in the form of the Proposed RPA, provide the first means to gauge results.
- **Performance Targets and Standards:** Commitments to action are reinforced by performance targets (long-term goals) and performance standards (benchmarks for results). These will help track and gauge the effectiveness of our actions.
- **Planning and Reporting:** A key aspect of our accountability structure is implementation plans, reporting and check-ins. The Action Agencies will report annually on progress of implementation and performance results to inform and signal appropriate adaptations or adjustments to our actions, and provide cumulative check-ins at 5 and 8 years.
- **Research, Monitoring, and Evaluation (RM&E) and Adaptive Management:** Using a program of extensive and robust RM&E, the Action Agencies will assess compliance, effectiveness, and critical uncertainties. Adaptive management will be used to modify our actions and ensure that they continue to track performance expectations, based on the best available scientific information.
- **Oversight:** Continued collaboration and oversight of implementation by the sovereign parties is provided, including review of how listed fish are progressing toward recovery and “All-H” (i.e., Hydropower, Hatchery, Habitat, and Harvest) diagnosis of emerging issues.
- **Contingencies:** Consistent with the 2000 BiOp, the Action Agencies will provide specific and general contingencies in case more aggressive adaptive management changes are called for based on evaluation of our performance in years 5 and 8.

2.1.2 Performance-Based Framework

As in the 2000 and 2004 BiOps, performance targets and standards and RM&E remain central to the success of the Proposed RPA. Commitments to specific actions are reinforced by a performance-based framework that will help the Action Agencies track and gauge the effectiveness of specific actions, as well as inform adaptive management actions.

The Action Agencies have identified performance *measures* (metrics) that will be monitored and evaluated relative to performance *standards* (benchmarks) and performance *targets* (longer-term goals) to assess progress and inform adaptive management actions. Performance *standards* will be monitored frequently to ensure accountability and adherence to Proposed RPA with potential contingencies or other time-critical corrective actions. Performance *targets* will be evaluated over longer time periods as new information and learning is applied through analytical models to check for progress toward expected life stage survival improvements and trends in population performance. Performance targets will inform longer-term adaptive management decisions and prioritization of options across populations with different relative needs.

The Action Agencies will monitor two aspects of performance:

- *Programmatic* performance standards, tracked through project implementation and compliance monitoring, and

- *Biological and Environmental* performance standards or targets, tracked and evaluated through status monitoring, action effectiveness research, and critical uncertainty research in combination with existing and developing quantitative models.

Descriptions of biological/environmental performance standards and targets are outlined for adult abundance, hydropower, predation, habitat, and hatchery performance in the following sections.

Programmatic performance standards are also discussed below, but specific programmatic standards are, or will be, identified by the specific actions and associated projects committed to within the Proposed RPA and in subsequent 3-year Implementation Plans.

Reporting on achievement of performance standards and progress toward longer-term targets will take place annually and through two comprehensive evaluations in years 2012 and 2015. The proposed reporting structure includes changes made through monitoring and adaptive management, as well as clear signals if performance standards are not being met. If there is a failure to achieve performance standards, the Action Agencies commit to explore specific contingencies, in coordination with States and Tribes. These discussions will occur through the Regional Implementation Oversight Group (RIOG) described in Section 2.1.4.3.

- **Performance targets:** Performance goals for actions. These are generally the survival improvements from the lifecycle modeling, and will continue to be assessed using a modeling approach. The performance targets represent long-term goals, which are not necessarily achievable by this Proposed RPA/BiOp alone.
- **Performance standards:** Results or benchmarks for accountability for FCRPS actions. They may be biological, physical, programmatic, or a combination. This Proposed RPA establishes contingencies to address failure to meet performance standards.
- **Performance metrics or measures:** Units of measurement for assessing performance targets or performance standards.
- **All-H Reporting metrics:** Broad-level measurements that the Action Agencies may report, but which are not the exclusive performance responsibility of the FCRPS (e.g., adult trends).

2.1.2.1 Adult Abundance and Trends (All-H Reporting Metrics)

Adult abundance and trends reflect the most accessible currency in which to evaluate the progress in region-wide recovery efforts over multiple years. They give an indication of how both the naturally spawning and hatchery-based portions of a listed species are doing.

Adult trends are also indicators of variability in ocean survival conditions, which can significantly affect the numbers of adult anadromous fish over multiple years. Because adult trends are so critical to understanding the progress of listed fish toward recovery, the Action Agencies will regularly track and report available data on overall adult abundance and trends for the ESUs. Adult abundance and trends represent an overarching performance target, not just for the FCRPS, but also for the collective actions by all parties in the Columbia River Basin for the conservation and recovery of listed fish. Specifically, this overarching performance target is a positive trend in adult abundance.

Based on examination of adult abundance and trends, including NMFS' expected updates of ESU status in 2009 and 2014, the Action Agencies may determine that some ESUs and populations require greater or less immediate attention as implementation of the Proposed RPA is advanced, particularly related to more "local" mitigation such as habitat improvements and hatchery reforms. This approach makes best use of available resources for those ESUs in greatest need.

2.1.2.2 Hydrosystem Performance

The primary benchmark for assessing progress of FCRPS actions for conservation of ESA-listed fish is adult and juvenile survival through the hydrosystem. The Action Agencies have the greatest influence on this outcome, and it is less confounded by actions of others. Hydrosystem performance will be tracked and evaluated through adult reach survival and juvenile dam survival performance standards, and through a juvenile system survival performance target.

Adult Survival Standards

For adult fish, the Action Agencies have largely achieved or exceeded the performance standards identified in the 2000 BiOp (Ruff 2004). Because the Action Agencies do not expect the Proposed RPA to reduce adult upstream passage survival, they will continue that operation and monitor adult passage. The intent of this standard is to demonstrate that current high levels of adult survival are being maintained.

The performance standard for Snake River Chinook salmon ESUs (including Spring/Summer and Fall), will be based on PIT-tag detections at Bonneville and Lower Granite dams. Past estimates have yielded an upstream survival estimate of 90 percent for Snake River Spring Chinook salmon, 94 percent for Snake River Summer Chinook salmon and 92 percent for Snake River Fall Chinook salmon. The Action Agencies propose to use these as estimates as the standard. For the Upper Columbia Chinook salmon ESU, the standard would be measured from Bonneville Dam to McNary Dam and would be 92 percent. Adult performance standards are summarized by ESU in Table 2-1. A more detailed discussion and the methods for calculating adult performance are located in Attachment B.2.6-2.

Table 2-1. Adult Performance Standards

ESU	Adult Standard	Reach	Rationale
Snake River Spring Chinook Salmon	90%	Bonn. to Lower Granite	Longest migratory route
Snake River Summer Chinook Salmon	94%	Bonn. to Lower Granite	Longest migratory route
Upper Columbia Spring Chinook Salmon	92%	Bonn. to McNary	Longest migratory route
Snake River Fall Chinook Salmon	92%	Bonn. to Lower Granite	Longest migratory route
Willamette River Chinook Salmon	None	None	Low Encounter Rate
Lower Columbia River Chinook Salmon	None	None	Surrogate of upriver ESU
Snake River Steelhead	N/A	Bonn. to Lower Granite	Unaccounted harvest leads to uncertainty in calculations
Upper Columbia River Steelhead	N/A	Bonn. to McNary	Unaccounted harvest leads to uncertainty in calculations
Mid-Columbia River Steelhead	N/A	Variable	Unaccounted harvest leads to uncertainty in calculations
Lower Columbia River Steelhead	None	None	Upriver Steelhead ESU surrogate
Willamette River Steelhead	None	None	Low Encounter Rate
Snake River Sockeye Salmon	None	None	Uncertainty in data
Lower Columbia River Coho Salmon	None	None	Upriver Chinook ESU surrogate
Columbia River Chum Salmon	None	None	Low Encounter Rate

Juvenile Dam Passage Survival Standards

The Action Agencies propose specific performance standards of 96 percent average relative dam survival for spring migrating fish and 93 percent average relative dam survival for summer migrating fish, with averaging/tradeoffs allowed between dams. Any survival averaging or tradeoffs between dams may occur among the Snake River dams or among the lower Columbia River dams, but not between Snake and Columbia River dams. Definitions and methods for calculating juvenile performance are located in Attachment B.2.6-2.

One mechanism for adaptive management to improve performance, when necessary, will be the Configuration and Operation Plans (COP) that the Corps prepares to evaluate and develop hydrosystem project improvements. The Corps has prepared COPs to lead to improvements including surface passage (e.g., RSWs) and other dam passage improvements at each of the lower Columbia River and Snake River projects. A COP is being/has been developed for each dam in close coordination with the Region at the technical level. Each COP will recommend the ultimate configuration and operation for that project.

The COP considers alternatives and performance standards, and several other components as described in the *Draft Snake and Columbia River Surface Passage Strategy* prepared by the Corps in July 2005. Following installation of dam passage improvements, an evaluation will be conducted to determine the success of the action in meeting the performance standard. If the standard is not met, the Corps will update the COP coordinated through the Regional Forum to determine additional potential actions.

Juvenile System Survival Targets

In the biological analyses, the Action Agencies have assessed the expected juvenile system survival to the Bonneville tailrace under current conditions (2006 hydrosystem configuration and the operation plan that were identified in the 2004 BiOp) and under the prospective conditions of our proposed hydrosystem actions through 2017. The Action Agencies propose to use the relative improvement in direct system survival from the 2004 base level conditions to the 2017 Proposed RPA conditions, as the system survival performance targets. Further explanation is provided in Appendix B.2.6-2 and tables in Appendix B of the Comprehensive Analysis.

Achievement of Performance Standards

Once the Action Agencies meet adult survival and juvenile dam survival performance standards, they will move from detailed actions to maintenance of the performance standard, subject to regular monitoring to ensure continued performance. The choice of tools needed to maintain performance will be at the discretion of the Action Agencies. The juvenile system survival target is a longer-term goal that will be used to inform broader lifecycle improvement assessments

2.1.2.3 Predation Management Performance

Management of piscivorous and avian predation of juvenile salmonids is an effective means of increasing juvenile fish survival (Beamesderfer et al. 1996, Roby et al. 1998, NMFS 2000, Good et al. 2004). The Action Agencies will pursue focused measures that reduce predation mortality in the near and long term. These measures will be monitored annually for programmatic-level standards.

For both piscivorous and avian predation, estimates of juvenile fish survival improvements associated with the 2007 to 2017 Actions (3.1 percent for Chinook salmon, 4.4 percent for steelhead, and 1.7 percent for fall Chinook salmon) will serve as long-term performance targets. Additional performance metrics that will be reported and included into modeling assessments will include monitoring results on predator exploitation rates and changes in estimated annual predation rates. As described above for juvenile system survival measures, comprehensive evaluations using modeling will take into account any improvements in predation management over the 2004 BiOp baseline condition (i.e., current survival benefits associated with ongoing predation control).

Research and monitoring results on predation will continue to be incorporated into these juvenile survival analyses and used to evaluate progress and achievement of expected survival improvements from predation actions.

2.1.2.4 Tributary and Estuary Habitat Performance

For the Tributary and Estuary Habitat Actions, the Action Agencies estimated survival and productivity benefits using methods developed and discussed in the Habitat and Estuary Workgroups. This approach, although not as precise as preferred, applies the best available scientific information to estimate benefits from habitat actions. The performance targets and standards derive from this approach.

Tributary Habitat

Benefits for Tributary Habitat Actions were estimated for individual populations and also were used in the biological analyses for the FCRPS BA. These estimated benefits, in the form of changes in habitat quality linked to limiting factors, provide the performance targets to be achieved by 2017 for individual populations. Performance standards will be initially based on annual progress reports of specific habitat projects that were identified for 2007 to 2009 implementation. Subsequent performance standards will be based on specific projects and actions identified in 3-year cycles from 2010 to 2017. Those projects will be selected from the menu of actions compiled in the Remand Collaboration Process in coordination with Council and recovery planning processes. Performance metrics such as cubic feet per second of streamflow improvement, miles of access restored to spawning and rearing habitat, diversions screened, acres of riparian habitat protected or enhanced, and miles of channel complexity improvement will be compiled and reported on an annual basis.

RM&E will be used to confirm and improve the understanding of the relationships among different habitat actions, environmental improvements, and survival and productivity improvements. As this information is developed, it will be considered in the selection and the priorities of projects for 2010 to 2017 to meet the habitat quality improvement targets.

Estuary Habitat

Biological benefits for Estuary Habitat Actions that will be implemented by the Action Agencies from 2007 to 2017 have been estimated for ESUs depending on life history and use of the estuary, and applied within the biological analysis in the FCRPS BA. Estimates are 5.7 percent for stream-type fish and 1.9 percent and 5 percent for ocean-type fish. These estimates have been based on a review of the menu of potential recovery actions developed in the Remand Collaboration Process, consideration of which projects might be feasible and estimated improvement of habitat functions linked to key limiting factors, developed in coordination with local biological input. The estimated improvements in habitat function based on Estuary Habitat Actions provide the long-term biological performance targets for estuary habitat.

Programmatic performance will be assessed by monitoring implementation of the specific projects identified to meet the habitat function targets on a 3-year cycle. Standard habitat performance measures such as acres of habitat restored will also be compiled on a rolling basis.

RM&E will be used to confirm and improve the understanding of the relationships between different estuary habitat actions, the environment, and the survival and productivity performance measures. As this information is developed, it will be considered in the selection and the priorities of projects for 2010 to 2017 to meet the habitat quality targets.

2.1.2.5 Hatchery Performance Standards

The Action Agencies have developed Hatchery Actions that are expected to reduce extinction risk and increase abundance and productivity of several ESUs. The Hatchery Actions identify targeted populations and factors to be improved. Programmatic performance standards will be used, based on Action Agency commitments and implementation plans, to track implementation.

Although ongoing hatchery RM&E has targeted many of the research needs described in the Hatchery Action, existing information remains insufficient to quantitatively estimate the effects of many of the actions proposed in the Hatchery Action, a view confirmed by the Hatchery/Harvest Workgroup. The expected benefits of the Action were qualitatively assigned as high, medium, or low value. These benefits represent the performance targets for adaptive management. Hatchery Action effectiveness research will be used to help confirm and update the qualitative expectations of these benefits as new information becomes available.

These benefits (performance targets) are relative to the following objectives of the Hatchery Actions:

- Safety-net programs reduce extinction risk for target populations in Snake River Sockeye Salmon, Snake River Spring/Summer Chinook Salmon, Mid-Columbia River Steelhead, Lower Columbia River Steelhead, and Columbia River Chum Salmon ESUs.
- Conservation hatchery programs increase abundance of target populations in Snake River Spring/Summer Chinook Salmon, Snake River Fall Chinook Salmon, and Upper Columbia River Steelhead ESUs, thereby reducing the time to recovery.
- High-priority hatchery reform actions (i.e., those needed to address hatchery programs that are considered major limiting factors by NMFS), result in improved abundance, productivity, diversity, and/or spatial structure of target populations.
- Future implementation of additional hatchery reforms identified through Columbia River Hatchery Scientific Review Group's hatchery review process, combined with use of best management practices (BMPs) at FCRPS hatchery facilities, improve abundance, productivity, diversity, and/or spatial structure of target populations, depending on the nature of the reform.
- Hatchery effectiveness monitoring and research will be used in the 2012 and 2015 comprehensive evaluations to test and update the expectations of these benefits and gauge the progress. As BMPs are adopted for specific hatchery programs, these will provide additional performance measures that Action Agencies will track and report.

2.1.2.6 Summary of Performance Targets and Standards

Table 2-2 provides a summary of performance targets, standards, monitoring, and reporting under the performance-based framework.

2.1.2.7 The Role of Cost Effectiveness

Comprehensive performance management is critical to success in achieving ESA goals, but cost-effectiveness is also a consideration. Consistent with the approach described in the Northwest Power Act, clearly defined performance standards and biological objectives should be met through cost-effective alternatives, so that fish receive the greatest benefits possible for the region's financial investment.

The Action Agencies will use the adaptive management framework to achieve performance standards in a cost-effective manner and may seek changes or propose alternative implementation options if they will achieve equal or better survival improvements at lower cost. The Action Agencies will continue to engage in regional discussions of any potential or proposed cost effectiveness initiatives.

Table 2-2. Outline of Performance Tracking and Reporting

Performance Targets	Performance Standards	Monitoring	Reporting
Fish Population Metrics			
Positive trends in abundance		Context for prioritization of actions and adaptive management needs	Comprehensive Evaluations [using NMFS Biological Review Team (BRT) Status Report]
Hydrosystem			
Percent system survival – by ESU or DPS		Juvenile Passage RM&E and System Survival Modeling	Comprehensive Evaluations
	Hydrosystem Action Programmatic Standards	Project Implementation and Compliance Monitoring	Annual Progress Reports and Comprehensive Evaluations
	Juvenile Dam Survival Standards (96 percent average for spring migrants and 93 percent average for summer migrants)	Juvenile Passage Monitoring and Dam Survival Modeling	Comprehensive Evaluations
Flow, gas, and temperature levels (adjusted to reflect annual and seasonal water conditions)	Juvenile and Adult Hydrosystem Environmental and Physical Configuration Standards	Environmental Monitoring at Mainstem Dams	TMT Annual Water Management Plan Reports
	Adult Hydrosystem Survival (no significant change from current average survival levels)	Adult System Survival Monitoring	Annual Progress Reports and Comprehensive Evaluations
Tributary Habitat			
Percent habitat quality improvement – by population for actions implemented from 2007 through 2017		Intensively Monitored Watersheds, Status Monitoring, and Project-Level Monitoring informs and updates modeling	Comprehensive Evaluations
	Tributary Habitat Action Programmatic Standards (3-year cycle)	Project Implementation and Compliance Monitoring	Annual Progress Reports and Comprehensive Evaluations
Estuary Habitat			
Percent function improvements for Stream Type and Ocean Type ESUs for actions through 2007 and through 2017		Status Monitoring and Project-Level Monitoring informs and updates modeling	Comprehensive Evaluations
	Estuary Habitat Action Programmatic Standards	Project Implementation and Compliance Modeling	Annual Progress Reports and Comprehensive Evaluations
Hatchery			
Low, Medium or High benefits relative to objectives – by target populating		Status Monitoring and Project-Level Monitoring and updates Lifecycle Modeling	Comprehensive Evaluations
	Hatchery Action Programmatic Standards; site-specific BMPs	Project Implementation and Compliance Monitoring	Annual Progress Reports and Comprehensive Evaluations

Table 2-2. Outline of Performance Tracking and Reporting (continued)

Performance Targets	Performance Standards	Monitoring	Reporting
Predation			
Percent survival increase for spring and for summer migrants		Predation Action Effectiveness Research and Status Monitoring	Comprehensive Evaluations
		Predation Exploitation rates	Comprehensive Evaluations
	Predation Action Programmatic Standards	Project Implementation and Compliance Monitoring	Annual Progress Reports and Comprehensive Evaluations

2.1.3 Planning and Reporting

The Action Agencies will provide a transparent and regular examination of their performance under the new FCRPS BiOp through implementation and progress reporting, using the milestones identified in Table 2-3.

Table 2-3. Overview of Planning and Reporting Milestones

Year	Implementation Plans	Comprehensive Evaluations	Annual Reports
2009	Dec. 2009 Plan for 2010-2012		Sept. 2009 Report on Jan. 2008-Dec. 2008
2010	-	-	Sept. 2010 Report on Jan. 2009-Dec. 2009
2011	-	-	Sept. 2011 Report on Jan. 2010-Dec. 2010
2012	Dec. 2012 Plan for 2013-2015	June 2012 Report on info. thru Dec. 2011	-
2013	-	-	Sept. 2013 Report on Jan. 2012-Dec. 2012
2014	-	-	Sept. 2014 Report on Jan. 2013-Dec. 2013
2015	Dec. 2015 Plan for 2016-2018	June 2015 Report on info. Thru Dec. 2014	-
2016	-	-	Sept. 2016 Report on Jan. 2015-Dec. 2015
2017	-	-	Sept. 2017 Report on Jan. 2016-Dec. 2016

2.1.3.1 Implementation Plans

Adaptive Management Action 1- Implementation Plans

The Corps, BPA, and Reclamation will submit to NMFS Action Implementation Plans by the end of December 2009, December 2012, and December 2015 that detail commitments to implement RPA actions during the subsequent 2-3 years. Specifically, the Action Implementation Plans will describe the tributary and estuary habitat actions that will be funded during the 2010 to 2012, 2013 to 2015, and 2016 to 2017 periods. The Action Implementation Plans will also detail any changes in Proposed RPA Actions for hydro, predation management, hatchery, or RM&E from the actions described in the BA for each time period. This information will assist NMFS in determining if the Proposed RPA is being implemented as identified in this BA or, conversely, if re-initiation triggers defined in 50 CFR 402.16 have been exceeded.

For the Proposed RPA, the Action Agencies have identified specific details for the first 3 years of the BiOp term (2007 to 2009). This specific information represents the initial 3-year implementation plan for the new BiOp. BPA will maintain a BiOp database to provide project- and action-level detail for planning and reporting purposes. This information will be updated and summarized in subsequent 3-year implementation plans to be submitted to NMFS in December 2009 for Fiscal Year (FY) 2010 to 2012 (i.e. October 2010 to September 2012), December 2012 for FY 2013 to 2015, and December 2015 for FY 2016 to 2017 during the life of the BiOp. The December submittal will allow for regional discussion of the results of the comprehensive evaluations provided in June of that year.

The Action Agencies will coordinate implementation plan with other appropriate regional processes. This includes coordination related to statutory provisions for the Federal government [BPA/Northwest Power and Conservation Council (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), Pacific Northwest Aquatic Monitoring Partnership (PNAMP), Northwest Environmental Data (NED) network, and others]. The collaboration described in the Oversight section (see Section 2.1.4.3) is intended to support continued interaction among the sovereigns regarding the effectiveness of the Proposed RPA and the need to alter or adjust actions in response to documented successes or failures.

2.1.3.2 Annual Progress Reporting

Adaptive Management Action 2- Annual Progress Reports

The Corps, BPA, and Reclamation will submit to NMFS Annual Progress Reports in September of all years except 2012, and 2015. The reports will cover operations for the previous calendar year. These Annual RPA 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 RPA Actions through December 2008. In addition to RPA Action implementation status, the Annual RPA Progress Reports will describe the status of physical or biological metrics monitoring (as described in the RM&E). This information will assist NMFS in determining if the RPA is being implemented as anticipated in this BA or, conversely, if re-initiation triggers defined in 50 CFR 402.16 have been exceeded.

As noted previously, the Action Agencies will monitor implementation and compliance, or programmatic performance, for all of the identified action commitments in the Proposed RPA and as further defined by Implementation Plans in 2009, 2012, and 2015. In addition, the Action Agencies will track biological and environmental performance metrics such as juvenile and adult hydrosystem passage through monitoring and annual reports of hydrosystem survival conditions, and performance metrics for non-hydrosystem actions. Finally, to provide context for the performance in aggregate with others' actions, the Action Agencies will report on adult abundance for listed ESUs using available information. The results of the progress reports will inform adjustments in future year actions through adaptive management.

The Action Agencies will prepare annual progress reports and provide them to the RIOG. The annual reports will document progress on specific performance standards. For example, some types of actions specify anticipated dates for implementation (e.g., for installation of RSWs). The Action Agencies consider project milestones as benchmarks for implementation. Annual reports will identify the status of achievement of these benchmarks.

The Annual Progress Reports will describe the progress on implementation of all of the Actions in the Proposed RPA, the status and results of the RM&E on juvenile and adult survival improvements, and adjustments made on specific actions through the Regional Forum within the reporting year. The Annual

Progress Reports are not intended to assess the overall re-assessment of the Proposed RPA to compare with the estimated survival improvements included in the Comprehensive Analysis. This overall analysis is addressed in the following Comprehensive Evaluations.

2.1.3.3 Comprehensive Evaluations

Adaptive Management Action 3- Comprehensive RPA Evaluations

The Corps, BPA, and Reclamation will submit to NMFS Comprehensive Evaluations of multi-year implementation activities by the end of June 2012, and June 2015. The Comprehensive Evaluations will 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 the BA or modified in the Implementation Plans in 2009, 2012, and 2015. The Comprehensive Evaluations will also describe the status of the physical and biological factors identified in this BA, and compare these with the expectations in the survival improvements identified in the Comprehensive Analysis. The Comprehensive Evaluation will include a discussion of 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 BA. This information will assist NMFS in determining if the RPA is being implemented as anticipated in this BA or, conversely, if re-initiation triggers defined in 50 CFR 402.16 have been exceeded.

Comprehensive Evaluations are a tool to ensure that the Action Agencies and regional parties step back and take a comprehensive and cumulative check on implementation of FCRPS actions. This allows the opportunity to both build on successes and make mid-course corrections where necessary. Comprehensive Evaluations are also a juncture to examine the broader context of recovery, looking at the status of listed fish, actions by others across the salmon lifecycle, and environmental or other changes.

The Action Agencies will prepare Comprehensive Evaluations in 2012 and 2015. The evaluations will include a cumulative review of both progress in implementation and updated information on ESU status and trends by the NMFS BRT (now scheduled for 2009 and 2012).

The evaluations will describe progress on programmatic (compliance) standards to determine whether the cumulative implemented actions remain consistent with the objectives identified for the new BiOp and an assessment of progress toward biological/environmental performance standards and targets.

Regarding programmatic standards, the evaluations will summarize the cumulative accomplishments; and propose corrective actions where the Proposed RPA may be off track programmatically.

Regarding biological performance standards and targets, progress toward the performance standards and targets for hydro, habitat, hatcheries and predation management will be reported on in the Comprehensive Evaluations, and used to inform adaptive management decisions. This report will also address any significant new information from RM&E results.

The results of the evaluations will be used to guide adaptive management of the Proposed RPA and to ensure that Action Agencies are making adequate progress on achieving the strategies and performance standards, as well as to inform the 2012 to 2015 implementation plan. If it is determined that course changes are necessary in order to achieve expected performance, the Action Agencies will discuss those changes with NMFS and the Collaboration parties prior to implementation.

Coordination with the RIOG in connection with the Comprehensive Evaluations will include consideration of adaptive management and contingencies (described in more detail below). The RIOG

may utilize a diagnostic performance framework described in Figure 2-2 to assess FCRPS and broader regional progress for listed fish.

2.1.3.4 Reporting Clear Signals for Adaptive Management

As part of the 2012 and 2015 Comprehensive Evaluations, the Action Agencies will use the following Green-Yellow-Red signals to gauge their success, challenges, and failures:

Green—Standard Met or Exceeded: If performance tracking shows that compliance or performance standards for a particular strategy have been met, the strategy will be maintained. If performance tracking shows that compliance or anticipated performance standards for a particular strategy has been exceeded, the strategies may also be adjusted.

Yellow—Obstacles or Delays in Meeting Standards: If performance tracking shows that issues are hindering or delaying achievement of performance standards, modifications of approach or schedule may be necessary to get back on track.

Red—Compliance/Standard Not Met: If performance tracking shows a failure to achieve compliance or performance standards for a particular strategy, a response will be necessary. This response may involve modification of the specific strategy not meeting expectations, or implementation of other cost-effective strategies. Depending on degree, more aggressive contingencies might be pursued. In the alternative, re-consultation might be necessary.

Red and yellow signals will be discussed with the RIOG.

2.1.4 Contingencies

Contingencies are alternative actions, plans, or approaches for addressing failure to meet performance standards, in other words a “Red” signal as described above.

2.1.4.1 Specific Contingencies

The Action Agencies have committed to explore specific contingencies they have been able to identify through coordination with States and Tribes, in advance of knowing whether they will actually need to be deployed:

- For dam modifications, COPs include specific Phase 2 actions to be pursued in the event initial actions do not achieve performance standards for juvenile dam passage (see Appendix B.2.1).
- For Snake River Sockeye Salmon safety-net production, the Action Agencies are investigating alternatives to the current expansion program, including lower river production and Wallowa Lake production, in the event that the expansion effort is not successful.
- For tributary and estuary habitat, the failure of an individual project to be implemented would lead to a replacement project of equal or greater biological value being implemented.

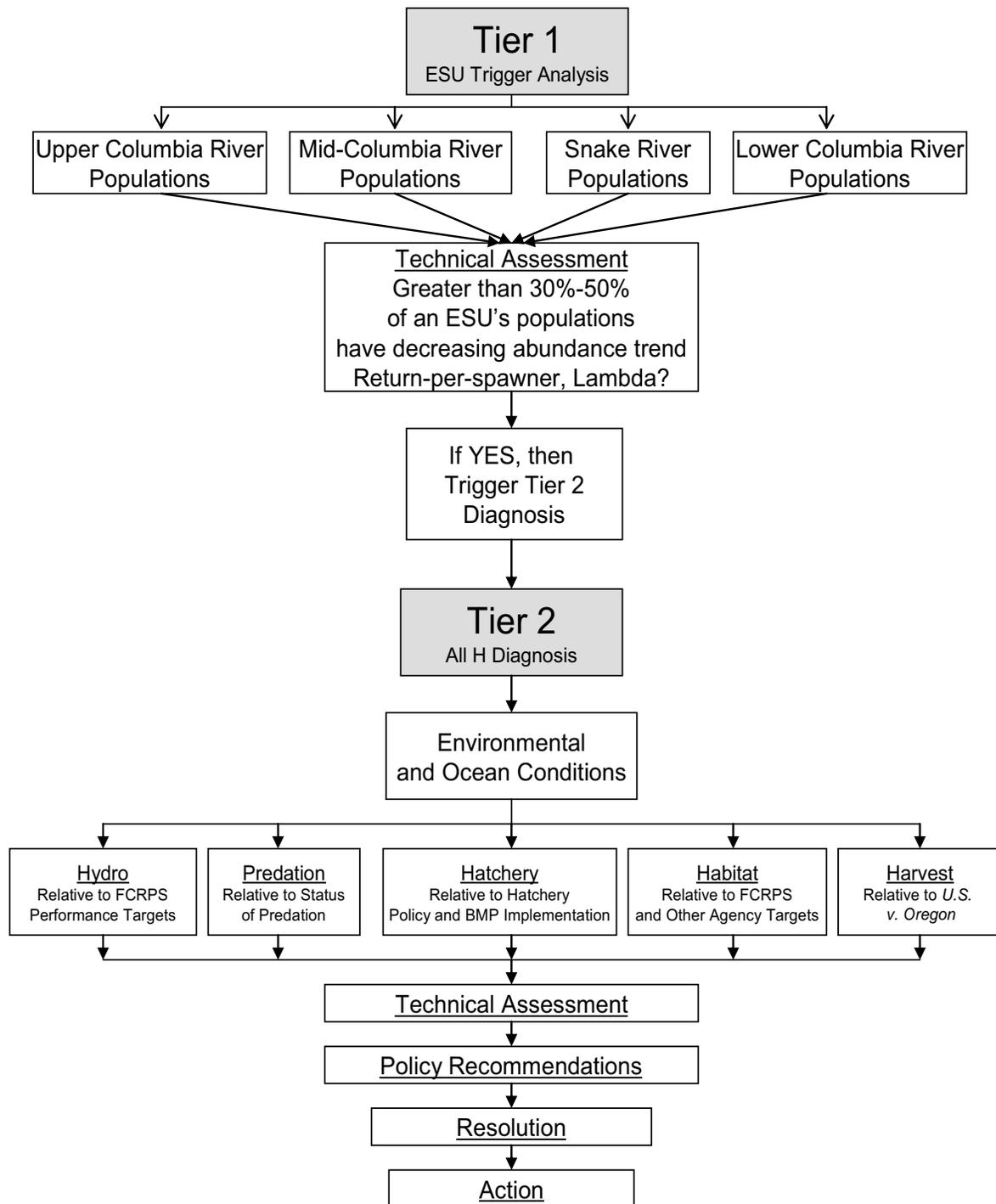


Figure 2-2. Performance Diagnosis Framework

2.1.4.2 Other Contingencies

The Action Agencies acknowledge the need to consider other contingencies in the event that actions under this new BiOp do not prove successful, even after adaptive management. As a result, the Action Agencies commit to the following approach in coordination with States and Tribes:

- In the course of the 2012 and the 2015 Comprehensive Evaluations, the Action Agencies will include the All-H diagnosis described in Figure 2-2.
- Tier 1 of this approach includes consideration of the status of abundance, trends, and productivity of the ESUs. Tier 2 includes consideration of whether the actions of the FCRPS are on track to meet All-H specific performance targets by 2017, as well as progress through broader regional actions.

Contingencies under this section may be advisable if ESA-listed fish are not making expected progress toward recovery goals and the All-H diagnosis confirms that the FCRPS is a significant factor.

Based on this review, the Action Agencies will coordinate with States and Tribes using the RIOG process to identify, evaluate, and develop proposed schedules for contingent actions to be implemented after 2017. Contingent actions will:

- Address the appropriate limiting factors identified in the All-H diagnostic analysis with a high likelihood of enhancing fish survival;
- Consider both biological effectiveness and cost effectiveness; and
- Ensure the RIOG consideration is guided by the All-H diagnosis process presented in Figure 2-2.

Once contingencies are identified, the Action Agencies will evaluate them for biological, economic, technical, and institutional feasibility. If feasible, the Action Agencies will proceed with pre-planning, design, and funding/authorization as appropriate, so that the actions can be implemented on schedule.

2.1.4.3 Collaboration and Oversight of Implementation

The Federal agencies, States, and Tribes would like to continue to collaborate and oversee implementation of recovery actions across the salmon and steelhead lifecycle. Acknowledging the value gained from the Remand Collaboration Policy Work Group, the Action Agencies will support a RIOG to oversee the implementation of the FCRPS BiOp, in aggregate with the conservation and recovery actions of others.

Like the Policy Work Group, the Action Agencies recommend that the RIOG consist of senior policy representatives, representing Federal, State, and Tribal sovereigns, appointed by:

- Federal executives to represent the following Federal agencies: NMFS, BPA, Reclamation, the Corps, and the U.S. Fish and Wildlife Service (USFWS);
- The Governors representing the States of Montana, Idaho, Washington, and Oregon; and
- Tribal governments appointed by Tribal councils.

A memorandum of agreement (MOA) to memorialize the RIOG would be desirable to provide operating principles and protocols. The RIOG may form subcommittees to oversee the hydrosystem and predation management, estuary and tributary habitat, hatchery, harvest, and RM&E.

Responsibilities of the RIOG would include:

- Review implementation of FCRPS ESA actions and results;
- Review implementation of lifecycle recovery actions by others, including States and Tribes;
- Discuss and attempt to resolve salmon and steelhead issues in ways that minimize or result in no adverse impact on other Columbia River Basin fish and wildlife;
- Clarify, address, and narrow policy issues and differences relating to implementation;
- Promote coordinated funding and partnerships;
- Emphasize “on-the ground” actions that meet or exceed legal requirements and provide accountability for results in a biologically effective and cost-efficient manner;
- Coordinate regarding the annual and comprehensive progress reports prepared by the Action Agencies, including adaptive management decisions and consideration of contingencies;
- Hold an annual meeting to review how well actions by the FCRPS and others have been implemented and the success in meeting the appropriate performance standards; and
- Coordinate implementation and oversight of the Proposed RPA with other regional processes [e.g., Council; Regional Forum; *U.S. v. Oregon*; NMFS recovery process] to minimize duplication and promote efficiencies).

In year 10 (2017), the RIOG will consider the effectiveness of the BiOp. It will also consider whether a new RPA is desirable, or whether an extension of the current Proposed RPA/BiOp would be appropriate, taking into account that biological benefits of FCRPS actions from 2007 to 2017 will continue to be expressed in adult returns and other measures in the next decade.

2.2 HYDROPOWER ACTION SUMMARY

Hydropower Action Objective for All ESUs:

Improve juvenile and adult fish survival as they pass through the hydrosystem.

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

- Hydropower Strategy 1—Operate the FCRPS to more closely approximate the shape of the natural hydrograph and to enhance flows and water quality to improve juvenile and adult fish survival
- Hydropower Strategy 2—Modify Columbia and Snake River dams to maximize juvenile and adult fish survival
- Hydropower Strategy 3—Implement spill and juvenile transportation improvements at Columbia River and Snake River dams
- Hydropower Strategy 4— Operate and maintain facilities at Corps mainstem projects to maintain biological performance

Each strategy consists of one or more substrategies, which, in turn, consist of one or more specific actions. These are summarized in the following sections. A conceptual overview of the overall

Hydropower Action is presented in Figure 2-3. Additional discussion of the Hydropower Action is provided in Appendix B, Section B.2.1.

2.2.1 Hydropower Strategy 1—Operate the FCRPS to More Closely Approximate the Shape of the Natural Hydrograph to Enhance Flows and Water Quality to Improve Juvenile and Adult Fish Survival

Hydropower Strategy 1: Operate the FCRPS to more closely approximate the shape of the natural hydrograph to enhance flows and water quality to improve juvenile and adult fish survival.

Performance Goals: Flow objectives and estimated fish system survivals under a range of water conditions.

Performance Standards: Specific operating commitments for individual reservoirs and stored water; preparation of annual Water Management Plan (WMP).

Funding Source(s): Corps and Reclamation Congressional appropriations for O&M and BPA direct funding.

Rationale: Passage through the hydrosystem is a limiting factor for all upriver listed fish, and also affects the lifecycle of lower river fish. Water is managed to assist juvenile and adult fish survival, although there is limited storage in the Columbia River Basin compared to other large watersheds.

What's New: Better defined operating commitments for water management; inclusion of the Montana operation for listed resident fish; commitments regarding Canadian storage priorities, negotiation, and coordination; inclusion of reporting velocity equivalents for flow levels; clarifications of what occurs in fish emergencies; inclusion of a dry water year provision; coordination of forecasting.

Hydropower Action 1— 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. Specific operations for each storage project are identified in Table 2-4 below. These storage project operations will be included in the annual WMP. These projects are operated for multiple purposes including fish and wildlife, flood control, irrigation, power, recreation, and navigation. Table 2-4 primarily identifies operations that are designed to benefit flow management specifically for listed species. For more detail on operation of storage projects for other purposes see Appendix B.1.

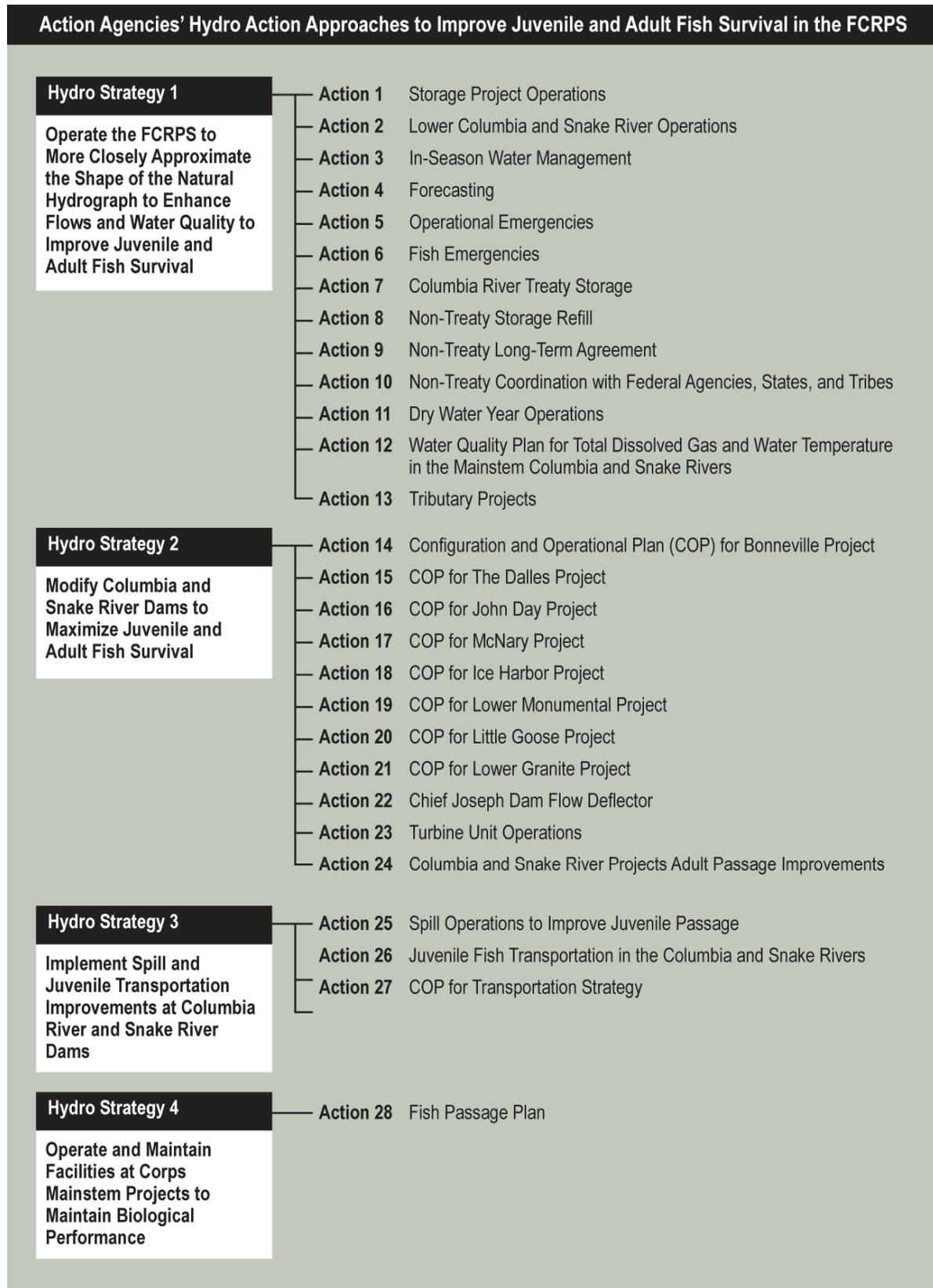


Figure 2-3. Action to Improve Juvenile and Adult Fish Survival as They Pass through the Hydrosystem

Table 2-4. Storage Project Operations to be Included in the Annual WMP

Storage Project	Operation
Dworshak	<ul style="list-style-type: none"> Operate to standard flood control criteria; shift system flood control to Grand Coulee in below average water years, when possible. When not operating to minimum flows, operate to reaching the upper flood control rule curve on or about April 10 (the exact date to be determined during in-season management) to increase flows for spring flow management. Provide minimum flows while not exceeding Idaho State Total Dissolved Gas (TDG) water quality standard of 110 percent. Refill by about June 30. Draft to elevation 1535 feet by the end of August and elevation 1520 feet (80 feet from full) by the end of September unless modified per the Agreement between the United States and the Nez Perce Tribe for water use in the Dworshak Reservoir. Regulate outflow temperatures to attempt to maintain water temperatures at Lower Granite tailwater at or below the water quality standard of 68° F. Maximum project discharge for salmon flow augmentation to be within state of Idaho TDG water quality standards of 110 percent.
Libby	<ul style="list-style-type: none"> Follow VARQ^{1/} (variable outflow) flood control procedures. Follow variable December 31 flood control draft based on early season water supply forecast. Operate consistent with the Columbia River Treaty, and the International Joint Commission and the 1938 Order on Kootenay Lake. When not operating to minimum flows, operate to achieve 75 percent chance of reaching the upper flood control rule curve on or about April 10 (the exact date to be determined during in-season management) to increase flows for spring flow management. Operate to provide tiered white sturgeon augmentation volumes to achieve habitat attributes for sturgeon spawning/recruitment consistent with the 2006 USFWS BiOp in May, June and July; shaped in coordination with Regional Forum TMT. To provide for summer flow augmentation, refill by early July (exact date to be determined in-season), determined by available water supply and shape and spring flow operations, while also avoiding involuntary spill and meeting flood control objectives. Provide even or gradually declining flows following sturgeon flows during the summer months (minimize double peak) as determined through TMT in-season management. Experimental draft to 10 feet from full by the end of September (except in lowest 20th percentile water years, as measured at The Dalles, when draft will increase to 20 feet from full by end of September). If project fails to refill to draft limit, release inflows or operate to meet minimum flows. Rationale for the experimental draft was adopted by the Council and further details of the evaluation follow in this section of the BA. Meet minimum flow requirements for bull trout from May 15 to September 30 as described in the USFWS 2006 Libby BiOp and 4,000 cubic feet per second (cfs) in October through April for resident fish. Limit spill to avoid exceeding Montana State TDG standard of 110 percent, when possible, and in a manner consistent with the Action Agencies' responsibilities for ESA-listed resident fish. Limit outflow fluctuations by operating to ramping rates set in the 2006 USFWS BiOp to avoid stranding bull trout.

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

Table 2-4. Storage Project Operations to be Included in the Annual WMP (continued)

Storage Project	Operation
Grand Coulee	<ul style="list-style-type: none"> • Use standard flood control criteria including adjustments for flood control shifts from Dworshak and Brownlee. • Operate to achieve 85 percent probability of reaching upper rule curve (URC) elevation by about April 10. • Refill by about June 30 each year (exact date to be determined during in-season management). • Take advantage of reservoir draft for flood control during high water years to perform drum gate maintenance. Drum gate maintenance may be deferred in some dry water years; however, drum gate maintenance must occur at a minimum one time in a 3-year period, two times in a 5-year period, and three times in a 7-year period. • Draft to meet salmon flow objectives during July-August with variable draft limit of 1278 to 1280 feet by August 31 based on the water supply forecast. Future evaluation of this element may be accomplished as discussed in this BA. • Reduce pumping into Banks Lake and allow Banks Lake to operate up to 5 feet from full pool (elevation 1565) during August to help meet salmon flow objectives when needed. • If the Lake Roosevelt drawdown component of Washington’s Columbia River Water Management Program (CRWMP) is implemented, it will not reduce flows during the juvenile salmon flow objective period (April to August). The metric for this is that Lake Roosevelt will be drafted by an additional 1.0 foot in non-drought years and by about 1.8 feet in drought^{2/} years by the end of August. A third of this water will go to in-stream flows. A more detailed description of this element is provided in this section of the FCRPS BA.^{3/} • May be used to help meet tailwater elevations below Bonneville Dam to support chum spawning and incubation. • Operate to help meet Priest Rapids flow objective to support fall Chinook salmon spawning and incubation. • Operate to minimize TDG production.
Hungry Horse	<ul style="list-style-type: none"> • Follow VARQ flood control procedures.^{4/} • Maintain minimum flows all year for bull trout with a sliding scale based on the forecast. Operate to meet minimum flows of 3,200 to 3,500 cfs at Columbia Falls on the mainstem Flathead River and 400 to 900 cfs in the South Fork Flathead River. • When not operating to minimum flows, operate to achieve 75 percent probability of reaching URC elevation by about April 10. • Refill by about June 30 each year (exact date to be determined during in-season management). • Experimental draft during July-September to a draft limit of 3550 feet (10 feet from full) by September 30, except in the driest 20 percentile of water conditions limit draft to 3540 feet (20 feet from full) when needed to meet lower Columbia flow augmentation objectives. If don’t refill to the draft limit pass inflows or operate to meet minimum flows. Rationale for the experimental draft was adopted by the Council and further details of the evaluation are provided in the BA.

^{2/} The definition of drought year in this case is when the March 1 water supply forecast for the April through September period at The Dalles is less than 60 MAF.

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

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

Table 2-4. Storage Project Operations to be Included in the Annual WMP (continued)

Storage Project	Operation
Hungry Horse (continued)	<ul style="list-style-type: none"> • Provide even or gradually-declining flows during summer months (minimize double peak). • Limit spill to maximum of 15 percent of outflow to avoid exceeding Montana State TDG standards of 110 percent to the extent possible. • Limit outflow fluctuations by operating to ramping rates set in 2006 USFWS BiOp to avoid stranding bull trout.
Albeni Falls	<ul style="list-style-type: none"> • Operate to standard flood control criteria. • Operate to provide Lake Pend Oreille shoreline spawning conditions for kokanee (winter pool levels of 2055 feet or 2051 feet elevation) determined through interagency coordination per USFWS BiOp of 2000. • Interagency coordination of winter pool levels for kokanee in consideration of spawning and incubation needs for lower Columbia River chum salmon.

Hydropower Action 2— Lower Columbia and Snake River Operations

The Action Agencies will operate the FCRPS run-of-river mainstem lower Columbia River and Snake River projects (Bonneville, The Dalles, John Day, McNary, Ice Harbor, Lower Monumental, Little Goose and Lower Granite projects) to minimize water travel time through the lower Columbia and Snake rivers to aid in juvenile fish passage as defined below. These projects are operated for multiple purposes including fish and wildlife, irrigation, navigation, power, recreation, and limited flood control. The following description primarily identifies operations that are designed to benefit listed anadromous species.

- Lower Snake River projects (Ice Harbor, Lower Monumental, Little Goose and Lower Granite projects) will be operated at minimum operating pool (MOP) with a 1-foot operating range from April 3 until small numbers of juvenile migrants are present (approximately September 1) unless adjusted to meet authorized project purposes, primarily navigation. Lower Granite reservoir may be raised as needed after September 1, in order to operate the adult fish holding facilities to support brood stock collection.
- Except for the John Day Project, the Lower Columbia River projects (Bonneville, The Dalles, and McNary) will be operated at normal operating range for each project. John Day Reservoir will be operated at the lowest elevation (elevation 262.5 to 264.0) (with a 1.5-foot operating range) that continues to allow irrigation withdrawals from April 10 through September 30. Slight deviations from these levels, based on navigation needs, load following, and operational sensitivity, may be required on occasion.
- These run-of-river operations will be included in the annual WMP.

Hydropower Action 3—In-Season Water Management

Prioritization of the use of flow augmentation water is done through in-season management. Each fall, the Action Agencies will prepare an annual 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 this document 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.

Hydropower Action 4— Forecasting

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.

Hydropower Action 5—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 in 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.

Hydropower Action 6— 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 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 emergency.

Hydropower Action 7— Columbia River Treaty Storage

BPA and the Corps will pursue negotiations with Canada of annual agreements to provide 1 MAF of storage in Treaty space by April 15 consistent with:

- Providing the greatest flexibility possible for releasing water to benefit U.S. 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; and
- 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.

Hydropower Action 8— Non-Treaty Storage (NTS)

BPA, in concert with BC Hydro, will refill the remaining NTS space by June 30, 2011, as required under the 1990 NTS agreement. Refill will be accomplished with minimal adverse impact to fisheries operations, to the extent possible.

Hydropower Action 9— Non-Treaty Storage Long-Term Agreement

BPA will seek to negotiate a new long-term agreement on use of NTS 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.

Hydropower Action 10— Non-Treaty Coordination with Federal Agencies, States, and Tribes

Prior to negotiations of new long-term or annual NTS 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.

Hydropower Action 11— 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 propose 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 Action 1), 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 BiOp, 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 needs may pose to fish operations and other project purposes.

Hydropower Action 12—Water Quality Plan for Total Dissolved Gas and Water Temperature in the Mainstem Columbia and Snake Rivers

The Action Agencies will continue to update the *Water Quality Plan for Total Dissolved Gas and Water Temperature in the Mainstem Columbia and Snake Rivers* (WQP) and implement water quality measures to enhance ESA-listed juvenile and adult fish survival and mainstem spawning and rearing habitat. The WQP is a comprehensive document which contains water quality measures needed to meet both ESA and Clean Water Act responsibilities. For purposes of this RPA, the WQP will include the following measures to address TDG and water temperature to meet ESA responsibilities:

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

- Continued development of fish passage strategies with less production of TDG (e.g., RSWs),
- Continued development and use of SYSTDG model for estimating TDG production to assist in real-time decision making,
- Continued development of the CE-QUAL-W2 model for estimating river temperatures to assist in real-time decision making for Dworshak Dam operations, and
- Continued operation of lower Snake River projects at MOP.

Hydropower Action 13— 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 NMFS in a timely manner to complete supplemental, project-specific consultations for these tributary projects. These supplemental consultations will address effects on tributary habitat and tributary water quality, as well as direct effects on salmon survival in the tributaries. The supplemental consultations will address effects on mainstem flows only to the extent to which they reveal additional effects on the in-stream flow regime not considered in the FCRPS and Upper Snake River BA/Comprehensive Analysis.

Reclamation submitted a BA on the Yakima Project and is currently preparing updates to this document. Reclamation is expected to complete a BA for the Tualatin Project by fall of 2007. Reclamation is preparing a BA for the Okanogan projects, which will be provided in draft form to the Okanogan Irrigation District and the Confederated Colville Tribes in August 2007. Following a coordinated review, the BA will be finalized and transmitted to NMFS.

2.2.2 Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival

Hydropower Strategy 2: Modify Columbia River and Snake River dams to maximize juvenile and adult fish survival.

Performance Standards: 96 percent dam survival on average for spring migrating fish and 93 percent dam survival on average for summer migrating fish through surface passage improvements; maintenance of current high adult survival levels; implementation of specific passage actions at individual dams.

Funding Source(s): Corps appropriations through Columbia River Fish Mitigation Program.

Rationale: Passage through the hydrosystem is a limiting factor for all upriver listed fish, and also affects the lifecycle of lower river fish. Improving and maintaining safe passage at individual dams is key to juvenile and adult fish survival, building on the \$1 billion recently invested in overhauling the FCRPS dams.

What's New: Specific and higher juvenile dam survival performance standards; major new investment in surface passage improvements at the lower river dams which affect all upriver ESUs or DPSs; and additional spillway and powerhouse improvements designed to improve survival, depending on the dam.

Hydropower Action 14— Configuration and Operational Plan (COP) for Bonneville Project

The Corps will prepare a COP for the Bonneville Project (2007). As part of the first phase of modifications, the Corps will include the following:

Bonneville Powerhouse I (PH1)

- 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 (PH2)

- Screened bypass system modification to improve fish guidance efficiency (FGE) and reduce gateway 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 altered as new biological and engineering information is gathered. Modifications will be coordinated through the Regional Forum. If Phase I actions fail to meet the intended biological targets, Phase II actions will be considered for further implementation.

Hydropower Action 15— COP for The Dalles Project

The Corps will prepare a COP for The Dalles Project (2007). As part of the first phase of modifications, the Corps will include the following:

- Turbine operation optimization to improve overall dam survival (2011)
- Extended tailrace spill wall to increase direct and indirect survival of spillway passed fish (2009)

The COP will be updated periodically and modifications may be altered as new biological and engineering information is gathered. Modifications will be coordinated through the Regional Forum. If Phase I actions fail to meet the intended biological targets, Phase II actions will be considered for further implementation.

Hydropower Action 16— COP for John Day Project

The Corps will prepare a COP for the John Day Project (2007). As part of the first phase of modifications, the Corps will include the following:

- 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).

The COP will be updated periodically and modifications may be altered as new biological and engineering information is gathered. Modifications will be coordinated through the Regional Forum. If Phase I actions fail to meet the intended biological targets, Phase II actions will be considered for further implementation.

Hydropower Action 17— COP for McNary Project

The Corps will prepare a COP for the McNary Project (2009). As part of the first phase of modifications, the Corps will include the following:

- 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. Modifications will be coordinated through the Regional Forum. If Phase I actions fail to meet the intended biological targets, Phase II actions will be considered for further implementation.

Hydropower Action 18— COP for Ice Harbor Project

The Corps will prepare a COP for the Ice Harbor Project (2008). As part of the first phase of modifications, the Corps will include the following:

- 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 (2011)

The COP will be updated periodically and modifications may be altered as new biological and engineering information is gathered. Modifications will be coordinated through the Regional Forum. If Phase I actions fail to meet the intended biological targets, Phase II actions will be considered for further implementation.

Hydropower Action 19— COP for Lower Monumental Project

The Corps will prepare a COP for the Lower Monumental Project (2009). As part of the first phase of modifications, the Corps will include the following:

- 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. Modifications will be coordinated through the Regional Forum. If Phase I actions fail to meet the intended biological targets, Phase II actions will be considered for further implementation.

Hydropower Action 20— COP for Little Goose Project

The Corps will prepare a COP for the Little Goose Project (2009). As part of the first phase of modifications, the Corps will include the following:

- 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 (2008)
- 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. Modifications will be coordinated through the Regional Forum. If Phase I actions fail to meet the intended biological targets, Phase II actions will be considered for further implementation.

Hydropower Action 21— COP for Lower Granite Project

The Corps will prepare a COP for the Lower Granite Project (2008). As part of the first phase of modifications, the Corps will include the following:

- 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. Modifications will be coordinated through the Regional Forum. If Phase I actions fail to meet the intended biological targets, Phase II actions will be considered for further implementation.

Hydropower Action 22— Chief Joseph Dam Flow Deflector

The Corps will complete the flow deflector construction at Chief Joseph Dam by 2009.

Deflector construction was initiated in 2005 in response to RPA 136 in the 2000 BiOp 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.

Hydropower Action 23— Turbine Unit Operations

The Action Agencies will operate turbine units 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 to 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.

Hydropower Action 24— 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:

The Dalles Dam

- East ladder emergency auxiliary water supply system and/or north ladder entrance modifications to improve *reliability* of upstream adult passage (2013).

John Day Dam

- Adult *ladder* systems modifications to improve upstream adult passage conditions (2011).

Lower Granite Dam

- Adult trap modification to provide greater and more efficient adult collection capability and to reduce handling stress of adult salmonids during collection (2007).
- Adult fishway modification to improve upstream adult passage conditions (need will be determined by results of further research) (prototype 2011).

System-Wide

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

2.2.3 Hydropower Strategy 3—Implement Spill and Juvenile Transportation Improvements at Columbia River and Snake River Dams

Hydropower Strategy 3: Implement spill and juvenile transportation improvements at Columbia River and Snake River dams.

Performance Standards: Specific initial spill operations for individual dams, subject to adaptive management as new data emerges and as surface passage is installed (when 96 percent/93 percent standard would apply); specific fish indices to control the termination and re-initiation of summer spill; specific initial transportation protocols, also subject to adaptive management as new data emerge.

Funding Source(s): Corps Congressional appropriations for O&M and BPA Direct Funding.

Rationale: Passage through the hydrosystem is a limiting factor for all upriver listed fish, and also affects the lifecycle of lower river fish. Spill is often the most effective means of passage at dams, alleviating both turbine passage and delay. Spill levels below are based on biological study results rather than spill formulas (e.g., 24-hour/7-day spill to the gas cap), because more spill is not always a biological improvement. Summer spill fish indices are based on recent data regarding timing of fish passage for fall Chinook salmon and recent life history information on when they are shifting from migrating to rearing (generally late July). Transportation protocols are based on adult return information and are subject to adaptive management over time.

What's New: Continued interim implementation and evaluation of 2006 court-ordered summer spill at collector projects to determine appropriate management strategies for Snake River Fall Chinook Salmon; manage duration of Snake River summer spill to match fish run timing; and provide additional transportation barges.

Hydropower Action 25— 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. 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 2-5. Future WMPs 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).

Table 2-5. Initial Voluntary Spill Operations at Columbia and Snake River Dams

Project	Spring Operation (Day/Night)	Spring Planning Dates	Summer Operation (Day/Night)	Summer Planning Dates
Bonneville	100 kcfs/100 kcfs	4/10-6/15	75 kcfs/Gas Cap	6/16-8/31 ^{3/}
The Dalles	40%/40%	4/10-6/15	40%/40%	6/16-8/31 ^{3/}
John Day	0/60% ^{1/}	4/10-6/15	30%/30%	6/16-8/31 ^{3/}
McNary	40%/40% 30%/30% vs. 45	4/10-6/15	40%/40% vs. 60%/60% 30%/30% vs. 45	6/16-8/31 ^{3/}
Ice Harbor Lower	kcfs/Gas Cap 27 kcfs/27 kcfs	4/7-6-15	kcfs/Gas Cap	6/1-8/31 ^{4/}
Monumental	(Bulk Spill Gas Cap)	4/7-6/15 ^{2/}	17 kcfs/17 kcfs	6/1-8/31 ^{4/}
Little Goose	30%/30%	4/5-6/15 ^{2/}	30%/30%	6/1-8/31 ^{4/}
Lower Granite	20 kcfs/20 kcfs	4/3-6/15 ^{2/}	18 kcfs/18 kcfs	6/1-8/31 ^{4/}

Notes:

1/ John Day spill operation during the spring will likely shift to 24-hour operation after construction of surface flow outlets.

2/ The actual transition date to summer spill will be initiated when subyearling Chinook salmon exceed 50 percent of the collection for a 3 day period for each Snake River project after June 1.

3/ Transitions from spring to summer spill has changed from July 1 to June 16 based on updated run timing of subyearling fall Chinook salmon run timing. For further information see Appendix B, Attachment B.2.1-1, Section 3.5.

4/ Termination of summer spill will occur at the four lower Snake projects when subyearling counts fall below 1000 fish per day for 3 consecutive days on a per project basis, but no later than August 31 each year. Termination of spill at Ice Harbor Dam will be two days after Lower Monumental Dam spill ends. If after discontinuing spill at any of the Snake River projects after August 1, if subyearling Chinook collection again exceeds 1000 fish per day for two consecutive days, spill will resume at that project. Thereafter, fish collection numbers will be re-evaluated to determine if spill should continue, using the criteria above until August 31.

Hydropower Action 26— Juvenile Fish Transportation in the Columbia and Snake Rivers

The Corps and BPA will continue the juvenile fish transportation program towards meeting system survival performance metrics of Snake and Columbia River salmon and steelhead with some adaptive management modifications based on results of RM&E. The Corps and BPA will continue to collect and transport juvenile fish at Lower Granite, Little Goose, Lower Monumental, and McNary dams, although under a modified operation as described in Tables 2-6 and 2-7. While the dates mentioned in this section should be considered firm planning dates, if in-season information or results of ongoing RM&E indicates a need for adaptive management, the Action Agencies will consider revising the dates and operations through the Regional Forum.

Hydropower Action 27— Configuration and Operational Plan Transportation Strategy

The Corps, in coordination with the Regional Forum, will initiate a COP in 2008 and complete it in 2010. It will present a strategy for prioritizing and carrying out further transportation actions at each dam. 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.

2.2.4 Hydropower Strategy 4—Operate and Maintain Facilities at Corps Mainstem Projects to Maintain Biological Performance

Hydropower Strategy 4: Operate and maintain facilities at Corps mainstem projects to maintain biological performance.

Funding Source(s): Corps Congressional appropriations for O&M and BPA Direct Funding.

Rationale: Passage through the hydrosystem is a limiting factor for all upriver listed fish, and also affects the lifecycle of lower river fish. Effective O&M of fish passage facilities is key to their continued safe performance.

Hydropower Action 28— Fish Passage Plan

The Corps will annually prepare a FPP and coordinate it regionally through the Fish Passage Operations and Maintenance Coordination Team (FPOM). The Corps will operate its projects (including juvenile and adult fish passage facilities) year-round in accordance with the criteria in the FPP. Key elements of the plan include:

- Operate according to project-specific criteria and dates to operate and maintain fish facilities, turbine operating priorities, and spill patterns;
- Operate according to fish transportation criteria;
- Maintain turbine operations within the 1 percent of best efficiency range;
- Maintain spillway discharge levels and dates to provide project spill for fish passage;
- Implement TDG monitoring plan;
- Operate according to protocols for fish trapping and handling;
- Take advantage of low river conditions, low reservoir elevations or periods outside the juvenile migration season to accomplish repairs, maintenance, or inspections so there is little or no effect on juvenile fish;
- Coordinate routine and non-routine maintenance that affects fish operations or structures to eliminate and/or minimize fish operation impacts;
- Schedule routine maintenance during non-fish passage periods;
- Conduct non-routine maintenance activities as needed; and
- Coordinate criteria changes and emergency operations with FPOM.

Table 2-6. Interim Transportation Strategy for Snake River Collector Projects

Lower Granite Dam	Spring Migrants				Summer Migrants			
	Spill and Bypass	Spill and Transport	Transport and No Voluntary Spill	Adaptive	Spill and Transport	Adaptive	Transport and No Spill	Adaptive
Seasonal Average Flows < 65 kcfs	None	None	April 3 to May 31	June	July	Aug	Sept	Oct +
Seasonal Average Flows 65 to 80 kcfs	April 3 to April 20	April 21 to April 30	May 1 to May 31	June	July	Aug	Sept	Oct +
Seasonal Average Flows > 80 kcfs	April 3 to April 20	April 21 to May 31	N/A ^{1/}	June	July	Aug	Sept	Oct +
Little Goose Dam	Spring Migrants				Summer Migrants			
	Spill and Bypass	Spill and Transport	Transport and No Voluntary Spill	Adaptive	Spill and Transport	Adaptive	Transport and No Spill	Adaptive
Seasonal Average Flows < 65 kcfs	None	None	April 3 to May 31	June	July	Aug	Sept	Oct +
Seasonal Average Flows 65 to 80 kcfs	April 5 to April 28	April 29 to May 4	May 5 to May 31	June	July	Aug	Sept	Oct +
Seasonal Average Flows > 80 kcfs	April 5 to April 28	April 29 to May 31	N/A ^{1/}	June	July	Aug	Sept	Oct +
Lower Monumental Dam	Spring Migrants				Summer Migrants			
	Spill and Bypass	Spill and Transport	Transport and No Voluntary Spill	Adaptive	Spill and Transport	Adaptive	Transport and No Spill	Adaptive
Seasonal Average Flows < 65 kcfs	None	None	April 3 to May 31	June	July	Aug	Sept	Oct +
Seasonal Average Flows 65 to 80 kcfs	April 7 to May 1	May 2 to May 9	May 10 to May 31	June	July	Aug	Sept	Oct +
Seasonal Average Flows > 80 kcfs	April 7 to May 1	May 2 to May 31	N/A ^{1/}	June	July	Aug	Sept	Oct +

^{1/} Under > than 80 thousand cfs (kcfs) seasonal average flows in the Snake River, the interim spill and transportation operation continues until May 31.

Notes:
 All flows are in average kcfs for the April through June time period.
 The term “adaptive” in this table refers to a transition between two adjacent management strategies in the table. For example, where “Adaptive” is between “Transportation and Non-Voluntary Spill” and “Spill and Transportation”, the decision for each option would be made based on RM&E and in-season data.

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Table 2-7. Proposed Interim Transportation Strategy for McNary Dam

McNary Dam	Spring Migrants				Summer Migrants			
	Spill and Bypass	Spill and Transport	Transportation and No Voluntary Spill	Adaptive	Spill and Transport	Adaptive	Transport and No Voluntary Spill	Adaptive
Seasonal Average Flows < 125 kcfs	None	None	April 10 to June 14	June 15 to June 30	July	Aug	Sept	Oct +
Seasonal Average Flows > 125 kcfs	Apr 10 to June 14	None ^{1/}	None ^{1/}	June 15 to June 30	July	Aug	Sept	Oct +

Notes:

^{1/} Under > than 125 kcfs seasonal average flows in the Columbia River, the interim spill and bypass operation will continue through June 14.

Average flows reported in average kcfs for April through June.

The term “adaptive” in this table refers to a transition between two adjacent management strategies in the table. For example, where “Adaptive” is between “Transportation and No Voluntary Spill” and “Spill and Transportation”, the decision for each option would be made based on RM&E and in-season data.

2.3 HABITAT (TRIBUTARY AND ESTUARY) SUMMARY

Habitat Action Objectives for All ESUs:
 Protect and improve tributary and estuary habitat to improve fish survival.

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

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

Each strategy consists of one or more specific actions. These are summarized in the following sections. A conceptual overview of the overall Habitat Action is presented in Figure 2-4. Additional discussion of the Habitat Action is provided in Appendix B, Section B.2.2

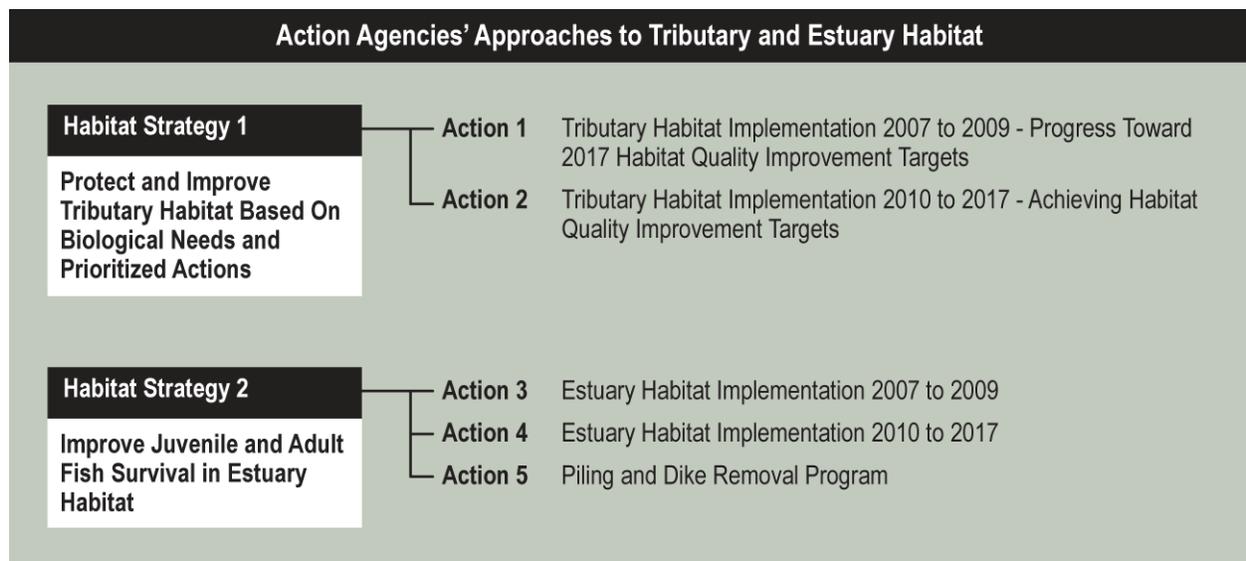


Figure 2-4. Actions to Protect and Improve Tributary and Estuary Habitat

2.3.1 Habitat Strategy 1—Protect and Improve Tributary Habitat Based on Biological Needs and Prioritized Actions

Habitat Strategy 1: Protect and improve tributary habitat based on biological needs and prioritized actions.

Performance Standard: Implementation of identified projects in 3-year implementation cycles selected to achieve the targeted improvement in habitat quality.

Funding Source(s): BPA direct funding, Reclamation Congressional annual appropriations for Columbia/Snake Salmon Recovery Program.

Rationale: Degradation of tributary habitat is a limiting factor for almost all listed fish, although the nature and magnitude of this impact varies by location. Protection and improvement of tributary habitat by acquiring water for instream flows, by restoring riparian habitat, improving water quality, screening diversions and providing passage, and improving mainstem and side-channel habitat are proven ways to enhance fish survival, depending on location. Priority locations for habitat actions are based on biological needs and potential for benefits.

What's New: BPA funding commitments have been increased from approximately \$21 million per year to approximately \$31.5 million per year for habitat actions for specified ESUs between 2007 and 2009. This is about a 58 percent increase over the 2000 BiOp program. In addition, actions beyond those selected for the 2007 to 2009 Fish and Wildlife Program have been identified for implementation in 2008 and 2009 based on the Action Agencies' lifecycle biological analysis and input from the Remand Collaboration Process. Budgets for these additional actions total up to \$11.6 million for the 2-year period.

Starting in 2010, BPA will further increase its funding commitment for all ESUs to \$45 million per year for tributary and estuary areas from 2010 to 2017. The increase in tributary habitat funding will be allocated according to "gaps" in biological performance of populations where tributary habitat is a limiting factor and habitat potential exists. Specific projects will be identified based on biological priorities and criteria in 3-year cycles.

As described in more detail below, the Action Agencies will implement an expanded and better-defined tributary habitat program to achieve commitment to improvement in habitat quality by addressing limiting factors impairing spawning and rearing habitat for ESUs affected by the FCRPS, with particular focus on populations with highest biological need (low productivity) and where habitat potential exists. An inventory of possible habitat project types identified in draft recovery plans and subbasin plans has been compiled in the Remand Collaboration Process, providing a menu of project types to select from in implementing the action. The primary types of actions that will be implemented include:

- Increase Streamflow Through Water Acquisitions
- Address Entrainment Through Screening
- Provide Fish Passage and Access
- Improve Mainstem and Side Channel Habitat Conditions
- Protect and Enhance Riparian Conditions
- Improve Water Quality

The Action Agencies, working through the Remand Collaboration, have identified specific habitat projects and categories of projects that address key limiting factors for implementation in 2007 through 2017, with priority for actions targeting populations with greatest biological needs. Habitat quality improvement performance targets for a 10-year period for ESUs at the population-level are specified in Appendix B, Attachment B.2.2-1, Table 1.

The proposed tributary habitat actions are reasonably certain, because they contain the following commitments:

1. For years 2007 to 2009, specific habitat projects are identified that will be funded and implemented.
 - In the event a project becomes infeasible, the Action Agencies commit to substitute a project or projects with equivalent benefit.
2. For years 2010 to 2017, the tributary habitat actions include:
 - Specific funding commitments;
 - Commitment to implement projects to achieve a population-specific improvement in habitat quality;
 - A specific process that will be used to identify and select specific projects;
 - Assurance that the process will prioritize projects based on the populations with greatest biological need (priority populations);
 - Selection of projects that is informed by experts' determination of anticipated change in habitat quality through coordination with recovery planning groups and the Council;
 - A specific process for reviewing compliance/implementation of projects in 3-year intervals and a commitment to implement substitute projects of equal value to habitat quality in the event selected projects are not implemented to ensure satisfactory progress toward meeting specified 2017 habitat quality improvements; and
 - Commitment to RM&E during implementation that will inform future project selection.

Initial Actions: For 2007 through 2009, the Action Agencies, working through the Remand Collaboration Process, first refined identification of ESUs and populations with greatest biological need based on most current science. For these 3 years, specific habitat projects were identified and funded with a broadened geographic scope consistent with scope of 2000 BiOp. Costs are approximately \$31.5 million annual average, compared to funding of about \$20 million in the 2000 to 2006 time period. This includes amounts earmarked for the Columbia Basin Water Transactions Program dedicated to secure water acquisitions and riparian easements to address limiting factors for anadromous fish.

Expanded Actions: For 2008 and 2009, expanded project implementation will occur. Later in the Remand Collaboration, the biological analyses completed by the Action Agencies identified additional populations and areas with survival gaps indicating biological need. With collaboration input, a further suite of projects was identified for implementation to address these areas. During 2008 and 2009, the Action Agencies will implement this additional suite of actions with an estimated further cost of up to \$11.6 million.

Future Actions: For 2010 to 2017, the Action Agencies will continue implementation of specific habitat actions based on biological priorities, limiting factors, and achievement of habitat quality performance targets. The funding commitment from BPA will increase to \$45 million on average annually. Specific categories of projects for particular ESUs and populations, with associated habitat quality improvements, have been identified through the Remand Collaboration as a basis for these commitments. On a 3-year cycle, individual projects will be selected based on expert determination of estimated habitat quality improvement, in coordination with regional recovery planning organizations and the Council. Projects for populations with the greatest biological need will receive priority for funding to achieve the habitat quality improvements for the targeted populations, and remaining funds will be used to implement projects that most effectively address limiting factors for other populations within the listed ESUs and

DPSs. Habitat quality improvements for specific populations are listed in Appendix B, Attachment B.2.2-1, Table 1.

Habitat Action 1: Tributary Habitat Implementation 2007 to 2009 – Progress Toward 2017 Habitat Quality Improvement Targets

During 2007 to 2009, the Action Agencies will:

- Implement specific projects identified in Attachment B.2.2-2 (the 2007 to 2009 Fish and Wildlife Program decision and the expanded projects for 2008 and 2009) to address key limiting factors for populations with the highest biological need.
- These projects will contribute to achieving the population specific habitat quality improvement performance standards identified in Table 2-8.
- Implementation of these projects will also address key limiting factors for other populations within the same geographic area.
- Implement additional water acquisitions and riparian easements to address key limiting factors for listed ESUs as opportunities arise, using 70 percent of the budget for the Columbia Basin Water Transactions Program.
- Report annually on project implementation, populations benefited, limiting factors addressed, metrics completed, and overall progress toward 10-year habitat quality improvement targets.
- Initiate regional coordination and planning for 2010 to 2017 habitat project priorities and selection.

Habitat Action 2: Tributary Habitat Implementation 2010 to 2017 – Achieving Habitat Quality Improvement Targets

During 2010 to 2017, the Action Agencies will:

- Commit \$45 million annually to implement a further expansion of the 2007 to 2009 tributary habitat program for listed ESUs.
- Implement actions to achieve population specific habitat quality improvements specified in Table 2-8.
- For the targeted populations, identify and implement specific projects in 3-year cycles to achieve habitat quality improvement targets based on:
 - expert determination of estimated habitat quality improvement developed in coordination with regional recovery planning organizations and Council; and
 - specific categories of projects for particular ESUs and populations, with associated habitat quality improvements that have been identified through the Remand Collaboration and will be further refined through regional recovery planning.
- For other populations, identify and implement specific projects in 3-year cycles to address limiting factors based on:
 - specific categories of projects for particular ESUs and populations, with associated habitat quality improvements that have been identified through the Remand Collaboration and will be further refined through regional recovery planning; and
 - a focused evaluation of the limiting factors for populations with productivity just above 1, in order to enhance the trend to recovery.
- Report annually on project implementation, noting populations benefited and limiting factors addressed, and tracking overall progress toward 10-year habitat quality improvement targets.

- Implement a comparable replacement project if a specific project becomes infeasible. The Action Agencies will first look for feasible replacement projects within the same population, then within the same Major Population Group (MPG), then within the same ESU to maintain estimated habitat quality improvement.
- Apply new scientific information to estimate future habitat quality improvements.
- Review cumulative implementation through the end of 2012 and 2015, and make adjustments necessary to ensure that habitat actions achieve the habitat quality improvement targets by 2017.

Table 2-8. Estimated Habitat Quality Improvements

ESU	Major Population Group	Population	Estimated Percentage Habitat Quality Improvement of 2007- 2009 Actions	Total Estimated Percentage Habitat Quality Improvement of 2007-2017 Actions	
Snake River Spring/Summer Chinook Salmon	Grande	Catherine Creek	4	23	
		Lostine/Wallowa River	2	*	
	Ronde/Imnaha	Grand Ronde River upper mainstem	2	23	
		Imnaha River mainstem	1	*	
	Middle Fork Salmon River	Big Creek	1	*	
	South Fork Salmon River	Secesh River	1	*	
		South Fork Salmon River Mainstem	<1	*	
	Lower Snake River	Tucannon River	7	17	
	Upper Salmon River	Upper Columbia River – Below Chief Joseph	East Fork Salmon River	1	*
			Lemhi River	7	*
Pahsimeroi River			41	*	
Salmon River lower mainstem below Redfish Lake			1	*	
Salmon River upper mainstem above Redfish Lake			14	*	
Valley Creek			1	*	
Yankee Fork			10	30	
Upper Columbia River Spring Chinook Salmon	Upper Columbia River – Below Chief Joseph	Entiat River	10	22	
		Methow River	2	6	
		Wenatchee River	1	3	

Table 2-8. Estimated Habitat Quality Improvements (continued)

ESU	Major Population Group	Population	Estimated Percentage Habitat Quality Improvement of 2007- 2009 Actions	Total Estimated Percentage Habitat Quality Improvement of 2007-2017 Actions	
Middle Columbia River Steelhead	Cascades Eastern Slope Tributaries	Deschutes River – eastside	1	*	
		Deschutes River – westside	<1	*	
		Fifteen mile Creek (winter run)	<1	*	
		Klickitat River	4	*	
	John Day River	John Day River lower mainstem tributaries	John Day River lower mainstem	<1	*
			John Day River upper mainstem	<1	*
			Middle Fork John Day River	<1	*
		North Fork John Day River	North Fork John Day River	<1	*
			South Fork John Day River	1	*
			Umatilla and Walla Walla River	Touchet River	4
	Umatilla River	4		*	
	Walla Walla River	4		*	
	Yakima River Group	Naches River	Satus Creek	4	*
			Toppenish	4	*
			Yakima River upper mainstem	4	*
			Snake River Steelhead	Clearwater River	Lochsa River
Lolo Creek	5	8			
Selway River	<1	<1			
South Fork Clearwater River	5	14			
Grand Ronde River	Grand Ronde River lower mainstem tributaries	Grand Ronde River upper mainstem		4	*
		Joseph Creek (OR)		<1	*
		Joseph Creek (WA)		4	*
		Wallowa River	<1	*	
		Hells Canyon	Hells Canyon		*
Imnaha River	Imnaha River		*		
Lower Snake River	Asotin Creek	Tucannon River	5	*	
		Salmon River	Lower Middle Fork mainstem and tribs (Big, Camas, and Loon Creeks)	1	7
East Fork Salmon River	2		*		
Lemhi River	3		*		
Pahsimeroi River	9		*		
Salmon River upper mainstem	6		*		
Secesh River	1		6		
South Fork Salmon River	<1		1		
Upper Columbia River Steelhead	Upper Columbia River – below Chief Joseph		Entiat River	6	8
		Methow River	2	4	
		Okanogan River	12	14	
		Wenatchee River	1	4	

Note: The Action Agencies will provide funding and/or technical assistance to maintain a broad habitat program in these geographic areas based on biological need and addressing limiting factors from the recovery/subbasin plan inventory.

2.3.2 Habitat Strategy 2—Improve Juvenile and Adult Fish Survival in Estuary Habitat

Habitat Strategy 2: Improve juvenile and adult fish survival in estuary habitat.

Performance Standards: Implementation of identified projects in 3-year implementation cycles to achieve the targeted biological benefit.

Funding Source(s): Corps (Section 536 of the Water Resources Development Act [WRDA] 2000 or other authorities, as appropriate). BPA – direct funding.

Rationale: Degradation of estuary habitat is a limiting factor affecting all listed fish to some extent, although the nature and magnitude of this impact varies by life history type. Recent studies indicate that protection and improvement of estuary habitat enhances fish survival. In particular, estuary projects that provide an increase in shallow water habitat would benefit all listed ESUs or DPSs, with the greatest habitat benefit to those ESUs that use the estuarine environment for longer periods of time (ocean-type fish).

What's New: Additional actions benefiting all ESUs and increased funding.

As described in more detail below, the Action Agencies will implement an expanded estuary habitat program to address limiting factors involved in passage and rearing in the estuary for ESUs affected by the FCRPS. An inventory of possible habitat projects, identified in draft recovery plans and subbasin plans, has been compiled in the Remand Collaboration Process. This inventory provides a menu of candidate projects for selection. Project selection criteria have been developed in collaboration with the Lower Columbia Estuary Partnership (LCREP) and other regional parties.

Action Agency estuary habitat projects will provide an increase in juvenile salmonid shallow water habitat that would benefit all listed ESUs, with the greatest habitat benefit to those ESUs expressing ocean-type life histories that use the estuarine environment for longer periods of time. Types of actions that will be implemented include:

- Acquire, Protect, and Restore Off-Channel Habitat
- Restore Tidal Influence and Improve Hydrologic Flushing
- Restore Floodplain Reconnection by Removing or Breaching Dikes or Installing Fish-Friendly Tide Gates
- Remove Invasive Plants and Weeds; Replant Native Vegetation
- Protect and Restore Emergent Wetland Habitat and Riparian Forest Habitat
- Restore Channel Structure and Function
- Develop and Implement a Piling and Dike Removal Program

The Action Agencies, working through the Remand Collaboration, have identified specific habitat projects for implementation in 2007 through 2009, with priority for actions targeting the greatest biological needs and limiting factors.

The Estuary Habitat Actions are reasonably certain to occur because they contain the following commitments:

1. For years 2007 to 2009, 35 specific habitat projects have been identified and will be funded and implemented. In the event a project becomes infeasible, the Action Agencies will substitute a project or projects with equivalent benefit.
2. For years 2010 to 2017, the actions include:
 - Specific funding commitments;
 - Commitment to implement projects to improve habitat quality and quantity;
 - A process that shall be used to identify, select, and prioritize specific projects, based on the greatest biological need and limiting factors; and
 - Coordination through the Council for BPA projects will be selected for a 3-year cycle.

For 2007 through 2009, 29 specific habitat projects are identified and funded by the Action Agencies, with funding of approximately \$4 million a year. Through its 2007 to 2009 Fish and Wildlife Program decision, BPA will fund approximately \$2 million per year, more than doubling the 2000 to 2006 funding of approximately \$600,000 per year for estuary projects.

The Corps expects to continue funding estuary habitat projects similar to current approximately \$2 million annual levels subject to Congressional appropriations. In addition, the Corps is seeking funding for a general investigation study to identify further ecosystem opportunities in the lower Columbia River (estuary). If funded, this study could lead to additional authorities and funding for habitat work in the estuary.

The Action Agencies, in response to the biological analyses and collaboration input after BPA's 2007 to 2009 project selection decision was made, committed to fund additional actions beyond those funded in the 2007 to 2009 program decision. These additional actions for 2008 and 2009 were identified for the estuary to benefit all ESUs. The additional budgeted amount for these actions is \$1.5 million annually and is focused on an expansion of the types of habitat projects in the 2007 to 2009 original suite of projects to provide an important additional benefit to all ESUs. The additional \$1.5 million annually, totaling \$3 million for 2008 and 2009, will implement six new estuary habitat projects, bringing the total of specific estuary habitat projects to 35.

For 2010 through 2017, the Action Agencies will implement continued actions based on biological criteria and limiting factors. BPA's funding commitment would remain at the increased level of \$3.5 million average annual for 2010 to 2017. The Corps expects to continue funding estuary habitat projects similar to the 2007 to 2009 level of approximately \$2 million annually subject to Congressional appropriations. BPA project selection will be based on criteria to prioritize actions for populations with greatest biological need and ensure consistency with recovery plan implementation through coordination with the LCREP and Council processes. Specific BPA actions will be identified in 3-year cycles.

The Corps will consider limiting factors and the recovery plan in working with potential local sponsors under its authorities. Specific projects will be selected based on biological effectiveness criteria consistent with the Willamette/Lower River Recovery Plan (Recovery Plan).

The Action Agencies will report annually on project implementation, noting ESUs benefited and limiting factors addressed. If a project becomes infeasible to implement, they will implement a comparable replacement project to maintain estimated biological benefits.

Habitat Action 3- Estuary Habitat Implementation 2007 to 2009

The Action Agencies will provide funding to implement specific actions identified for implementation in 2007 to 2009 (Appendix B.2.2). If actions identified for implementation in 2007 to 2009 prove infeasible, the Action Agencies will implement comparable replacement projects in 2010 -2013 to provide equivalent benefits.

Habitat Action 4- Estuary Habitat Implementation 2010 to 2017

The Action Agencies will provide funding to implement specific projects to achieve the additional estuary survival benefits identified in Appendix B.2.2.

- Projects will be selected in coordination with LCREP and other regional experts, using recovery planning products and the modified LCREP project selection criteria (Appendix B, Attachment B.2.2-3) to identify projects that will benefit salmon.
- To support project selection, the Action Agencies will convene an expert regional technical group to determine the estimated change in survival which would result from implementation of each project proposed for implementation.
- The expert regional technical group will use the approach originally applied in Attachment B.2.2 (*Estimated Benefits of Federal Agency Habitat Projects in the Lower Columbia River Estuary* which is included as Appendix D, Attachment D-1 to the Comprehensive Analysis) and all subsequent information on the relationship between actions, habitat and salmon productivity models developed through the FCRPS RM&E to estimate the change in overall estuary habitat and resultant change in population survival.

Habitat Action 5- Piling and Dike Removal Program

To increase access to productive habitat and to reduce avian predation, the Action Agencies will develop and implement a piling and pile dike removal program.

- In 2008, the Action Agencies will work with LCREP to develop a plan for strategic removal of structures that have low value to navigation channel maintenance, present low-risk to adjacent land use, support increased ecosystem function, and are cost-effective.
- Beginning in 2008 and 2009, the Action Agencies will begin implementation. Implementation will continue through 2017.

2.4 HATCHERY STRATEGY SUMMARY

<p style="text-align: center;">Hatchery Action Objective for All ESUs:</p> <p>Fund FCRPS mitigation hatchery programs in a way that contributes to reversing the decline of downward-trending ESUs</p>

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

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

Each strategy consists of two specific actions. These are summarized in the following sections. A conceptual overview of the overall Hatchery Action is presented in Figure 2-5. Additional discussion of the Hatchery Action is provided in Appendix B, Section B.2.3.

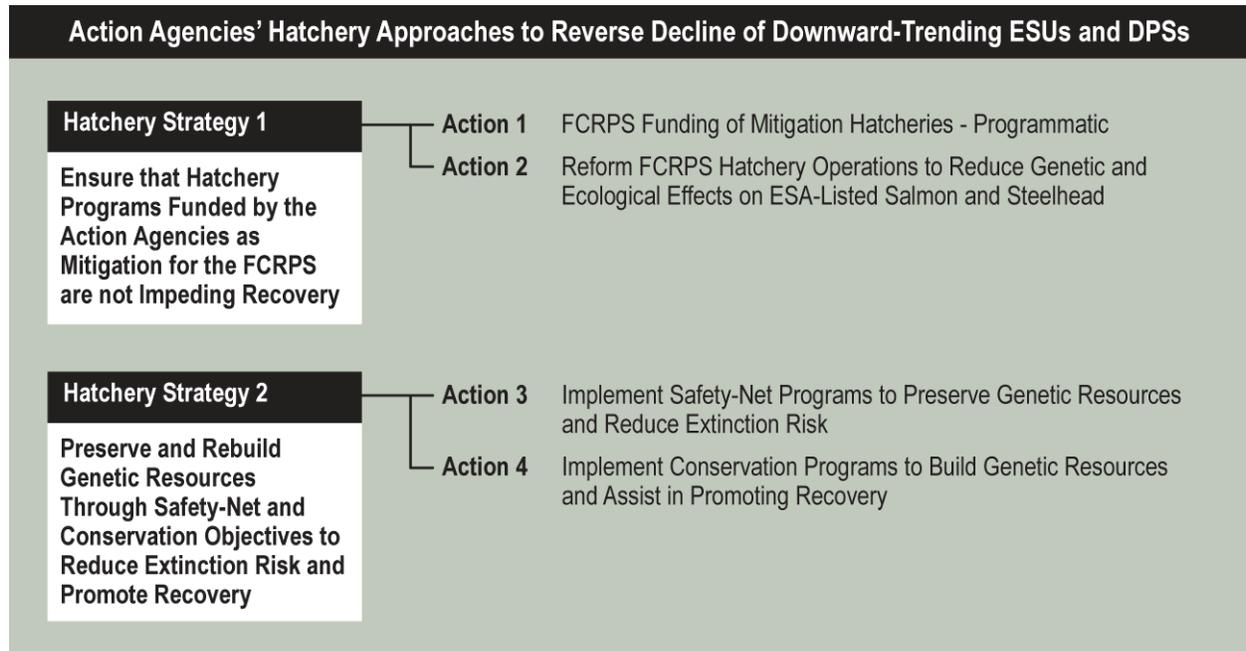


Figure 2-5. Hatchery Approaches to Reverse the Decline of Downward-Trending ESUs

2.4.1 Hatchery Strategy 1—Ensure that Hatchery Programs Funded by the Action Agencies as Mitigation for the FCRPS are not Impeding Recovery of ESUs

Hatchery Strategy 1: Ensure that hatchery programs funded by the Action Agencies as mitigation for the FCRPS are not impeding recovery of ESUs.

Performance Standards: Implementation of identified reform actions for Action Agency-funded hatchery programs.

Funding Source(s): BPA direct funding agreements with the USFWS, Reclamation, and the Corps for O&M of the Lower Snake River Compensation Plan hatchery programs, the Leavenworth Complex hatcheries, and three Corps mitigation hatcheries.

Rationale: Hatchery programs may have negative impacts on viability of natural salmon and steelhead populations. Improving the overall management and operation of FCRPS mitigation anadromous hatchery programs in the Interior Columbia River Basin through application of funding criteria and BMPs, on a case-by-case basis, is intended to minimize or eliminate these negative effects on listed populations. Some hatchery programs have been identified as major limiting factors for listed populations and urgently require reform or elimination of the program to improve viability and aid recovery of the affected populations. Ongoing hatchery reviews are likely to identify additional FCRPS hatchery reforms that will benefit listed stocks.

What's New: Adoption of programmatic criteria for funding decisions on mitigation programs for the FCRPS that incorporate best managements practices to lessen negative effects on ESA-listed ESUs to ensure hatchery mitigation programs funded by the FCRPS do not impede recovery. The Action Agencies are undertaking reform actions in cooperation with hatchery operators to achieve the FCRPS hatchery objective.

Hatchery Action 1- FCRPS Funding of Mitigation Hatcheries - Programmatic

The Action Agencies will adopt programmatic criteria for funding decisions on mitigation programs for the FCRPS that incorporate BMPs. (Site specific application of BMPs will be defined in ESA Section 7, Section 10, or Section 4(d) consultations with NMFS to be initiated and conducted by hatchery operators with the Action Agencies as cooperating agencies.)

Hatchery Action 2— 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 regularly approval) are listed in Table 2-9. Other reforms will be identified and implemented following the conclusion of the Columbia River Hatchery Scientific Review Group process.

Table 2-9. Specific Projects to Implement Hatchery RPA Actions

Habitat Action 2 - Reform FCRPS Hatchery Operations to Reduce Genetic and Ecological Effects on ESA Listed Salmon & Steelhead
For Lower Columbia Chinook Salmon : The Corps will review John Day Hatchery Mitigation Program.
For Snake River Steelhead : Fund the Tucannon River steelhead supplementation program to transition to local broodstock using BMPs. ^{1/}
For Mid-Columbia River Steelhead : Fund the Touchet River steelhead supplementation program to transition to local broodstock using BMPs. ^{2/}
Habitat Action 3 - Implement Safety-Net Programs to Preserve Genetic Resources and Reduce Extinction Risk
For Snake River Sockeye : Fund the safety net program to achieve annual releases of 150,000 smolts.
For Snake River Spring/Summer Chinook Salmon : Fund the Tucannon River spring/summer Chinook salmon safety-net supplementation program as long as NMFS considers it beneficial and necessary to reduce extinction risk of the target population.
For Snake River Spring/Summer Chinook Salmon : Fund the Upper Grande Ronde and Catherine Creek safety net supplementation programs using BMPs.
For Snake River Spring/Summer Chinook Salmon : Fund the Johnson Creek / South Fork Salmon River safety net supplementation program.
For Snake River Spring/Summer Chinook Salmon : Fund the experimental captive rearing program for East Fork and West Fork Yankee Fork Salmon River (until phased out by Idaho Department of Fish and Game (IDFG)).
For Snake River Steelhead , as a project to benefit primarily B-run steelhead, the Action Agencies will work with NMFS to develop a trigger for future artificial propagation safety-net planning or to identify populations for immediate safety-net planning.
Habitat Action 4 - Implement Conservation Programs to Build Genetic Resources & Assist in Promoting Recovery
For Upper Columbia Spring Chinook : Fund reintroduction of spring Chinook salmon into the Okanogan Basin consistent with the Upper Columbia Salmon Recovery Plan and BMPs. Reintroduction will be coordinated with the quality and quantity of available habitat in the Okanogan, and will be contingent on the availability of within ESU broodstock from the Methow Basin.
For Upper Columbia River Steelhead : Fund reconditioning of natural origin kelts for the Entiat, Methow and Okanogan basins.
For Upper Columbia River Steelhead : Fund development of a local broodstock derived from the Okanogan River Basin following BMPs.
For Middle Columbia River Steelhead : Fund reconditioning of natural origin kelts in the Yakima River basin.

^{1/} Current operation of these programs is undergoing site specific ESA consultation; an ESA Section 7 determination has not yet been made.

^{2/} Current operation of these programs is undergoing site specific ESA consultation; an ESA Section 7 determination has not yet been made.

Table 2-9. Specific Projects to Implement Hatchery RPA Actions (continued)

Habitat Action 4 - Implement Conservation Programs to Build Genetic Resources & Assist in Promoting Recovery (continued)

For **Snake River Steelhead**: Fund the small-scale program trapping locally returning steelhead in the East Fork Salmon River for local broodstock supplementation program (no more than 50,000 smolts) following BMPs.

For **Snake River Spring/Summer Chinook Salmon**: Fund supplementation programs in the Lostine and Imnaha rivers, contingent on a NMFS-approved management plan for the Northeast Oregon Hatchery program.

For **Snake River Sockeye Salmon**: Fund expansion of the safety net program to increase smolt releases to between 500,000 and 1 million fish.

For **Snake River Sockeye Salmon**: The Action Agencies will work with appropriate parties to investigate feasibility and potentially develop a plan for ground transport of adult sockeye from Lower Granite Dam to Redfish Lake.

For **Columbia River Chum Salmon**: Fund the program to re-introduce chum salmon in Duncan Creek as long as NMFS considers it beneficial to recovery and necessary to reduce extinction risk of the target population.

For **Columbia River Chum Salmon**: Fund assessment of habitat potential, development of reintroduction strategies, and implementation of pilot supplementation projects in selected lower Columbia River tributaries below Bonneville Dam.

2.4.2 Hatchery Strategy 2—Preserve and Rebuild Genetic Resources Through Safety-Net and Conservation Objectives to Reduce Extinction Risk and Promote Recovery

Hatchery Strategy 2: Preserve and rebuild genetic resources through safety-net and conservation objectives to reduce extinction risk and promote recovery.

Performance Standards: Implementation of identified safety-net projects contributes to increased abundance and reduced extinction risk of target populations; conservation projects contribute to improving viability of target populations.

Funding Source(s): BPA funding for planning, design, construction, operation, and maintenance for safety-net and conservation hatchery programs under the Fish and Wildlife Program.

Rationale: Populations at high risk of extinction can be preserved through artificial propagation safety-net programs until limiting factors can be addressed. Properly designed and implemented artificial propagation conservation programs can improve abundance, spatial structure, and diversity of natural spawning populations.

What’s New: Significant expansion of Snake River Sockeye Salmon Program and development of performance standards, exploration of options for transportation of returning adult Sockeye Salmon from Lower Granite Dam to the Stanley Basin, upper Columbia River Spring Chinook Salmon (Methow Composite stock) reintroduction in Okanogan River, development of a mechanism or procedure to identify Snake River Steelhead populations that may need planning for a safety-net program, construction and operation of the Northeast Oregon Hatchery project contingent upon Nez Perce Tribe’s development of a NMFS-approved management plan for the hatchery program, and assessment of Columbia River Chum Salmon habitat potential and development of reintroduction strategies in selected lower Columbia River tributaries.

Hatchery Action 3— Implement Safety-Net Programs to Preserve Genetic Resources and Reduce 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 abundance and preserving genetic diversity, 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 2-9.

Hatchery Action 4— Implement Conservation Programs to Build Genetic Resources and Assist in Promoting Recovery

The Action Agencies will implement conservation programs for ESA-listed stocks where the programs assist in recovery. Specific conservation programs to be implemented under this action are listed in Table 2-9.

2.5 HARVEST ACTION SUMMARY

Harvest Action Objective for All ESUs:

Improve the survival of juvenile and adult fish as they pass through the hydrosystem.

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 primarily managed through State and Federal agencies and Tribes other than the Action Agencies. However, the Action Agencies will support the identification and implementation of approaches or conservation measures to reduce the effects of harvest on ESA-listed species. To accomplish this, the Action Agencies will pursue the following three strategies (Figure 2-6) to meet this overall objective (see Figure 2-6). Additional discussion of the Harvest Action is provided in Appendix B, Section B.2.4.



Figure 2-6. Harvest Approaches to Improving Adult Lifestage Survival

2.5.1 Harvest Strategy 1—Fishery Conservation Effectiveness Programs

Harvest Strategy 1: Fishery Conservation Effectiveness Programs

Performance Standards: Accurate harvest rates on natural spawners.

Funding Source(s): BPA; other Action Agencies as appropriate.

Rationale: Management of fisheries to meet multiple conservation objectives associated with ESA, in the context of changing fishery methods, seasonal structures and legal obligations, is complex and needs technical advancements to provide necessary precision.

What's New: Action Agencies will assist in the development of a plan to add PIT-tag detections in mainstem Columbia River fisheries.

2.5.2 Harvest Strategy 2—Potential Alternative/Terminal Fishing Locations

Harvest Strategy 2: Potential Alternative/Terminal Fishing Locations

Performance Standards: Accurate harvest rates on natural spawners; percentage reduction in impacts to natural spawners.

Funding Source(s): BPA.

Rationale: Fisheries can be located in areas and during time periods that minimize the harvest of non-target stocks, subject to various constraints.

What's New: 2007 begin implementation of the Colville selective fisheries project (BPA 200724900).

2.5.3 Harvest Strategy 3—Develop Fishing Techniques

Harvest Strategy 3: Develop fishing techniques to enable fisheries to target non-listed fish while reducing harvest-related mortality on ESA-listed species.

Performance Standards: Accurate harvest rates on natural spawners.

Funding Source(s): BPA – Direct Program.

Rationale: Achieving greater gear selectivity in both commercial and recreational fisheries has the potential to increase numerical catch while reducing impacts to ESA-listed stocks.

What's New: 2007 begin implementation of the Colville Selective Fisheries Project (BPA 200724900).

2.6 PREDATION MANAGEMENT ACTION SUMMARY

Predation Management Action Objective for All ESUs:
 Improve survival of juvenile and adult fish as they pass through the hydrosystem.

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

- Predation Management Strategy 1—Reduce piscivorous predation
- Predation Management Strategy 2—Management of avian predators
- Predation Management Strategy 3—Address marine mammal predation

Each strategy consists of one or more specific actions. These are summarized in the following sections. A conceptual overview of the overall Predation Management Action is presented in Figure 2-7. Additional discussion of the Predation Management Action is provided in Appendix B.2.5.

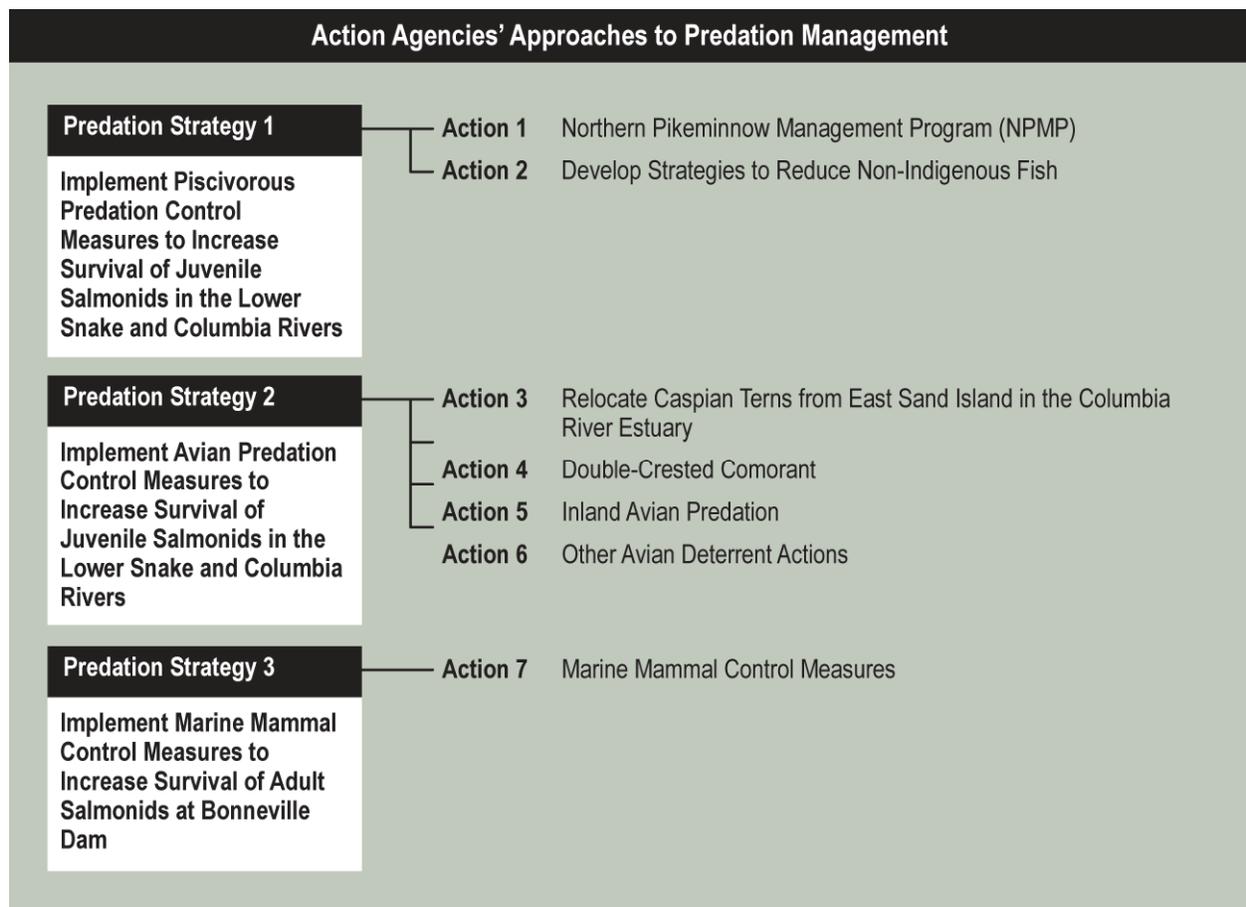


Figure 2-7. Approaches to Predation Management

2.6.1 Predation Management Strategy 1—Implement Piscivorous Predation Control Measures to Increase Survival of Juvenile Salmonids in the Lower Snake and Columbia Rivers

Predation Management Strategy 1: Implement piscivorous predation control measures to increase survival of juvenile salmonids in the lower Snake and Columbia rivers.

Performance Standards: Maintain exploitation rates in the range of 15 to 19 percent consistent with rates observed since implementation of increased incentive measures that began in summer 2004.

Funding Source(s): BPA – Direct Program.

Rationale: Reducing the number of larger, predatory northern pikeminnow throughout the mainstem Columbia and Snake rivers directly reduces predation losses and increases the survival of outmigrating juvenile salmon and steelhead.

What's New: Focused pikeminnow removals at The Dalles and John Day dams forebay; tailrace boat restricted zones will be tested and evaluated in the 2007 field season; and studies of other piscivorous predators.

Predation Management Action 1- Northern Pikeminnow Management Program (NPMP)

The 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 this evaluation and adaptive management principles.

Predation Management Action 2—Develop Strategies to Reduce Non-Indigenous Fish

The Action Agencies will work with States and Tribes to coordinate the formation of a workshop to review, evaluate, and develop strategies to reduce non-indigenous piscivorous predation.

2.6.2 Predation Management Strategy 2—Implement Avian Predation Control Measures to Increase Survival of Juvenile Salmonids in the Lower Snake and Columbia Rivers

Predation Management Strategy 2: Implement avian predation control measures to increase survival of juvenile salmonids in the lower Snake and Columbia rivers.

Performance Standards: Caspian terns: phased reduction of Caspian tern nesting habitat on East Sand Island, from approximately 6.5 acres to 1.5 to 2 acres. Double-crested cormorants: reduce consumption rates of juvenile salmonids as determined by results of future investigations.

Funding Source(s): Corps' Columbia River Fish Mitigation Program funding. BPA – direct funding.

Rationale: Dispersing most of the Caspian tern population to locales outside of the Columbia River Basin will substantially reduce predation losses of juvenile salmonids in the Columbia River estuary and increase their escapement to the Pacific Ocean. Management efforts directed toward populations of double-crested cormorants nesting in the Columbia River estuary and in the mid-Columbia River and Caspian terns nesting in the mid-Columbia may further increase juvenile salmonid survival; further research is needed to address potential management actions for those populations of Caspian terns and double-crested cormorants.

What's New: Moving ahead with plans for dispersing most of the Caspian tern population to locales outside of the Columbia River Basin to substantially reduce predation losses in the Columbia River estuary. Management efforts directed toward populations of double-crested cormorants nesting in the Columbia River estuary and in the mid-Columbia River, and Caspian terns nesting in the mid-Columbia River.

Predation Management Action 3—Relocate Caspian Terns from East Sand Island in the Columbia River Estuary

The Action Agencies will carry out Caspian tern management actions within the western region (California and Oregon) to redistribute a majority of the Caspian terns from the Columbia River estuary. Alternative nesting locations are listed below (Table 2-10). Once alternative habitat alterations are complete, 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.

Table 2-10. Alternative Nesting Locations for Caspian Terns

Site	Acres	Proposed Year of Creation	Proposed Year in which Target Acreage is Achieved
Fern Ridge Lake	1	2007/2008	2007/2008
Summer Lake	1.5	2008	2008
Crump Lake	1	2009	2009
Brooks Island (San Francisco Bay)	2	2008/2009	2008/2009
Hayward Regional Shoreline (San Francisco Bay)	0.5	2008/2009	2008/2009
Don Edwards NWR (San Francisco Bay)	0.5-1	2009	2009

Predation Management Action 4— Double-Crested Cormorant

The Action Agencies will develop a cormorant management plan encompassing additional research, development of a conceptual management plan and implementation of actions if warranted in the estuary.

Predation Management Action 5— Inland Avian Predation

The Action Agencies will develop an avian management plan for Corps-owned lands and associated shallow-water habitat.

Predation Management Action 6— 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 FPOM and included in the FPP.

2.6.3 Predation Management Strategy 3—Implement Marine Mammal Control Measures to Increase Survival of Adult Salmonids at Bonneville Dam

Predation Management Strategy 3: Implement marine mammal control measures to increase survival of adult salmonids at Bonneville Dam.

Performance Standards: Reduced presence of marine mammals at Bonneville Dam.

Funding Source(s): Corps O&M and Columbia River Fish Mitigation Program funding.

Rationale: Studies estimate that between 0.5 and 2 percent of adult spring Chinook salmon have been consumed by sea lions; this consumption appears to be increasing due to increased sea lion activity/presence at Bonneville Dam.

What's New: Continued and expanded efforts to deter predation at and near Bonneville Dam.

Predation Management Action 7— 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 NMFS, Oregon Department of Fish and 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.

2.7 RESEARCH, MONITORING, AND EVALUATION (RM&E) ACTION SUMMARY

RM&E Action Objective for All ESUs:

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 overall RM&E objective is to provide information needed to support planning and adaptive management and demonstrate accountability related to the implementation of FCRPS ESA hydropower and offsite actions for all ESUs. The Action Agencies will undertake RM&E through project

implementation and compliance monitoring, status monitoring, action effectiveness research, and critical uncertainties research in the following nine areas:

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

Each of the nine areas is identified as a strategy in the following discussion. Each strategy consists of one or more specific actions. These are summarized in the following sections. A conceptual overview of the overall RM&E Action is presented in Figure 2-8. Additional discussion of the RM&E Action is provided in Appendix B, Section B.2.6.

The RM&E will address the following management questions related to FCRPS ESA actions:

- Are actions being implemented as proposed? (Addressed through Project Implementation and Compliance Monitoring)
- Are performance standards and targets for each ESA-listed ESU being achieved? What is the effectiveness of specific types of actions in addressing limiting factors? (Addressed through Status and Effectiveness Monitoring)
- Are there management questions or limiting factors that require further understanding? (Addressed through Critical Uncertainties Analysis)

The Actions have and will continue to be coordinated through regional RM&E processes and are also intended to be consistent with the NMFS' *RM&E Guidance for Recovery Planning and Delisting*.

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

- **Programmatic performance** will be tracked through project implementation and compliance monitoring.
- **Biological and environmental performance** will be tracked and evaluated through status monitoring, action effectiveness research, and critical uncertainty research in combination with existing and developing quantitative models. Performance standards will be monitored to ensure accountability and adherence to proposed actions. Biological performance targets will be evaluated over longer time periods as new information and learning is applied through analytical models. Targets allow us to check for progress toward expected life stage survival improvements and trends in evolutionarily significant unit (ESU) or population performance. Performance targets inform longer-term adaptive management decisions and prioritization of options across populations with different relative needs.

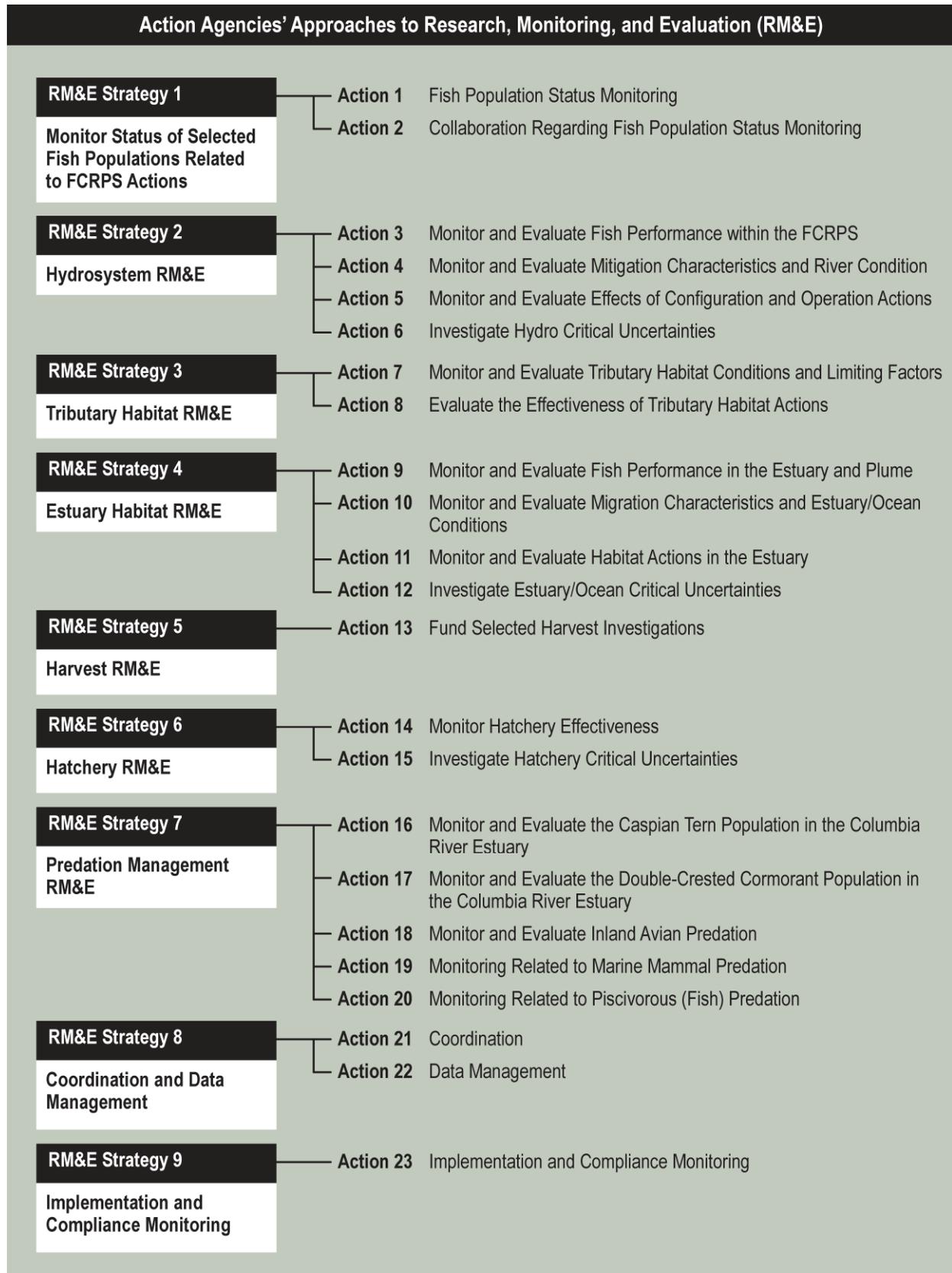


Figure 2-8. Research Monitoring and Evaluation (RM&E) Action Summary

Performance standards will be monitored frequently to ensure accountability and adherence to Actions with potential contingencies or other time critical corrective actions. Performance targets will be evaluated over longer time periods as new information and learning is applied through analytical models to check for progress toward expected life stage survival improvements and trends in population performance. Performance targets will inform longer-term adaptive management decisions and prioritization of options across populations with different relative needs.

The Action Agencies currently fund extensive RM&E programs for the FCRPS, totaling more than \$75 million per year. Implementation of these RM&E actions will continue to be coordinated through existing program project selection and funding processes including those of the Council and the Corps' Anadromous Fish Evaluation Program (AFEP). The RM&E actions described in the following will be funded within these programs. Accomplishing this goal will require balancing on-the-ground mitigation actions for fish benefits, with RM&E, and data management. This will require reprioritization of these new RM&E activities, with existing activities. RM&E funding might also be leveraged through cost-sharing arrangements with other Federal and State agencies.

2.7.1 RM&E Strategy 1—Monitor the Status of Selected Fish Populations Related to FCRPS Actions

RM&E Strategy 1: Monitor the status of selected fish populations related to FCRPS actions.

Funding Source(s): BPA Fish and Wildlife Program direct funding, Corps O&M and Columbia River Fish Mitigation Program, and Reclamation Congressional appropriations for Columbia/Snake River Salmon Recovery.

Rationale: Monitoring status of selected populations supports future examination of recovery and survival metrics and trends for All Hs, including actions by the FCRPS and others.

What's New: Review and potential modifications to increase focus and value for existing Action Agencies status monitoring, and expansion to address a critical deficiency in regional monitoring of Snake River B- Run Steelhead; strengthened commitments to collaboration.

Management Questions: The primary management questions regarding information on fish populations for the FCRPS to provide information to support future management decisions.

- What are the abundance, productivity, and spatial distribution of ESA-listed populations affected by the FCRPS?
- What is the proportion of ESA-listed populations that are of hatchery origin?

Approach: The Action Agencies will be using population performance information reported in the periodic population status reports from NMFS and in annual abundance estimates in the Columbia Basin Fish and Wildlife Authority's (CBFWA) State of the Resource reports to provide context for performance of FCRPS actions in aggregate with other regional actions and environmental conditions. The Action Agencies expect these status reports will continue to provide performance measures for trends in abundance and productivity and assessment of spatial diversity conditions.

The Action Agencies will also be funding specific status monitoring related to FCRPS actions. These projects are undergoing review and potential modifications to increase their focus and value for monitoring critical populations, and they are being expanded to address a critical deficiency in the regional monitoring of Snake River B-Run Steelhead.

See Table 8, Attachment B.2.6-1 for specific projects that are currently being implemented during the FY 2007 to FY 2009 period that contribute information to regional assessments of fish population status. Additional fish population status monitoring is also obtained as ancillary information under several projects listed under the hydrosystem, habitat, and hatchery project tables also in Attachment B.2.6-1.

Performance Measures: Population-specific performance measures include fish abundance, average recruits per spawner, lambda (annual population growth rate), abundance trends, and population viability extinction risks. The majority of these performance measures and associated monitoring actions are being implemented through the programs and mandated responsibilities of regional fish management agencies. A subset of these fish population performance measures are currently obtained from Action Agencies' funded projects.

RM&E Action 1—Fish Population Status Monitoring

The Action Agencies will enhance existing fish population status monitoring performed by fish management agencies through the specific actions listed below. In addition, ancillary population status and trend information is being obtained through several ongoing habitat and hatchery improvement projects (see project tables in B.2.6-1).

- Implement and maintain the Columbia River Basin PIT-tag information system. (Annually)
- Monitor adult returns at mainstem hydroelectric dams using both visual counts and the PIT-tag detection system (see Hydrosystem section). (Annually)
- Monitor juvenile fish migrations at mainstem hydro electric dams using smolt monitoring and the PIT-tag detection system (see Hydrosystem section). (Annually)
- Fund status and trend monitoring as a component of the pilot studies in the 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 to 2009 Project Funding)
- 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)
- 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)
- Fund marking of hatchery releases from Action Agencies funded facilities to enable monitoring of hatchery-origin fish in natural spawning areas and the assessment of status of wild populations. (Annually)
- Report available information on population viability metrics in annual and comprehensive evaluation reports. (Initiate in FY 2008)

RM&E Action 2—Collaboration Regarding Fish Population Status Monitoring

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

- Support the coordination, data management, and annual synthesis of fish population metrics through Regional Data Repositories and reports such as the CBFWA State of the Resource. (Annually)
- Facilitate and participate in an ongoing collaboration process to develop a regional strategy for status and trend monitoring for key ESA fish populations and an associated regional agreement

for joint funding and implementation. This monitoring strategy will be coordinated with the status monitoring needs and strategies being developed for hydrosystem, habitat, hatchery, harvest, and estuary/ocean. (Initiate in FY 2008)

- Provide cost-shared funding support and staff participation in regional coordination forums such as the 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)

2.7.2 RM&E Strategy 2—Hydropower RM&E

RM&E Strategy 2: Support performance monitoring and adaptive management related to hydropower actions.

Funding Source(s): Corps O&M and Columbia River Fish Mitigation Program funding. BPA – direct funding.

Rationale: Evaluating the effectiveness of hydro actions and critical uncertainties is a central feature of the FCRPS ESA responsibilities.

What's New: Additional actions that include PIT-tagging of Upper Columbia River Chinook Salmon and Steelhead and Snake River Sockeye Salmon, if feasible.

Management Questions: The following are the primary management questions with respect to FCRPS hydrosystem passage actions. Hydropower RM&E Actions described in this section are focused on providing information needed to answer these questions to support ongoing and adaptive management decisions.

- Are salmon and steelhead meeting juvenile and adult hydro passage performance standards and targets?
- Is each project in the hydropower system safely and efficiently passing adult and juvenile migrants?
- What are the most effective configurations and operations for achieving desired performance standards and targets in the FCRPS?
- What is the post-Bonneville mortality effect of changes in fish arrival timing and transportation to below Bonneville?
- Under what conditions does in-river passage provide greater SAR rates than transport?

See Table 1, Attachment B.2.6-1 for specific projects that have been currently identified for implementation in the FY 2007 to FY 2009 period to meet the actions for Hydropower RM&E. Additional, more detailed information supporting the identification of Hydropower RM&E actions is provided in Attachment B.2.6-2.

Performance Measures: The biological and environmental performance measures for hydropower are juvenile and adult system survival, juvenile dam passage survival, proportion of juveniles transported, fish and spillway passage efficiency, forebay behavior, tailrace egress, and total dissolved gas at fish passage projects. Performance standards have been set for average juvenile dam survival for run-of-river spring and summer migrants and adult hydrosystem survival.

Programmatic standards for the Hydro Actions have also been identified and will be annually monitored with project implementation monitoring. The expected increase in total juvenile system survival associated with the hydro actions has been set as a long-term performance target for each ESU. This performance target will be assessed in the future using the same modeling approach used to assess the benefit of Hydro Actions within the BA, but using actual operations and configurations in place at the time of the performance evaluation. These estimates will be based on the most recent fish passage research applied within the Comprehensive Fish Passage Model (COMPASS), calibrated and validated by recent years' empirical survival data.

RM&E Action 3—Monitor and Evaluate Fish Performance within the FCRPS

The Action Agencies will monitor the following biological responses and/or environmental attributes involved in passage through the hydrosystem, and report these estimates on an annual basis:

- Monitor and evaluate juvenile salmonid dam survival rates for a subset of FCRPS projects.
- Monitor and evaluate juvenile salmonid system survival through the FCRPS, including estimates of differential post-Bonneville survival of transported fish relative to in-river fish (D-value) as needed.
- Monitor and evaluate adult salmonid system survival upstream through the FCRPS.
- Provide additional PIT-tag marking of upper Columbia River populations to provide ESU specific estimates of juvenile and adult survival through the Federal mainstem dams.
- Assess the feasibility of PIT-tag marking of Snake River Sockeye Salmon for specific survival tracking of this ESU through the FCRPS.
- Develop an action plan for conducting hydrosystem status monitoring (analytical approaches, tagging needs, methods, and protocols) in ongoing collaboration with the State and Federal fishery agencies and Tribes. This will be done in coordination with status monitoring needs and strategies being developed for estuary/ocean, habitat, hatcheries, and harvest. (Initiate in FY 2009)

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 2-11.

Table 2-11. Minimum Adult Fish Counting Schedule

Dam	Duration of Operation	Duration of Counting	Hours of Count
Bonneville	January 1 - December 31	January 1 - December 31	04:00 - 20:00
The Dalles	February 20 – December 7	February 20 – December 7	04:00 - 20:00
John Day	February 20 – December 7	February 20 – December 7	04:00 - 20:00
McNary	March 1 – December 31	March 1 – December 31	04:00 - 20:00
Ice Harbor	March 1 – December 31	March 1 – March 31	06:00 - 16:00
		April 1 - October 31	04:00 - 20:00
L. 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 15	06:00 - 16:00

RM&E Action 4—Monitor and Evaluate Migration Characteristics and River Condition

The Action Agencies will monitor and evaluate the following biological and physical attributes of anadromous fish species migrating through the FCRPS, monitor on an annual basis:

- Monitor and estimate the abundance of smolts passing index dams.
- Monitor and describe the migration timing of smolts at index dams, identify potential problems, and evaluate implemented solutions.
- Monitor and document the condition (e.g., descaling, injury, gas bubble trauma) of smolts at index dams, identify potential problems, and evaluate implemented solutions.
- Monitor and enumerate adult salmonids passing through fishways in the FCRPS, identify potential problems, and evaluate implemented solutions.
- Monitor and describe the migration timing of adults at dams in the FCRPS, identify potential problems, and evaluate implemented solutions.
- Monitor and evaluate the TDG, temperature, turbidity, and flow at projects in the FCRPS relative to performance objectives.

RM&E Action 5—Monitor and Evaluate Effects of Configuration and Operation Actions

The Action Agencies will monitor and evaluate the numerous operations and configurations implemented at projects in the FCRPS identified below. These project evaluations will be conducted following modifications to configuration or operations. For project specific information on configurations or operational changes, see Section B.2.1 Hydropower Action.

- Monitor and evaluate the effects of existing spillways, modifications, and operations on smolt survival.
- Monitor and evaluate the effectiveness of traditional juvenile bypass systems and modifications to such, on smolt survival and condition.
- Monitor and evaluate the effectiveness of surface bypass structures and modifications on smolt survival and condition.
- Monitor and evaluate the effectiveness of turbine operations and modifications on smolt survival and condition.
- Monitor and evaluate overall dam passage with respect to modifications at projects.
- Monitor and evaluate the effectiveness of the juvenile fish transportation program and modifications to operations.
- Monitor and evaluate the effects of environmental conditions affecting juvenile fish survival.
- Monitor and evaluate the effectiveness of reducing predation towards improving juvenile fish survival.
- Investigate, evaluate and deploy alternative technologies and methodologies for fish passage and the RM&E Action.
- Determine if actions directed at benefiting juveniles have an unintended effect on migrating adults (e.g., certain spill operations).
- Install and maintain adult PIT-tag detectors in fish ladders at key dams in the FCRPS.
- Assess the feasibility of developing PIT-tag detectors for use in natal streams and tributaries as appropriate to support more comprehensive and integrated All-H monitoring designs and assessments of stray rates.
- Monitor and evaluate the effects of fish ladder operations and configurations on adult passage rates.

RM&E Action 6—Investigate Hydro Critical Uncertainties

The Action Agencies will fund selected research directed at resolving critical uncertainties that are pivotal in lifecycle model analyses. These specific actions include:

- Investigate and quantify delayed differential effects (D-value) associated with the transportation of smolts in the FCRPS as needed. (Initiate in FY 2007 to 2009 Projects)
- Investigate the post-Bonneville mortality effect of changes in fish arrival timing and transportation to below Bonneville. (Initiate in FY 2007 to 2009)
- Conduct a workshop every other year with members of the Independent Scientific Advisory Board (ISAB) to review current research and monitoring approaches on post Bonneville mortality for transported and non-transported fish. (Initiate in FY 2009)
- Investigate, describe and quantify key characteristics of the early life history of Snake River Fall Chinook Salmon in the mainstem Snake, Columbia, and Clearwater rivers. (Initiate in FY 2007 to 2009 Project)
- Investigate effects of adult passage experience in the FCRPS on pre-spawning mortality. (Initiate in FY 2009)

2.7.3 RM&E Strategy 3—Tributary Habitat RM&E

RM&E Strategy 3: Support performance monitoring and adaptive management related to Tributary Habitat Actions.

Funding Source(s): BPA – direct funding; Reclamation Columbia River Basin Salmon Recovery funding.

Rationale: Evaluating the effectiveness of habitat actions that are being implemented as offsite mitigation for dam effects is a central feature of the FCRPS ESA responsibilities.

What's New: Additional actions.

Management Questions: The following are the primary management questions with respect to tributary habitat offsite mitigation actions. The RM&E actions described in this section are focused on providing information needed to answer these questions to support ongoing and adaptive management decisions.

- Are Tributary Habitat Actions achieving the expected biological and environmental performance targets?
- What are the relationships between Tributary Habitat Actions and fish survival or productivity increases? What actions are most effective?
- What are the limiting factors or threats preventing the achievement of desired habitat or fish performance objectives?

See Table 2, Attachment B.2.6-1 for specific projects that have been currently identified for implementation in the FY 2007 to FY 2009 period to meet the Actions for Tributary RM&E. Additional, more detailed information supporting the identification of Tributary RM&E Actions is provided in Attachment B.2.6-3.

Performance Measures: Survival and productivity benefits for the aggregate of Tributary Habitat Actions that are expected to be implemented in the periods FY 2007 to 2009 and for FY 2010 to 2017

have been estimated for individual populations and will be used in future evaluations. These estimated tributary habitat benefits will provide the long-term biological performance targets for individual populations. In addition, potential changes in limiting factors and overall habitat condition resulting from habitat actions implemented within the two time periods have been estimated based on local biologist input.

Programmatic-level performance standards have been set for annual tracking of project implementation (linked to expected changes in limiting factors and their habitat) projected for the periods FY 2007 to 2009 and for FY 2010 to 2017, which were used to estimate the long-term survival benefits. RM&E will be used to confirm and improve our understanding of the relationships between different habitat actions, the environment and the survival and productivity performance measures. As this information is developed and relationships and models are updated, the Action Agencies will re-confirm the modeling estimates of expected survival improvements associated with Actions.

RM&E Action 7—Monitor and Evaluate Tributary Habitat Conditions and Limiting Factors

The Action Agencies will:

- Implement research in select areas of the pilot study basins (Wenatchee, Methow and Entiat river basins in the upper Columbia River, the Lemhi and South Fork Salmon river basins, and the John Day River Basin) to quantify the relationships between habitat conditions and fish productivity (limiting factors) to improve the development and parameterization of models used in the planning and implementation of habitat projects. These studies will be coordinated with the influence of hatchery programs in these habitat areas.
- 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 to 2009 Projects)
- 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 and an associated regional memorandum of understanding (MOU) for joint funding and implementation. 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)

RM&E Action 8—Evaluate the Effectiveness of Tributary Habitat Actions

The Action Agencies will evaluate the effectiveness of habitat actions through RM&E projects that support the testing and further development of relationships and models used for estimating habitat benefits. These evaluations will be coordinated with hatchery effectiveness studies.

- Action effectiveness pilot studies in the Entiat River Basin to study treatments to improve channel complexity and fish productivity. (Initiate in FY 2007 to 2009 Projects)
- Pilot study in the Lemhi River Basin to study treatments to reduce entrainment and provide better fish passage flow conditions. (Initiate in FY 2007 to 2009 Projects)
- 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 to 2009 Projects)
- Project and watershed level assessments of habitat, habitat restoration and fish productivity in the Wenatchee, Methow and John Day basins. (Initiate in FY 2007 to 2009 Projects)
- Incorporate research and monitoring results within existing or newly developed habitat relationships or models. (Initiate in FY 2008)

2.7.4 RM&E Strategy 4—Estuary and Ocean RM&E

RM&E Strategy 4: Support performance monitoring and adaptive management related to Estuary Habitat Actions.

Funding Source(s): BPA – direct funding; Corps appropriations through Section 536 of the WRDA of 1999 and Columbia River Fish Mitigation Program

Rationale: Evaluating the effectiveness of habitat actions that are being implemented as offsite mitigation for effects of dams is a central feature of the FCRPS ESA responsibilities.

What's New: Several new actions.

Management Questions: The estuary/ocean RM&E summarized here draws on the *Plan for Research, Monitoring and Evaluation of Salmon in the Columbia River Estuary* (Estuary/Ocean RM&E Subgroup 2004) and the *Research, Monitoring and Evaluation – Conceptual Framework Outline* (Sovereign Collaboration Group 2006). The following are the primary management questions with respect to Estuary Habitat Actions. The RM&E Actions described in this section are focused on providing information needed to answer these questions to support ongoing and adaptive management decisions.

- Are aquatic, riparian, and upland Estuary Habitat Actions achieving the expected biological and environmental performance targets?
- Are the offsite habitat actions in the estuary improving juvenile salmonid performance and which actions are most effective at addressing the limiting factors preventing achievement of habitat, fish, or wildlife performance objectives?
- What are the limiting factors or threats in the estuary/ocean preventing the achievement of desired habitat or fish performance objectives?

See Table 3, Attachment B.2.6-1 for specific projects that have been currently identified for implementation in the FY 2007 to 2009 period to meet the actions for Estuary and Ocean RM&E. Additional, more detailed information supporting the identification of Estuary and Ocean RM&E Actions is provided in Attachment B.2.6-4.

Performance Measures: Performance measures for the Columbia River estuary include reach survival, life history diversity, growth rates, and predation rates of juvenile salmonids and the bathymetry, topography, connectivity, and hydrology of estuary habitats. Survival benefits for actions implemented in the periods FY 2007 to 2009 and for FY 2010 to 2017 for Estuary Habitat Actions have been estimated for stream and ocean-type life histories and will be used in future evaluations based on methods discussed and developed in the Remand Collaboration Process. These estimated benefits provide the long-term performance targets.

Performance standards have also been set for annual tracking of project implementation projected for the periods FY 2007 to 2009 and for FY 2010 to 2017 used to estimate the long-term survival benefits. RM&E will be used to confirm and improve our understanding of the relationships between different estuary habitat actions, the environment and the survival and productivity performance measures. As this information is developed and relationships and models are updated, the Action Agencies will reconfirm the modeling estimates of expected survival improvements associated with actions.

RM&E Action 9—Monitor and Evaluate Fish Performance in the Estuary and Plume

The Action Agencies will monitor biological responses and/or environmental attributes, and report in the following areas:

- Monitor and evaluate smolt survival and/or fitness in select reaches from Bonneville Dam through the estuary. (Initiate in FY 2007 to 2009 Projects)
- Develop an index and monitor and evaluate life history diversity of salmonid populations at representative locations in the estuary. (Initiate in FY 2007 to 2009 Projects)
- Monitor and evaluate juvenile salmonid growth rates and prey resources at representative locations in the estuary and plume. (Initiate in FY 2007 to 2009 Projects)
- 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 to 2009 Projects)

RM&E Action 10—Monitor and Evaluate Migration Characteristics and Estuary/Ocean Conditions

The Action Agencies will monitor and evaluate selected ecological attributes of the estuary, which will include the following:

- Map bathymetry and topography of the estuary as needed for RM&E. (Initiate in FY 2007 to 2009 Projects)
- Establish a hierarchical habitat classification system based on hydro-geomorphology, ground-truth it with vegetation cover monitoring data, and map existing habitats. (Initiate in FY 2007 to 2009 Projects)
- Develop an index of habitat connectivity and apply it to each of the eight reaches of the study area. (Initiate in FY 2007 to 2009 Projects)
- Evaluate migration through and use of a subset of various shallow-water habitats from Bonneville Dam to the mouth towards understanding specific habitat use and relative importance to juvenile salmonids. (Initiate in FY 2007 to 2009 Projects)
- Monitor habitat conditions periodically, including water surface elevation, vegetation cover, plant community structure, primary and secondary productivity, substrate characteristics, dissolved oxygen, temperature, and conductivity, at representative locations in the estuary as established through RM&E. (FY 2007 to 2009 Projects)

RM&E Action 11—Monitor and Evaluate Habitat Actions in the Estuary

The Action Agencies will monitor and evaluate the effects of a representative set of habitat projects in the estuary, as follows:

- Develop a limited number of reference sites for typical habitats (e.g., tidal swamp, marsh, island, and tributary delta, to use in action effectiveness evaluations). (Initiate in FY 2007 to 2009 Projects)
- 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 to 2009 Projects)
- 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 controlling factors, structures, and processes affecting salmon habitats and performance. (Initiate in FY 2007 to 2009 Projects)

RM&E Action 12—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, including the following:

- Continue work to define the ecological importance of the tidal freshwater, estuary, plume, and nearshore ocean environments to the viability and recovery of listed salmonid populations in the Columbia River Basin.
- Continue work to define the causal mechanisms and migration/behavior characteristics affecting survival of juvenile salmon during their first weeks in the ocean.
- Investigate the importance of early life history of salmon populations in tidal freshwater of the lower Columbia River.
- Continue development of a hydrodynamic numerical model for the estuary and plume to support critical uncertainties investigations.

2.7.5 RM&E Strategy 5—Harvest RM&E

RM&E Strategy 5: Support performance monitoring and adaptive management related to Harvest Actions.

Funding Source(s): BPA – direct funding.

Rationale: Evaluating improved harvest actions that would allow more natural fish to spawning grounds is a feature of the FCRPS action.

What’s New: Additional action.

Management Questions: Key management questions related to FCRPS-sponsored harvest improvements are:

- What is the effect of acquiring more accurate and precise in-river harvest estimates on the resultant estimates of straying and adult passage survival?
- Can selective fisheries targeting hatchery fish or healthy populations reduce impacts on ESA-listed populations?

See Table 4, Attachment B.2.6-1 for specific projects that have been currently identified for implementation in the FY 2007 to 2009 period to meet the Actions for Harvest RM&E.

Performance Measures: No biological or environmental performance measures or targets for the FCRPS have been identified for Harvest Actions. The primary intent of the Harvest RM&E Action is to utilize the information gathered to support the overall Harvest Actions.

RM&E Action 13—Fund Selected Harvest Investigations

The Action Agencies will fund selected harvest investigations linked to FCRPS interests:

- Evaluate the feasibility of obtaining PIT-tag recoveries in Zone 6 to determine whether recoveries can help refine estimates of in-river harvest rates, upstream survival rates, and straying rates. For FY 2007, focus on a pilot to test the feasibility of PIT-tag recoveries in Zone 6 harvest (spring, summer, and fall Chinook salmon and summer steelhead). (Initiate in FY 2007 to 2009 Projects)

- Evaluate methods to develop or expand use of selective fishing methods and gear. (Initiate in FY 2007 to 2009 Projects)
- Evaluate post-release mortality rates for selected fisheries. (Initiate in FY 2007 to 2009 Projects)
- Support coded-wire tagging and coded-wire tag recovery operations that inform survival, straying, and harvest rates of hatchery fish by stock, rearing facility, release treatment, and location. (Initiate in FY 2007 to 2009 Projects)
- Investigate the feasibility of genetic stock identification monitoring techniques. (Initiate in FY 2007 to 2009 Projects)

2.7.6 RM&E Strategy 6—Hatchery RM&E

RM&E Strategy 6: Support performance monitoring and adaptive management related to Hatchery Actions.

Funding Source(s): BPA – direct funding

Rationale: Hatcheries provide central mitigation for FCRPS effects. Safety-net and conservation hatcheries and hatchery reforms funded by the Action Agencies should be evaluated within the framework of ESA recovery goals.

What's New: Additional actions and hatchery reforms benefiting ESA-listed fish.

Management Questions: The following are the primary management questions with respect to Hatchery Actions. Hatchery RM&E Actions are focused on providing information needed to answer these questions to support ongoing and adaptive management decisions.

- Are hatchery improvement programs and actions achieving the expected biological performance targets?
- What is the proportion and origin of hatchery fish within naturally spawning salmon and steelhead populations?
- Can hatchery reforms reduce the deleterious effects of artificial production on listed populations, thereby contributing to a reduction in extinction risk for affected natural populations?
- Can properly designed intervention programs using artificial production make a net positive contribution to recovery of listed populations?
- What is the reproductive success of hatchery fish spawning in the wild relative to the reproductive success of wild fish?

See Table 5, Attachment B.2.6-1 for specific projects that have been currently identified for implementation in the FY 2007 to 2009 period to meet the Actions for Hatchery RM&E. Additional, more detailed information supporting the identification of Hatchery RM&E Actions is provided in Attachment B.2.6-5.

Performance Measures: The primary performance measures for hatcheries involve implementation tracking and the qualitative ranking of the expected benefits of hatchery actions. The objectives of these actions include:

- Safety-net programs reduce extinction risk for target populations in Snake River Sockeye Salmon, Snake River Spring/Summer Chinook Salmon, Mid-Columbia River Steelhead, Lower Columbia River Steelhead, and Columbia River Chum Salmon ESUs.
- Conservation hatchery programs that increase the abundance of target populations in Snake River Spring/Summer Chinook Salmon, Snake River Fall Chinook Salmon, and Upper Columbia River Steelhead ESUs, thereby reducing the time to recovery.
- High-priority hatchery reform actions (i.e., those needed to address hatchery programs) that are considered major limiting factors by NMFS, result in improved abundance, productivity, diversity, and/or spatial structure of target populations.
- Future implementation of additional hatchery reforms identified through Columbia River Hatchery Scientific Review Group's hatchery review process, combined with use of BMPs at FCRPS hatchery facilities, improve abundance, productivity, diversity, and/or spatial structure of target populations, depending on the nature of the reform.

Effectiveness research will be used to help confirm and update our expectations of these benefits as new information becomes available as a result of the hatchery actions.

In addition to these qualitatively rated benefits and performance targets identified above, a more quantitative assessment approach has been included for the benefits associated with improved hatchery management practices. This assessment associates changes in management practices to a change from historic to current reproductive success of hatchery fish spawning in the wild. This change in reproductive success of hatchery fish and the number of hatchery spawning fish over time has been used to estimate a survival improvement for supplemented populations. Research on the current reproductive success of hatchery fish spawning in the wild will be used to help confirm these estimated benefits and update modeled population effects where needed.

Programmatic performance standards will be developed for BMPs that are being set for various hatcheries based on ongoing regional program reviews.

RM&E Action 14—Monitor Hatchery Effectiveness

The Action Agencies will continue to fund selected monitoring and evaluation of the effectiveness of Hatchery Actions. The evaluation of hatchery projects will be coordinated with the Tributary Habitat monitoring and evaluation program. These actions include:

- Determine the effect that safety-net and conservation hatchery programs have on the viability and recovery of the targeted populations of salmon and steelhead. (Initiate in FY 2007 to 2009 Projects)
- Determine the effect that implemented hatchery reform actions have on the recovery of targeted salmon and steelhead populations. (Initiate in FY 2007 to 2009 Projects)

RM&E Action 15—Investigate Hatchery Critical Uncertainties

The Action Agencies will continue to fund selected research directed at resolving artificial propagation critical uncertainties:

- Estimate the relative reproductive success of hatchery-origin salmon and steelhead compared to reproductive success of their natural-origin counterparts. (Initiate in FY 2007 to 2009 Projects)

- Determine if hatchery reforms reduce the deleterious effects of artificial production on listed populations, thereby contributing to a reduction of extinction risk for the affected natural populations. (Initiate in FY 2007 to 2009 Projects)
- Determine if properly designed intervention programs using artificial production make a net positive contribution to recovery of listed populations. (Initiate in FY 2007 to 2009 Projects)

2.7.7 RM&E Strategy 7—Predation Management RM&E

RM&E Strategy 7: Support performance monitoring and adaptive management related to predation management actions

Funding Source(s): BPA – direct funding; Corps O&M and Columbia River Fish Mitigation Program funding.

Rationale: Evaluating predation management actions is a key aspect of the FCRPS actions.

What's New: Additional actions including RM&E leading to development of a land management plan for avian predators.

Management Questions: The following are the primary management questions with respect to predation. Predation RM&E actions described in this plan are focused on providing information needed to answer these questions to support ongoing and adaptive management decisions.

- Are predation programs and actions achieving the expected biological performance targets?
- What are the impacts and consumption rates of major piscivorous, avian, and marine mammal predators on juvenile salmonids within the Columbia River Basin?
- What are the distributions, population sizes, and productivity for the major predators within the Columbia River Basin?
- Is there compensation occurring in reaction to predation reduction measures?
- What is the effect of alternative management alternatives/actions used to reduce the impact of predators? What are the most effective management alternatives/actions?

See Table 6, Attachment B.2.6-1 for specific projects that have been currently identified for implementation in the FY 2007 to 2009 period to meet the Actions for Predation RM&E.

Performance Measures: Estimates of juvenile fish survival improvements associated with changes in both piscivorous and avian predation have been identified for the periods FY 2007 to 2009 and for FY 2010 to 2017 for long-term performance targets for predation management. Performance standards have also been set for annual tracking of project implementation projected for the periods FY 2007 to 2009 and for FY 2010 to 2017. Research and monitoring on predator – prey relationships, predator exploitation rates, and resulting change in annual juvenile fish survival rates will be used to evaluate progress and achievement of expected survival improvements from Predation Actions.

The following RM&E actions address avian, fish, and marine mammal predation.

RM&E Action 16—Monitor and Evaluate the Caspian Tern Population in the Columbia River Estuary

The Action Agencies will monitor the tern population in the estuary and its impacts on outmigrating juvenile salmonids, as well as the effectiveness of the Caspian tern management plan. Specific actions include:

- Estimate annual Caspian tern predation rates on juvenile salmonids and the estimated change in juvenile salmonids survival rates. (Initiate in FY 2007 to 2009 Projects)
- Determine the size, habitat use, nesting success, and factors limiting the nesting success of the Caspian tern colony on East Sand Island. (Initiate in FY 2007 to 2009 Projects)
- Determine diet composition of Caspian terns nesting on East Sand Island.
- Detect the formation of tern colonies at other dredged-material disposal sites in the estuary. (Initiate in FY 2007 to 2009 Projects)
- Determine the accuracy of tern predation rates on salmonids based on smolt PIT-tag recoveries on colony. (Initiate in FY 2007 to 2009 Projects)
- Continue ongoing research to detect PIT-tags deposited on avian bird colonies in the estuary. (Initiate in FY 2007 to 2009 Projects)

RM&E Action 17—Monitor and Evaluate the Double-Crested Cormorant Population in the Columbia River Estuary

The Action Agencies will monitor the cormorant population in the estuary and its impacts on outmigrating juvenile salmonids in an effort to determine if management is warranted and to determine potential management techniques to decrease predation rates. Specific actions include:

- Estimate annual double-crested cormorant predation rates on juvenile salmonids and the estimated change in juvenile salmonids survival rates. (Initiate in FY 2007 to 2009 Projects)
- Determine the colony size, habitat use, nesting success and factors limiting nesting success of double-crested cormorants nesting on East Sand Island. (Initiate in FY 2007 to 2009 Projects)
- Determine diet composition of cormorants nesting on East Sand Island. (Initiate in FY 2007 to 2009 Projects)
- Determine the accuracy of cormorant predation rates on salmonids based on smolt PIT-tag recoveries on colony. (Initiate in FY 2007 to 2009 Projects)
- Determine the geographic boundaries of the Pacific Coast subspecies of double-crested cormorant so that the size of the population and management unit that includes the East Sand Island cormorant colony can be ascertained. (Initiate in FY 2007 to 2009 Projects)
- Determine the potential to use social attraction and habitat improvements to attract double-crested cormorants to alternative nesting locations. (Initiate in FY 2007 to 2009 Projects)
- Continue ongoing research to detect PIT-tags deposited on avian bird colonies in the estuary. (Initiate in FY 2007 to 2009 Projects)

RM&E Action 18—Monitor and Evaluate Inland Avian Predation

The Action Agencies will monitor avian predator populations in the Mid-Columbia River and evaluate their impacts on outmigrating juvenile salmonids in an effort to determine if management of the colonies is warranted and to determine potential management techniques to decrease predation rates. Specific actions include:

- Determine colony locations, size, and distribution, and habitat use and nesting success of avian predation on Corps-managed lands in the lower Snake and middle Columbia rivers towards developing a land management plan. (Initiate in FY 2007 to 2009 Projects)

- Determine diet composition and consumption of juvenile salmonids by inland avian predators (including terns nesting on Crescent Island and by cormorants nesting on Foundation Island). (Initiate in FY 2007 to 2009 Projects)
- Determine the effects of operational strategies on avian predation rates on juvenile salmon. (Initiate in FY 2007 to 2009 Projects)

RM&E Action 19—Monitoring Related to Marine Mammal Predation

The Action Agencies will:

- Estimate overall sea lion abundance immediately below Bonneville Dam. (Initiate in FY 2007 to 2009 Projects)
- Monitor the spatial and temporal distribution of sea lion predation attempts and estimate predation rates. (Initiate in FY 2007 to 2009 Projects)
- Monitor the effectiveness of deterrent actions (e.g., exclusion gates, acoustics, and harassment) and their timing of application on spring runs of anadromous fish passing Bonneville Dam. (Initiate in FY 2007 to 2009 Projects)

RM&E Action 20—Monitoring Related to Piscivorous (Fish) Predation

The Action Agencies will:

- Continue to update and estimate the cumulative benefits of sustained removals of northern pikeminnow since 1990. (Initiate in FY 2007 to 2009 Projects)
- Continue to evaluate if inter- and intra-compensation is occurring. (Initiate in FY 2007 to 2009 Projects)
- Evaluate the benefit of additional removals and resultant increase in exploitation rate's effect on reduction in predator mortality since the 2004 program incentive increase. (Initiate in FY 2007 to 2009 Projects)
- Develop a study plan to review, evaluate, and develop strategies to reduce non-indigenous piscivorous predation. (Initiate in FY 2007 to 2009 Projects)

2.7.8 RM&E Strategy 8—Coordination and Data Management RM&E

RM&E Strategy 8: Coordination and Data Management RM&E

Funding Source(s): BPA – direct funding; Corps appropriations; Reclamation appropriations.

Rationale: Because FCRPS RM&E is part of the overall RM&E for recovery of salmon in the Columbia River Basin, coordination and data management are tools to make this RM&E more effective.

The Action Agencies are committed to making coordination and data management more effective, since FCRPS RM&E is part of the overall RM&E for recovery of salmon in the Columbia River Basin.

See Table 7, Attachment B.2.6-1 for specific projects that have been currently identified for implementation in the FY 2007 to 2009 period for RM&E Coordination and Data Management.

RM&E Action 21—Coordination

The Action Agencies will coordinate RM&E activities with other Federal, State, and Tribal agencies on an ongoing annual basis, including:

- Organizing and supporting the Corps AFEP.
- Supporting and participating in the Council’s Columbia River Basin Fish and Wildlife Program project planning and review efforts.
- Supporting the standardization and coordination of tagging and monitoring efforts through participation and leadership in regional coordination forums such as PNAMP.
- Working with regional monitoring agencies to develop, cooperatively fund, and implement standard metrics, business practices, and information collection and reporting tools needed to cooperatively track and report on the status of regional fish improvement and fish monitoring projects.
- Coordinating the further development and implementation of Hydrosystem, Tributary Habitat, Estuary/Ocean, Harvest, Hatchery, and Predation RM&E through leadership and participation in ongoing collaboration and review processes and workgroups.
- Coordinating implementation with other appropriate regional collaboration processes. This includes coordination related to statutory provisions for the Federal government (BPA/Council), voluntary coordination among Federal agencies (Federal Caucus), and coordination with regional processes for Federal/non-Federal engagement (TMT, SCT, PNAMP, NED, and others).

RM&E Action 22—Data Management

The Action Agencies will ensure that the information obtained under the auspices of the FCRPS RM&E Program is archived in appropriate data management systems. Actions include:

- Continue to work with regional Federal, State and Tribal agencies to establish a coordinated and standardized information system network to support the RM&E program and related performance assessments. The coordination of this development will occur primarily through leadership, participation, and joint funding support in regional coordination forums such as the NED workgroup, and PNAMP and the ongoing RM&E pilot studies in the Wenatchee River, John Day River, upper Salmon River, and Columbia River Estuary. (Initiate in FY 2007 to 2009 Projects)
- Contribute funding for data system components that support the information management needs of individual Hydrosystem, Tributary Habitat, Estuary/Ocean, Harvest, Hatchery, and Predation RM&E. (Initiate in FY 2007 to 2009 Projects)
- Participate in Northwest regional coordination and collaboration efforts such as the current PNAMP and NED efforts to develop and implement a regional management strategy for water, fish, and habitat data. (Initiate in FY 2007 to 2009 Projects).

2.7.9 RM&E Strategy 9—Project Implementation and Compliance Monitoring

RM&E Strategy 9: Project implementation and Compliance Monitoring

Funding Source(s): BPA – direct funding; Corps appropriations; Reclamation appropriations.

Rationale: Regular tracking of implementation commitments is essential to accountability.

The Action Agencies have identified specific commitments or actions for each of our hydrosystem, estuary/ocean, tributary habitat, hatchery, and predation control strategies, providing clear programmatic-level measures for evaluating progress, subject of course to adaptive management. The Action Agencies will update these implementation details in 3-year cycles. Projects will be monitored for implementation of planned deliverables and compliance to performance expectations.

RM&E Action 23— Implementation and Compliance Monitoring

- The Action Agencies will annually monitor the successful implementation of projects through standard procedures and requirements of contract oversight and management, and review of project deliverables and final reports.
- The Action Agencies will 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.

2.8 PROPOSED REASONABLE AND PRUDENT ALTERNATIVE TABLE

The FCRPS projects are operated for multiple purposes including fish and wildlife, flood control, irrigation, navigation, power, and recreation. The Proposed RPA focuses on actions that support listed species; other actions associated with multipurpose operations (that are also part of the Proposed RPA) are as described in Appendix B unless specifically amended in the following table.

Proposed Reasonable and Prudent Alternative Table

ADAPTIVE MANAGEMENT ACTIONS

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
1	<p>Implementation Plans The Corps, BPA, and Reclamation will collectively submit to NMFS <u>Action Implementation Plans</u> by the end of December 2009, December 2012, and December 2015 that detail commitments to implement actions during the subsequent 2-3 years. Specifically, the Action Implementation Plans will describe the tributary and estuary habitat actions that will be funded during the 2010-2012, 2013-2015, and 2016-2017 periods. The Action Implementation Plans will also detail any changes in hydro, predation management, hatchery, or RM&E RPA actions from the actions described in the BA for each time period. This information will assist NMFS in determining if the RPA is being implemented as identified in this BA or, conversely, if re-initiation triggers defined in 50 CFR 402.16 have been exceeded.</p>	Implementation Plans will be submitted to NMFS in December 2009, December 2012, and December 2015.
2	<p>Annual Progress Reports The Corps, BPA, and Reclamation will submit to NMFS <u>Annual Progress Reports</u> in September of all years except 2012, and 2015. The reports will cover operations for the previous calendar year. These Annual Progress reports will describe the status of implementing all actions as of the end of the previous calendar year. For example, the 2009 RPA Progress report will describe the status of actions through December 2008. In addition to RPA action implementation status, the Annual Progress Reports will describe the status of physical or biological metrics monitoring (as described in the RM&E). This information will assist NMFS in determining if the RPA is being implemented as anticipated in this BA or, conversely, if re-initiation triggers defined in 50 CFR 402.16 have been exceeded.</p>	Annual Progress Reports will be submitted to NMFS in September 2009 through 2017, except in 2012 and 2015. In 2012 and 2015, progress reports will be part of the Comprehensive Evaluation Reports.
3	<p>Comprehensive RPA Evaluations The Corps, BPA, and Reclamation will submit to NMFS <u>Comprehensive RPA Evaluation</u> of multi-year implementation activities by the end of June 2012, and June 2015. 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 the BA or modified in the Implementation Plans in 2009, 2012 and 2015. The Comprehensive Evaluations will also describe the status of the physical and biological factors identified in this BA, and compare these with the expectations in the survival improvements identified in the Comprehensive Analysis. The Comprehensive Evaluation will include a discussion of 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 BA. This information will assist NMFS in determining if the RPA is being implemented as anticipated in this BA or, conversely, if re-initiation triggers defined in 50 CFR 402.16 have been exceeded.</p>	Comprehensive RPA Evaluation Reports will be submitted to NMFS in June 2012 and June 2015.

HYDRO ACTIONS

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
<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"> • <i>Hydropower Strategy 1— Operate the FCRPS to more closely approximate the shape of the natural hydrograph and to enhance flows and water quality to improve juvenile and adult fish survival</i> • <i>Hydropower Strategy 2— Modify Columbia and Snake River dams to maximize juvenile and adult fish survival</i> • <i>Modify Columbia and Snake River dams to achieve biological and water quality performance standards</i> • <i>Hydropower Strategy 3— Implement spill and juvenile transportation improvements at Columbia River and Snake River dams</i> • <i>Hydropower Strategy 4— Operate and maintain facilities at Corps mainstem projects to maintain biological performance</i> <p><i>Each strategy consists of one or more specific actions. These are summarized in the following sections.</i></p>		
<p>Hydropower Strategy 1—Operate the FCRPS to More Closely Approximate the Shape of the Natural Hydrograph and to Enhance Flows and Water Quality to Improve Juvenile and Adult Fish Survival</p>		
<p>1</p>	<p>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. 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.</p>	<p>Implementation Plans</p> <ul style="list-style-type: none"> • Plan for the operations of storage projects will be described in the Annual Water Management Plan. <p>Annual Compliance Progress Report</p> <ul style="list-style-type: none"> • Annual progress reports will describe MOP operations at the Lower Snake River projects and John Day elevations for the fish passage season. There is no other physical or biological monitoring or reporting. <p>2012 and 2015 Comprehensive RPA Evaluation Report</p> <ul style="list-style-type: none"> • Comprehensive Evaluation Report will summarize MOP operations at the Lower Snake River projects and John Day elevations for the fish passage season. There is no other physical or biological monitoring or reporting.

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

Storage Project	Operation
Dworshak	<ul style="list-style-type: none"> • Operate to standard flood control criteria; shift system flood control to Grand Coulee in below average water years, when possible. • When not operating to minimum flows, operate to reaching the upper flood control rule curve on or about April 10 (the exact date to be determined during in-season management) to increase flows for spring flow management. • Provide minimum flows while not exceeding Idaho State Total Dissolved Gas (TDG) water quality standard of 110 percent. • Refill by about June 30. • Draft to elevation 1535 feet by the end of August and elevation 1520 feet (80 feet from full) by the end of September unless modified per the Agreement between the U.S. and the Nez Perce Tribe for water use in the Dworshak Reservoir. • Regulate outflow temperatures to attempt to maintain water temperatures at Lower Granite tailwater at or below the water quality standard of 68° F. • Maximum project discharge for salmon flow augmentation to be within state of Idaho TDG water quality standards of 110 percent.
Libby	<ul style="list-style-type: none"> • Follow VARQ¹ (variable outflow) flood control procedures. • Follow variable December 31 flood control draft based on early season water supply forecast. • Operate consistent with the Columbia River Treaty, and the International Joint Commission and the 1938 Order on Kootenay Lake. • When not operating to minimum flows, operate to achieve 75 percent chance of reaching the upper flood control rule curve on or about April 10 (the exact date to be determined during in-season management) to increase flows for spring flow management. • Operate to provide tiered white sturgeon augmentation volumes to achieve habitat attributes for sturgeon spawning/recruitment consistent with the 2006 U.S. Fish and Wildlife Service (USFWS) Biological Opinion (BiOp) in May, June and July; shaped in coordination with Regional Forum TMT. • To provide for summer flow augmentation, refill by early July (exact date to be determined in-season), determined by available water supply and shape and spring flow operations, while also avoiding involuntary spill and meeting flood control objectives. • Provide even or gradually declining flows following sturgeon flows during the summer months (minimize double peak) as determined through TMT in-season management. • Experimental draft to 10 feet from full by the end of September (except in lowest 20th percentile water years, as measured at The Dalles, when draft will increase to 20 feet from full by end of September). If project fails to refill to draft limit, release inflows or operate to meet minimum flows. Rationale for the experimental draft was adopted by the Northwest Power and Conservation Council (Council) and further details of the evaluation follow in this section of the Biological Assessment (BA). Meet minimum flow requirements for bull trout from May 15 to September 30 as described in the USFWS 2006 Libby BiOp and 4,000 cubic feet per second (cfs) in October through April for resident fish. • Limit spill to avoid exceeding Montana State TDG standard of 110 percent, when possible, and in a manner consistent with the Action Agencies’ responsibilities for ESA-listed resident fish. • Limit outflow fluctuations by operating to ramping rates set in the 2006 USFWS BiOp to avoid stranding bull trout.

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

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

Storage Project	Operation
Grand Coulee	<ul style="list-style-type: none"> • Use standard flood control criteria including adjustments for flood control shifts from Dworshak and Brownlee. • Operate to achieve 85 percent probability of reaching upper rule curve (URC) elevation by about April 10. • Refill by about June 30 each year (exact date to be determined during in-season management). • Take advantage of reservoir draft for flood control during high water years to perform drum gate maintenance. Drum gate maintenance may be deferred in some dry water years; however, drum gate maintenance must occur at a minimum one time in a 3-year period, two times in a 5-year period, and three times in a 7-year period. • Draft to meet salmon flow objectives during July-August with variable draft limit of 1278 to 1280 feet by August 31 based on the water supply forecast. Future evaluation of this element may be accomplished as discussed in this BA. • Reduce pumping into Banks Lake and allow Banks Lake to operate up to 5 feet from full pool (elevation 1565) during August to help meet salmon flow objectives when needed. • If the Lake Roosevelt drawdown component of Washington’s Columbia River Water Management Program (CRWMP) is implemented, it will not reduce flows during the salmon flow objective period (April to August). The metric for this is that Lake Roosevelt will be drafted by an additional 1.0 foot in non-drought years and by about 1.8 feet in drought² years by the end of August. A third of this water will go to in-stream flows. A more detailed description of this element is provided in this section of the FCRPS BA.³ • May be used to help meet tailwater elevations below Bonneville Dam to support chum spawning and incubation. • Operate to help meet Priest Rapids flow objective to support fall Chinook salmon spawning and incubation. • Operate to minimize TDG production.
Hungry Horse	<ul style="list-style-type: none"> • Follow VARQ flood control procedures.⁴ • Maintain minimum flows all year for bull trout with a sliding scale based on the forecast. Operate to meet minimum flows of 3200-3500 cfs at Columbia Falls on the mainstem Flathead River and 400-900 cfs in the South Fork Flathead River. • When not operating to minimum flows, operate to achieve 75 percent probability of reaching URC elevation by about April 10. • Refill by about June 30 each year (exact date to be determined during in-season management). • Experimental draft during July-September to a draft limit of 3550 feet (10 feet from full) by September 30, except in the driest 20 percentile of water conditions limit draft to 3540 feet (20 feet from full) when needed to meet lower Columbia flow augmentation objectives, If don’t refill to the draft limit pass inflows or operate to meet minimum flows. Rationale for the experimental draft was adopted by the Council and further details of the evaluation are provided in the BA. • Provide even or gradually-declining flows during summer months (minimize double peak). • Limit spill to maximum of 15 percent of outflow to avoid exceeding Montana State TDG standards of 110 percent to the extent possible. • Limit outflow fluctuations by operating to ramping rates set in 2006 USFWS BiOp to avoid stranding bull trout.

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

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

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

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

Storage Project	Operation
Albeni Falls	<ul style="list-style-type: none">• Operate to standard flood control criteria.• Operate to provide Lake Pend Oreille shoreline spawning conditions for kokanee (winter pool levels of 2055 feet or 2051 feet elevation) determined through interagency coordination per USFWS BiOp of 2000.• Interagency coordination of winter pool levels for kokanee in consideration of spawning and incubation needs for lower Columbia River chum salmon.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
<p>Hydropower Strategy 1—Operate the FCRPS to More Closely Approximate the Shape of the Natural Hydrograph and to Enhance Flows and Water Quality to Improve Juvenile and Adult Fish Survival</p>		
<p>2</p>	<p>Lower Columbia and Snake River Operations The Action Agencies will operate the FCRPS run-of-river mainstem lower Columbia River and Snake River projects (Bonneville, The Dalles, John Day, McNary, Ice Harbor, Lower Monumental, Little Goose and Lower Granite projects) to minimize water travel time through the lower Columbia and Snake rivers to aid in juvenile fish passage as defined below. These projects are operated for multiple purposes including fish and wildlife, irrigation, navigation, power, recreation, and limited flood control. The following description primarily identifies operations that are designed to benefit listed anadromous species.</p> <ul style="list-style-type: none"> • 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. • Except for the John Day Project, the Lower Columbia River projects (Bonneville, The Dalles, and McNary) will be operated at normal operating range for each project. John Day Reservoir will be operated at the lowest elevation (elevation 262.5 to 264.0) (with a 1.5-foot operating range) that continues to allow irrigation withdrawals from April 10 through September 30. Slight deviations from these levels, based on navigation needs, load following, and operational sensitivity, may be required on occasion. • These run-of-river operations will be included in the annual WMP. 	<p><u>Implementation Plans</u></p> <ul style="list-style-type: none"> • Plan for the operations of run-of-river mainstem projects will be described in the Annual Water Management Plan. <p><u>Annual Compliance Progress Report</u></p> <ul style="list-style-type: none"> • Annual progress reports will describe MOP operations at the Lower Snake River projects and John Day elevations for the fish passage season. There is no other physical or biological monitoring or reporting. <p><u>2012 and 2015 Comprehensive RPA Evaluation Report</u></p> <ul style="list-style-type: none"> • Comprehensive Evaluation Report will summarize MOP operations at the Lower Snake River projects and John Day elevations for the fish passage season. There is no other physical or biological monitoring or reporting.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
<p>Hydropower Strategy 1—Operate the FCRPS to More Closely Approximate the Shape of the Natural Hydrograph and to Enhance Flows and Water Quality to Improve Juvenile and Adult Fish Survival</p>		
<p>3</p>	<p>In-Season Water Management Prioritization of the use of flow augmentation water is done through in-season management. 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 this document 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.</p>	<p>Implementation Plans</p> <ul style="list-style-type: none"> • Annual Water Management Plan and seasonal updates. <p>Annual Progress Report</p> <ul style="list-style-type: none"> • Annual progress reports will describe FCRPS operations for the fish passage season. There is no other physical or biological monitoring or reporting. <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> • Comprehensive Evaluation Report will summarize FCRPS operations for the fish passage season. There is no other physical or biological monitoring or reporting.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
<p>Hydropower Strategy 1—Operate the FCRPS to More Closely Approximate the Shape of the Natural Hydrograph and to Enhance Flows and Water Quality to Improve Juvenile and Adult Fish Survival</p>		
<p>4</p>	<p>Forecasting 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.</p>	<p><u>Implementation Plans</u></p> <ul style="list-style-type: none"> • There is no implementation plans for annual reviews. If new procedures become available, this will be reported in the 2009, 2012 or 2015 Implementation Plans. <p><u>Annual Progress Report</u></p> <ul style="list-style-type: none"> • Annual progress reports will summary of the annual reviews. There is no other physical or biological monitoring or reporting. <p><u>2012 and 2015 Comprehensive RPA Evaluation Reports</u></p> <ul style="list-style-type: none"> • Comprehensive Evaluation Report will summarize annual review process and identify any new procedures that become available. There is no other physical or biological monitoring or reporting.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
<p>Hydropower Strategy 1—Operate the FCRPS to More Closely Approximate the Shape of the Natural Hydrograph and to Enhance Flows and Water Quality to Improve Juvenile and Adult Fish Survival</p>		
<p>5</p>	<p>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 in the Fish Passage Plan (FPP) and other appropriate Action Agencies emergency procedures. The Action Agencies will take all reasonable steps to limit the duration of any emergency impacting fish.</p>	<p><u>Implementation Plans</u></p> <ul style="list-style-type: none"> TMT emergency protocols identified in the Annual Water Management Plan and other appropriate Action Agencies emergency procedure documents. <p><u>Annual Progress Report</u></p> <ul style="list-style-type: none"> 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. <p><u>2012 and 2015 Comprehensive RPA Evaluation Report</u></p> <ul style="list-style-type: none"> Comprehensive Evaluation Report will summarize any emergency situations and actions taken. There is no other physical or biological monitoring or reporting.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
<p>Hydropower Strategy 1—Operate the FCRPS to More Closely Approximate the Shape of the Natural Hydrograph and to Enhance Flows and Water Quality to Improve Juvenile and Adult Fish Survival</p>		
<p>6</p>	<p>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 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 emergency.</p>	<p>Implementation Plans</p> <ul style="list-style-type: none"> Fish emergencies will be included in the THT emergency protocols and other appropriate Action Agency emergency procedure documents. <p>Annual Progress Report</p> <ul style="list-style-type: none"> Annual progress reports will describe any fish emergency situations and actions taken. There is no other physical or biological monitoring or reporting. <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> Comprehensive Evaluation Report will summarize any emergency situations and actions taken. There is no other physical or biological monitoring or reporting.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
<p>Hydropower Strategy 1—Operate the FCRPS to More Closely Approximate the Shape of the Natural Hydrograph and to Enhance Flows and Water Quality to Improve Juvenile and Adult Fish Survival</p>		
<p>7</p>	<p>Columbia River Treaty Storage BPA and the Corps will pursue negotiations with Canada of annual agreements to provide 1 MAF of storage in Treaty space by April 15 consistent with:</p> <ul style="list-style-type: none"> • Providing the greatest flexibility possible for releasing water to benefit U.S. fisheries May through July; • Giving preference to meeting April 10 upper rule curve elevation or achieving refill at Grand Coulee Dam over flow augmentation storage in Canada in lower water supply conditions; and • Releasing flow augmentation storage to avoid causing damaging flow or excessive TDG in the United States or Canada. <p>BPA and the Corps will coordinate with Federal agencies, States and Tribes on Treaty operating plans.</p>	<p>Implementation Plans</p> <ul style="list-style-type: none"> • BPA and the Corps will pursue negotiations annually with Canada prior to the fish passage season. <p>Annual Progress Report</p> <ul style="list-style-type: none"> • Annual progress reports will describe actions taken to provide 1 MAF of storage in Treaty space. There is no other physical or biological monitoring or reporting. <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> • Comprehensive Evaluation Report will summarize actions taken to provide 1 MAF of storage in Treaty space. There is no other physical or biological monitoring or reporting.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
<p>Hydropower Strategy 1—Operate the FCRPS to More Closely Approximate the Shape of the Natural Hydrograph and to Enhance Flows and Water Quality to Improve Juvenile and Adult Fish Survival</p>		
<p>8</p>	<p>Non-Treaty Storage (NTS) BPA, in concert with BC Hydro, will refill the remaining non-Treaty storage space by June 30, 2011, as required under the 1990 non-Treaty storage agreement. Refill will be accomplished with minimal adverse impact to fisheries operations, to the extent possible.</p>	<p><u>Implementation Plans</u></p> <ul style="list-style-type: none"> BPA will manage refill obligations consistent with the 1990 non-Treaty storage agreement. <p><u>Annual Progress Report</u></p> <ul style="list-style-type: none"> Annual progress reports will describe actions taken to refill non-Treaty storage space. There is no other physical or biological monitoring or reporting. <p><u>2012 Comprehensive RPA Evaluation Report</u></p> <ul style="list-style-type: none"> Comprehensive Evaluation Report will summarize actions taken to refill the remaining non-Treaty storage space by June 30, 2011. There is no other physical or biological monitoring or reporting. <p><u>2015 Comprehensive RPA Evaluation Report</u></p> <ul style="list-style-type: none"> Action completed. No reporting.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
<p>Hydropower Strategy 1—Operate the FCRPS to More Closely Approximate the Shape of the Natural Hydrograph and to Enhance Flows and Water Quality to Improve Juvenile and Adult Fish Survival</p>		
<p>9</p>	<p>Non-Treaty Long-Term Agreement BPA will seek to negotiate a new long-term agreement on use of non-Treaty space in Canada so long as such an agreement provides both power and non-power benefits for BC Hydro, BPA, and Canadian and U.S. interests. As part of these negotiations, BPA will seek opportunities to provide benefits to ESA-listed fish, consistent with the Treaty. 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.</p>	<p>Implementation Plans</p> <ul style="list-style-type: none"> Following refill of the non-Treaty space under the 1990 agreement, and in coordination with U.S. agencies, states, and Tribes, BPA will pursue negotiation of a long-term agreement contingent on BC Hydro's interest. <p>Annual Progress Report</p> <ul style="list-style-type: none"> 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. <p>2012 Comprehensive RPA Evaluation Report</p> <ul style="list-style-type: none"> Comprehensive Evaluation Report will summarize actions taken to refill the remaining non-Treaty storage space by June 30, 2011. There is no other physical or biological monitoring or reporting. <p>2015 Comprehensive RPA Evaluation Report</p> <ul style="list-style-type: none"> Action completed. No reporting.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
<p>Hydropower Strategy 1—Operate the FCRPS to More Closely Approximate the Shape of the Natural Hydrograph and to Enhance Flows and Water Quality to Improve Juvenile and Adult Fish Survival</p>		
<p>10</p>	<p>Non-Treaty Coordination with Federal Agencies, States, and Tribes Prior to negotiations of new long-term or annual non-Treaty storage agreements, BPA will coordinate with Federal agencies, States, and Tribes to obtain ideas and information on possible points of negotiation, and will report on major developments during negotiations.</p>	<p><u>Implementation Plans</u></p> <ul style="list-style-type: none"> • Prior to negotiation of a long-term agreement, BPA will meet with U.S. agencies, states, and Tribes to solicit input. <p><u>Annual Progress Report</u></p> <ul style="list-style-type: none"> • Annual progress reports will describe actions to coordinate non-Treaty storage agreements. There is no other physical or biological monitoring or reporting. <p><u>2012 and 2015 Comprehensive RPA Evaluation Reports</u></p> <ul style="list-style-type: none"> • Comprehensive Evaluation Report will summarize actions to coordinate non-Treaty storage agreements. There is no other physical or biological monitoring or reporting.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
<p>Hydropower Strategy 1—Operate the FCRPS to More Closely Approximate the Shape of the Natural Hydrograph and to Enhance Flows and Water Quality to Improve Juvenile and Adult Fish Survival</p>		
<p>11</p>	<p>Dry Water Year Operations Flow management during dry years is often critical to maintaining and improving habitat conditions for ESA-listed species. A dry water year is defined as the lowest 20th percentile years based on the Northwest River Forecast Center’s (NWRFC) averages for their statistical period of record (currently 1971 to 2000) using the May final water supply forecast for the April to August period as measured at The Dalles. The Action Agencies propose the following activities to further the continuing efforts to address the dry flow years:</p> <ul style="list-style-type: none"> • Within the defined “buckets” of available water (reservoir draft limits identified in Action 1), 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. 	<p>Implementation Plans</p> <ul style="list-style-type: none"> • Dry water year operations will be described in the Annual Water Management Plan and seasonal updates. <p>Annual Progress Report</p> <ul style="list-style-type: none"> • Annual progress reports will describe actions taken during dry water years. There is no other physical or biological monitoring or reporting. <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> • Comprehensive Evaluation Report will summarize actions taken during dry water years. There is no other physical or biological monitoring or reporting.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
<p>Hydropower Strategy 1—Operate the FCRPS to More Closely Approximate the Shape of the Natural Hydrograph and to Enhance Flows and Water Quality to Improve Juvenile and Adult Fish Survival</p>		
	<p>Dry Water Year Operations (continued)</p> <ul style="list-style-type: none"> • Upon issuance of the FCRPS BiOp, 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 <i>Guide to Tools and Principles for a Dry Year Strategy</i> to reduce the effect energy needs may pose to fish operations and other project purposes. 	
12	<p>Water Quality Plan for Total Dissolved Gas and Water Temperature in the Mainstem Columbia and Snake Rivers</p> <p>The Action Agencies will continue to update the <i>Water Quality Plan for Total Dissolved Gas and Water Temperature in the Mainstem Columbia and Snake Rivers</i> (WQP) and implement water quality measures to enhance ESA-listed juvenile and adult fish survival and mainstem spawning and rearing habitat. The WQP is a comprehensive document which contains water quality measures needed to meet both ESA and Clean Water Act responsibilities. For purposes of this RPA, the WQP will include the following measures to address TDG and water temperature to meet ESA responsibilities:</p> <ul style="list-style-type: none"> • Real-time monitoring and reporting of TDG and temperatures measured at fixed monitoring sites, • Continued development of fish passage strategies with less production of TDG (e.g., removable spillway weirs [RSWs]), • Continued development and use of SYSTDG model for estimating TDG production to assist in real-time decision making, • Continued development of the CE-QUAL-W2 model for estimating river temperatures to assist in real-time decision making for Dworshak Dam operations, and • Continued operation of lower Snake River projects at MOP. 	<p>Implementation Plans</p> <ul style="list-style-type: none"> • The Water Quality Plan for Total Dissolved Gas and Water Temperature in the Mainstem Columbia and Snake Rivers (WQP) will be updated periodically and described in the 2009, 2012 and 2015 Implementation Plans. <p>Annual Progress Report</p> <ul style="list-style-type: none"> • Annual progress reports will describe actions taken to implement actions for ESA commitments. There is no other physical or biological monitoring or reporting. <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> • Comprehensive Evaluation Report will summarize actions taken to implement actions for ESA commitments. There is no other physical or biological monitoring or reporting.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
<p>Hydropower Strategy 1—Operate the FCRPS to More Closely Approximate the Shape of the Natural Hydrograph and to Enhance Flows and Water Quality to Improve Juvenile and Adult Fish Survival</p>		
<p>13</p>	<p>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 NMFS in a timely manner to complete supplemental, project-specific consultations for these tributary projects. These supplemental consultations will address effects on tributary habitat and tributary water quality, as well as direct effects on salmon survival in the tributaries. The supplemental consultations will address effects on mainstem flows only to the extent to which they reveal additional effects on the in-stream flow regime not considered in the FCRPS and Upper Snake River BA/Comprehensive Analysis.</p> <p>Reclamation submitted a BA on the Yakima Project and is currently preparing updates to this document. Reclamation is expected to complete a BA for the Tualatin Project by fall of 2007. Reclamation is preparing a BA for the Okanogan projects, which will be provided in draft form to the Okanogan Irrigation District and the Confederated Colville Tribes in August 2007. Following a coordinated review, the BA will be finalized and transmitted to NMFS.</p>	<p>Annual Progress Report</p> <ul style="list-style-type: none"> • Status of the consultations will be provided in the annual progress reports.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival⁵		
<i>Once the Action Agencies meet hydrosystem performance standards, they will move from detailed actions to maintenance of the performance standard, subject to regular monitoring to ensure continued performance. The choice of tools needed to maintain performance will be at the discretion of the Action Agencies.</i>		
14	<p>Configuration and Operational Plan for Bonneville Project The Corps will prepare a Configuration and Operational Plan for the Bonneville Project (2007). As part of the first phase of modifications, the Corps will include the following:</p> <p>Bonneville Powerhouse I</p> <ul style="list-style-type: none"> • 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) <p>Bonneville Powerhouse II</p> <ul style="list-style-type: none"> • 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) <p>Bonneville Dam Spillway</p> <ul style="list-style-type: none"> • 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) <p>The COP will be updated periodically and modifications may be altered as new biological and engineering information is gathered. Modifications will be coordinated through the Regional Forum. If Phase I actions fail to meet the intended biological targets, Phase II actions will be considered for further implementation.</p>	<p>Implementation Plans</p> <ul style="list-style-type: none"> • The initial COP for Bonneville Dam has been completed. The COP will be updated periodically, and the current version will be referenced in the 2009, 2012 and 2015 implementation plans. Specific Phase 1 actions will be addressed in these plans. <p>Annual Progress Report</p> <ul style="list-style-type: none"> • Annual progress reports will describe status of the actions taken in the COP and the results of the associated RM&E. <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> • Comprehensive Evaluation Report will summarize actions taken and the results of the associated RM&E. The Report will also include an analysis of the biological effectiveness of the actions taken to meet the dam passage survival performance standard.

⁵ Dates shown are scheduled planning dates for completion.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival⁵		
<i>Once the Action Agencies meet hydrosystem performance standards, they will move from detailed actions to maintenance of the performance standard, subject to regular monitoring to ensure continued performance. The choice of tools needed to maintain performance will be at the discretion of the Action Agencies.</i>		
15	<p>Configuration and Operational Plan for The Dalles Project The Corps will prepare a Configuration and Operational Plan for The Dalles Project (2007). As part of the first phase of modifications, the Corps will include the following:</p> <ul style="list-style-type: none"> • Turbine operation optimization to improve overall dam survival (2011) • Extended tailrace spill wall to increase direct and indirect survival of spillway passed fish (2009) <p>The COP will be updated periodically and modifications may be altered as new biological and engineering information is gathered. Modifications will be coordinated through the Regional Forum. If Phase I actions fail to meet the intended biological targets, Phase II actions will be considered for further implementation.</p>	<p>Implementation Plans</p> <ul style="list-style-type: none"> • The initial COP for The Dalles Dam has been completed. The COP will be updated periodically, and the current version will be referenced in the 2009, 2012 and 2015 implementation plans. Specific Phase 1 actions will be addressed in these plans. <p>Annual Progress Report</p> <ul style="list-style-type: none"> • Annual progress reports will describe status of the actions taken in the COP and the results of the associated RM&E. <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> • Comprehensive Evaluation Report will summarize actions taken and the results of the associated RM&E. The Report will also include an analysis of the biological effectiveness of the actions taken to meet the dam passage survival performance standard.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival⁵		
<i>Once the Action Agencies meet hydrosystem performance standards, they will move from detailed actions to maintenance of the performance standard, subject to regular monitoring to ensure continued performance. The choice of tools needed to maintain performance will be at the discretion of the Action Agencies.</i>		
16	<p>Configuration and Operational Plan for John Day Project The Corps will prepare a Configuration and Operational Plan for the John Day Project (2007). As part of the first phase of modifications, the Corps will include the following:</p> <ul style="list-style-type: none"> • 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). <p>The COP will be updated periodically and modifications may be altered as new biological and engineering information is gathered. Modifications will be coordinated through the Regional Forum. If Phase I actions fail to meet the intended biological targets, Phase II actions will be considered for further implementation.</p>	<p>Implementation Plans</p> <ul style="list-style-type: none"> • The initial COP for John Day Dam has been completed. The COP will be updated periodically, and the current version will be referenced in the 2009, 2012 and 2015 implementation plans. Specific Phase 1 actions will be addressed in these plans. <p>Annual Progress Report</p> <ul style="list-style-type: none"> • Annual progress reports will describe status of the actions taken in the COP and the results of the associated RM&E. <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> • Comprehensive Evaluation Report will summarize actions taken and the results of the associated RM&E. The Report will also include an analysis of the biological effectiveness of the actions taken to meet the dam passage survival performance standard.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival⁵		
<i>Once the Action Agencies meet hydrosystem performance standards, they will move from detailed actions to maintenance of the performance standard, subject to regular monitoring to ensure continued performance. The choice of tools needed to maintain performance will be at the discretion of the Action Agencies.</i>		
17	<p>Configuration and Operational Plan for McNary Project The Corps will prepare a Configuration and Operational Plan for the McNary Project (2009). As part of the first phase of modifications, the Corps will include the following:</p> <ul style="list-style-type: none"> • 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) <p>The COP will be updated periodically and modifications may be altered as new biological and engineering information is gathered. Modifications will be coordinated through the Regional Forum. If Phase I actions fail to meet the intended biological targets, Phase II actions will be considered for further implementation.</p>	<p>Implementation Plans</p> <ul style="list-style-type: none"> • The initial COP for John Day Dam will be completed in 2008. The COP will be updated periodically, and the current version will be referenced in the 2009, 2012 and 2015 implementation plans. Specific Phase 1 actions will be addressed in these plans. <p>Annual Progress Report</p> <ul style="list-style-type: none"> • Annual progress reports will describe status of the actions taken in the COP and the results of the associated RM&E. <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> • Comprehensive Evaluation Report will summarize actions taken and the results of the associated RM&E. The Report will also include an analysis of the biological effectiveness of the actions taken to meet the dam passage survival performance standard.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival⁵		
<i>Once the Action Agencies meet hydrosystem performance standards, they will move from detailed actions to maintenance of the performance standard, subject to regular monitoring to ensure continued performance. The choice of tools needed to maintain performance will be at the discretion of the Action Agencies.</i>		
18	<p>Configuration and Operational Plan for Ice Harbor Project The Corps will prepare a Configuration and Operational Plan for the Ice Harbor Project (2008). As part of the first phase of modifications, the Corps will include the following:</p> <ul style="list-style-type: none"> • 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 (2011) <p>The COP will be updated periodically and modifications may be altered as new biological and engineering information is gathered. Modifications will be coordinated through the Regional Forum. If Phase I actions fail to meet the intended biological targets, Phase II actions will be considered for further implementation.</p>	<p>Implementation Plans</p> <ul style="list-style-type: none"> • The initial COP for John Day Dam will be completed in 2008. The COP will be updated periodically, and the current version will be referenced in the 2009, 2012 and 2015 implementation plans. Specific Phase 1 actions will be addressed in these plans. <p>Annual Progress Report</p> <ul style="list-style-type: none"> • Annual progress reports will describe status of the actions taken in the COP and the results of the associated RM&E. <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> • Comprehensive Evaluation Report will summarize actions taken and the results of the associated RM&E. The Report will also include an analysis of the biological effectiveness of the actions taken to meet the dam passage survival performance standard.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival⁵		
<i>Once the Action Agencies meet hydrosystem performance standards, they will move from detailed actions to maintenance of the performance standard, subject to regular monitoring to ensure continued performance. The choice of tools needed to maintain performance will be at the discretion of the Action Agencies.</i>		
19	<p>Configuration and Operational Plan for Lower Monumental Project</p> <p>The Corps will prepare a Configuration and Operational Plan for the Lower Monumental Project (2009). As part of the first phase of modifications, the Corps will include the following:</p> <ul style="list-style-type: none"> • 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) <p>The COP will be updated periodically and modifications may be altered as new biological and engineering information is gathered. Modifications will be coordinated through the Regional Forum. If Phase I actions fail to meet the intended biological targets, Phase II actions will be considered for further implementation.</p>	<p>Implementation Plans</p> <ul style="list-style-type: none"> • The initial COP for John Day Dam will be completed in 2008. The COP will be updated periodically, and the current version will be referenced in the 2009, 2012 and 2015 implementation plans. Specific Phase 1 actions will be addressed in these plans. <p>Annual Progress Report</p> <ul style="list-style-type: none"> • Annual progress reports will describe status of the actions taken in the COP and the results of the associated RM&E. <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> • Comprehensive Evaluation Report will summarize actions taken and the results of the associated RM&E. The Report will also include an analysis of the biological effectiveness of the actions taken to meet the dam passage survival performance standard.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival⁵		
<i>Once the Action Agencies meet hydrosystem performance standards, they will move from detailed actions to maintenance of the performance standard, subject to regular monitoring to ensure continued performance. The choice of tools needed to maintain performance will be at the discretion of the Action Agencies.</i>		
20	<p>Configuration and Operational Plan for Little Goose Project The Corps will prepare a Configuration and Operational Plan for the Little Goose Project (2009). As part of the first phase of modifications, the Corps will include the following:</p> <ul style="list-style-type: none"> • 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 (2008) • Surface spillway weir and deflector installation to improve FPE, reduce forebay delay and improve direct and indirect survival (2009) <p>The COP will be updated periodically and modifications may be altered as new biological and engineering information is gathered. Modifications will be coordinated through the Regional Forum. If Phase I actions fail to meet the intended biological targets, Phase II actions will be considered for further implementation.</p>	<p>Implementation Plans</p> <ul style="list-style-type: none"> • The initial COP for Little Goose Dam will be completed in 2009. The COP will be updated periodically, and the current version will be referenced in the 2009, 2012 and 2015 implementation plans. Specific Phase 1 actions will be addressed in these plans. <p>Annual Progress Report</p> <ul style="list-style-type: none"> • Annual progress reports will describe status of the actions taken in the COP and the results of the associated RM&E. <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> • Comprehensive Evaluation Report will summarize actions taken and the results of the associated RM&E. The Report will also include an analysis of the biological effectiveness of the actions taken to meet the dam passage survival performance standard.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival⁵		
<i>Once the Action Agencies meet hydrosystem performance standards, they will move from detailed actions to maintenance of the performance standard, subject to regular monitoring to ensure continued performance. The choice of tools needed to maintain performance will be at the discretion of the Action Agencies.</i>		
21	<p>Configuration and Operational Plan for Lower Granite Project The Corps will prepare a Configuration and Operational Plan for Lower Granite Project (2008). As part of the first phase of modifications, the Corps will include the following:</p> <ul style="list-style-type: none"> • New juvenile fish facility including orifice configuration changes, primary dewatering, holding for transport, and primary bypass to improve direct and indirect survival for all collected fish (2012) • Turbine operation optimization to improve survival of turbine passed fish (2014) <p>The COP will be updated periodically and modifications may be altered as new biological and engineering information is gathered. Modifications will be coordinated through the Regional Forum. If Phase I actions fail to meet the intended biological targets, Phase II actions will be considered for further implementation.</p>	<p>Implementation Plans</p> <ul style="list-style-type: none"> • The initial COP for Lower Granite Dam will be completed in 2008. The COP will be updated periodically, and the current version will be referenced in the 2009, 2012 and 2015 implementation plans. Specific Phase 1 actions will be addressed in these plans. <p>Annual Progress Report</p> <ul style="list-style-type: none"> • Annual progress reports will describe status of the actions taken in the COP and the results of the associated RM&E. <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> • Comprehensive Evaluation Report will summarize actions taken and the results of the associated RM&E. The Report will also include an analysis of the biological effectiveness of the actions taken to meet the dam passage survival performance standard.
22	<p>Chief Joseph Dam Flow Deflector The Corps will complete the flow deflector construction at Chief Joseph Dam by 2009.</p> <p>Deflector construction was initiated in 2005 in response to RPA 136 in the 2000 BiOp 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.</p>	<p>Implementation Plans</p> <ul style="list-style-type: none"> • Not applicable. <p>Annual Progress Report</p> <ul style="list-style-type: none"> • Annual progress reports will describe status of the flow deflector construction. <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> • Not applicable.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival⁵		
<i>Once the Action Agencies meet hydrosystem performance standards, they will move from detailed actions to maintenance of the performance standard, subject to regular monitoring to ensure continued performance. The choice of tools needed to maintain performance will be at the discretion of the Action Agencies.</i>		
23	<p>Turbine Unit Operations</p> <p>The Action Agencies will operate turbine units 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.</p>	<p><u>Implementation Plans</u></p> <ul style="list-style-type: none"> The turbine unit operations are identified in the annual FPP. <p><u>Annual Progress Report</u></p> <ul style="list-style-type: none"> Annual progress reports are developed by BPA. <p><u>2012 and 2015 Comprehensive RPA Evaluation Reports</u></p> <ul style="list-style-type: none"> Not applicable.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
<p>Hydropower Strategy 2—Modify Columbia and Snake River Dams to Maximize Juvenile and Adult Fish Survival⁵</p>		
<p><i>Once the Action Agencies meet hydrosystem performance standards, they will move from detailed actions to maintenance of the performance standard, subject to regular monitoring to ensure continued performance. The choice of tools needed to maintain performance will be at the discretion of the Action Agencies.</i></p>		
<p>24</p>	<p>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:</p> <p>The Dalles Dam</p> <ul style="list-style-type: none"> • East ladder emergency auxiliary water supply system and/or north ladder entrance modifications to improve <i>reliability</i> of upstream adult passage (2013). <p>John Day Dam</p> <ul style="list-style-type: none"> • Adult <i>ladder</i> systems modifications to improve upstream adult passage conditions (2011). <p>Lower Granite Dam</p> <ul style="list-style-type: none"> • Adult trap modification to provide greater and more efficient adult collection capability and to reduce handling stress of adult salmonids during collection (2007). • Adult fishway modification to improve upstream adult passage conditions (need will be determined by results of further research) (prototype 2011). <p>System-Wide</p> <ul style="list-style-type: none"> • Investigate surface-flow outlets during wintertime to provide safer fallback opportunity for over wintering steelhead (need will be determined by results of further research). 	<p>Implementation Plans</p> <ul style="list-style-type: none"> • The initial adult passage improvements are identified in the proposed RPA. Implementation plans in 2009, 2012, and 2015 will reflect current implementation plans. <p>Annual Progress Report</p> <ul style="list-style-type: none"> • Annual progress reports will describe status of the actions taken. <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> • Comprehensive Evaluation Report will summarize actions taken and the results of the associated RM&E.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hydropower Strategy 3— Implement Spill and Juvenile Transportation Improvements at Columbia River and Snake River Dams		
25	<p>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. 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).</p>	<p><u>Implementation Plans</u></p> <ul style="list-style-type: none"> The initial spill operation for juvenile is described in the proposed RPA. The spill operation will be updated annually and reported in the FPP. <p><u>Annual Progress Report</u></p> <ul style="list-style-type: none"> Spill operations are reported annually. <p><u>2012 and 2015 Comprehensive RPA Evaluation Reports</u></p> <ul style="list-style-type: none"> This information is the same as will be reported for each mainstem dam in hydro actions 14-21.

Table 2. Initial Voluntary Spill Operations at Columbia and Snake River Dams

Project	Spring Operation (Day/Night)	Spring Planning Dates	Summer Operation (Day/Night)	Summer Planning Dates
Bonneville	100 kcfs/100 kcfs	4/10-6/15	75 kcfs/Gas Cap	6/16-8/31 ³
The Dalles	40%/40%	4/10-6/15	40%/40%	6/16-8/31 ³
John Day	0/60% ¹	4/10-6/15	30%/30%	6/16-8/31 ³
McNary	40%/40%	4/10-6/15	40%/40% vs. 60%/60%	6/16-8/31 ³
Ice Harbor	30%/30% vs. 45 kcfs/Gas Cap	4/7-6-15	30%/30% vs. 45 kcfs/Gas Cap	6/1-8/31 ⁴
Lower Monumental	27 kcfs/27 kcfs (Bulk Spill Gas Cap)	4/7-6/15 ²	17 kcfs/17 kcfs	6/1-8/31 ⁴
Little Goose	30%/30%	4/5-6/15 ²	30%/30%	6/1-8/31 ⁴
Lower Granite	20 kcfs/20 kcfs	4/3-6/15 ²	18 kcfs/18 kcfs	6/1-8/31 ⁴

Notes:

¹ John Day spill operation during the spring will likely shift to 24-hour operation after construction of surface flow outlets.

² The actual transition date to summer spill will be initiated when subyearling Chinook exceed 50 percent of the collection for a 3 day period for each Snake River project after June 1.

³ Transitions from spring to summer spill has changed from July 1 to June 16 based on updated run timing of subyearling fall Chinook salmon run timing. For further information see Appendix B, Attachment B.2.1-1, Section 3.5.

⁴ Termination of summer spill will occur at the four lower Snake projects when subyearling counts fall below 1000 fish per day for 3 consecutive days on a per project basis, but no later than August 31 each year. Termination of spill at Ice Harbor Dam will be two days after Lower Monumental Dam spill ends. If after discontinuing spill at any of the Snake River projects after August 1, if subyearling Chinook collection again exceeds 1000 fish per day for two consecutive days, spill will resume at that project. Thereafter, fish collection numbers will be reevaluated to determine if spill should continue, using the criteria above until August 31.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
<p>Hydropower Strategy 3— Implement Spill and Juvenile Transportation Improvements at Columbia River and Snake River Dams</p>		
26	<p>Juvenile Fish Transportation in the Columbia and Snake Rivers The Corps and BPA will continue the juvenile fish transportation program towards meeting system survival performance metrics of Snake and Columbia River salmon and steelhead with some adaptive management modifications based on results of RM&E. The Corps and BPA will continue to collect and transport juvenile fish at Lower Granite, Little Goose, Lower Monumental, and McNary dams, although under a modified operation as described in Table 3 and Table 4 below. While the dates mentioned in this section should be considered firm planning dates, if in-season information or results of ongoing RM&E indicates a need for adaptive management, the Action Agencies will consider revising the dates and operations through the Regional Forum.</p>	<p><u>Implementation Plans</u></p> <ul style="list-style-type: none"> The initial juvenile fish transportation program is described in the proposed RPA. The program will be updated annually and reported in the FPP. <p><u>Annual Progress Report</u></p> <ul style="list-style-type: none"> Annual progress reports will provide the number of fish collected and transported in an annual report each February. <p><u>2012 and 2015 Comprehensive RPA Evaluation Reports</u></p> <ul style="list-style-type: none"> Please see Hydro Action 27.

Table 3. Interim Transportation Strategy for Snake River Collector Projects

Lower Granite Dam								
	Spring Migrants				Summer Migrants			
	Spill and Bypass	Spill and Transport	Transport and No Voluntary Spill	Adaptive	Spill and Transport	Adaptive	Transport and No Spill	Adaptive
Seasonal Average Flows < 65 kcfs	None	None	April 3 to May 31	June	July	Aug	Sept	Oct +
Seasonal Average Flows 65 to 80 kcfs	April 3 to April 20	April 21 to April 30	May 1 to May 31	June	July	Aug	Sept	Oct +
Seasonal Average Flows > 80 kcfs	April 3 to April 20	April 21 to May 31	NA ¹	June	July	Aug	Sept	Oct +
Little Goose Dam								
	Spring Migrants				Summer Migrants			
	Spill and Bypass	Spill and Transport	Transport and No Voluntary Spill	Adaptive	Spill and Transport	Adaptive	Transport and No Spill	Adaptive
Seasonal Average Flows < 65 kcfs	None	None	April 3 to May 31	June	July	Aug	Sept	Oct +
Seasonal Average Flows 65 to 80 kcfs	April 5 to April 28	April 29 to May 4	May 5 to May 31	June	July	Aug	Sept	Oct +
Seasonal Average Flows > 80 kcfs	April 5 to April 28	April 29 to May 31	NA ¹	June	July	Aug	Sept	Oct +
Lower Monumental Dam								
	Spring Migrants				Summer Migrants			
	Spill and Bypass	Spill and Transport	Transport and No Voluntary Spill	Adaptive	Spill and Transport	Adaptive	Transport and No Spill	Adaptive
Seasonal Average Flows < 65 kcfs	None	None	April 3 to May 31	June	July	Aug	Sept	Oct +
Seasonal Average Flows 65 to 80 kcfs	April 7 to May 1	May 2 to May 9	May 10 to May 31	June	July	Aug	Sept	Oct +
Seasonal Average Flows > 80 kcfs	April 7 to May 1	May 2 to May 31	NA ¹	June	July	Aug	Sept	Oct +

¹ Under > than 80 kcfs seasonal average flows in the Snake River, the interim spill and transportation operation continues until May 31.

Notes:

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

The term “adaptive” in this table refers to a transition between two adjacent management strategies in the table. For example, where “Adaptive” is between “Transportation and Non Voluntary Spill” and “Spill and Transportation”, the decision for each option would be made based on RM&E and in-season data.

Table 4. Proposed Interim Transportation Strategy for McNary Dam (continued)

McNary Dam	Spring Migrants				Summer Migrants			
	Spill and Bypass	Spill and Transport	Transportation and No Voluntary Spill	Adaptive	Spill and Transport	Adaptive	Transport and No Voluntary Spill	Adaptive
Seasonal Average Flows < 125 kcfs	None	None	April 10 to June 14	June 15 to June 30	July	Aug	Sept	Oct +
Seasonal Average Flows > 125 kcfs	Apr 10 to June 14	None ¹	None ¹	June 15 to June 30	July	Aug	Sept	Oct +

Notes:

¹ Under > than 125 kcfs seasonal average flows in the Columbia River, the interim spill and bypass operation will continue through June 14.

Average flows reported in average kcfs for April through June.

The term “adaptive” in this table refers to a transition between two adjacent management strategies in the table. For example, where “Adaptive” is between “Transportation and No Voluntary Spill” and “Spill and Transportation”, the decision for each option would be made based on RM&E and in-season data.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
<p>Hydropower Strategy 3— Implement Spill and Juvenile Transportation Improvements at Columbia River and Snake River Dams</p>		
<p>27</p>	<p>Configuration and Operational Plan Transportation Strategy The Corps, in coordination with the Regional Forum, will initiate a Configuration Operational Plan in 2008. The plan will be completed in 2010 and will present a strategy for prioritizing and carrying out further transportation actions at each dam. Construction actions for transportation are primarily in the context of changes to juvenile bypass systems. Changes meant to increase adult salmon returns through the juvenile fish transportation process are being evaluated. Some changes include additional barges, a new juvenile fish facility at Lower Granite Dam and modifications to the juvenile fish facilities at Little Goose, Lower Monumental and McNary dams.</p>	<p><u>Implementation Plans</u></p> <ul style="list-style-type: none"> The COP for Transportation Strategy will be initiated in 2008. The COP will be updated periodically, and the current version will be included in the 2009, 2012 and 2015 implementation plans. <p><u>Annual Progress Report</u></p> <ul style="list-style-type: none"> Annual progress reports will describe status of the construction and operational actions and associated RM&E to support the transportation strategy. <p><u>2012 and 2015 Comprehensive RPA Evaluation Reports</u></p> <ul style="list-style-type: none"> Comprehensive Evaluation Report will summarize the construction and operational actions taken and associated RM&E to support the transportation strategy. The Report will also include an analysis of the biological effectiveness of the actions taken to meet a system survival performance target.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
<p>Hydropower Strategy 4—Operate and Maintain Facilities at Corps’ Mainstem Projects to Maintain Biological Performance</p>		
<p>28</p>	<p>Fish Passage Plan The Corps will annually prepare a FPP and coordinate it regionally 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. Key elements of the plan include:</p> <ul style="list-style-type: none"> • Operate according to project-specific criteria and dates to operate and maintain fish facilities, turbine operating priorities, and spill patterns; • Operate according to fish transportation criteria; • Maintain turbine operations within the 1 percent of best efficiency range; • Maintain spillway discharge levels and dates to provide project spill for fish passage; • Implement TDG monitoring plan; • Operate according to protocols for fish trapping and handling; • Take advantage of low river conditions, low reservoir elevations or periods outside the juvenile migration season to accomplish repairs, maintenance, or inspections so there is little or no effect on juvenile fish; • Coordinate routine and non-routine maintenance that affects fish operations or structures to eliminate and/or minimize fish operation impacts; • Schedule routine maintenance during non-fish passage periods; • Conduct non-routine maintenance activities as needed; and • Coordinate criteria changes and emergency operations with FPOM. 	<p><u>Implementation Plans</u></p> <ul style="list-style-type: none"> • The FPP is prepared annually. <p><u>Annual Progress Report</u></p> <ul style="list-style-type: none"> • Not applicable. <p><u>2012 and 2015 Comprehensive RPA Evaluation Reports</u></p> <ul style="list-style-type: none"> • Not applicable.

HABITAT ACTIONS

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
<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"> • <i>Habitat Strategy 1—Protect and improve tributary habitat based on biological needs and prioritized actions</i> • <i>Habitat Strategy 2—Improve juvenile and adult fish survival in estuary habitat</i> <p><i>Each strategy consists of one or more specific actions. These are summarized in the following sections.</i></p>		
<p>Habitat Strategy 1—Protect and Improve Tributary Habitat Based on Biological Needs and Prioritized Actions</p>		
<p>1</p>	<p>Tributary Habitat Implementation 2007 to 2009 – Progress Toward 2017 Habitat Quality Improvement Targets. The Action Agencies will provide funding and technical assistance for specific actions identified for implementation in 2007 to 2009 (FCRPS BA, Attachment B.2.2-2, Tables 1-5a) based on biological need and limiting factors.</p> <p>If actions identified for implementation in 2007-2009 prove infeasible, the Action Agencies will implement comparable replacement projects in 2010-2013 to maintain estimated habitat quality improvements at the population level, or alternatively at the major population group (MPG) or ESU level.</p>	<p><u>Implementation Plan</u></p> <ul style="list-style-type: none"> • Specific projects for implementation in the 2007-2009 period are identified in the FCRPS BA, Attachment B.2.2-2, Tables 1-5a. <p><u>Annual Progress Reports</u></p> <ul style="list-style-type: none"> • Status of project implementation (including project milestones) through December of previous year for all 2007-2009 actions. • Report physical metrics for implementation achieved (e.g., miles of access, cfs streamflow acquired, #s of screens, and miles or acres of habitat protected or enhanced, and miles of complexity enhanced).

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Habitat Strategy 1—Protect and Improve Tributary Habitat Based on Biological Needs and Prioritized Actions		
2	<p>Tributary Habitat Implementation 2010-2017 – Achieving Habitat Quality Improvement Targets. On 3-year cycles, the Action Agencies will identify additional habitat projects for implementation based on biological need and limiting factors from the recovery/subbasin plan inventory where habitat potential exists. Projects will identify location, treatment of limiting factor, targeted population or populations, appropriate reporting metrics, and estimated biological benefits.</p> <p>a) During 2010 to 2017, the Action Agencies will provide funding and/or technical assistance to implement specific habitat projects to achieve the specified habitat quality improvement for populations with greatest biological need (bolded populations 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 habitat actions in coordination with recovery planning groups and the Northwest Power Planning and Conservation Council:</p> <ul style="list-style-type: none"> • The expert panel will use methods consistent with the NWF v NMFS Remand Collaboration habitat workgroup process to estimate benefits. • If actions from the previous cycle prove infeasible for the bolded populations, the Action Agencies will implement comparable replacement projects in the next 3 year-cycle to maintain estimated habitat quality improvements at the population level. If infeasible at the population level, then alternatively at the MPG or ESU/DPS level. Selection of replacement projects will be made based on input from expert panels, regional recovery planning groups, the Northwest Power and Conservation Council, and NMFS. • RME will inform the determination of habitat quality improvements and new scientific information will be applied to estimate benefits for future implementation. 	<p>Implementation Plans</p> <ul style="list-style-type: none"> • Specific projects for a 3 year period will be identified in implementation plans in December, 2009, 2012 and 2015. Plans will include location, limiting factor treated, targeted population/s, reporting metrics and expected biological benefits for all projects • Progress Guidelines: To maintain progress toward the 2017 habitat improvements, each 3 year cycle will identify projects expected to achieve approximately 25% of the total habitat quality improvements noted in Table 5. <p>Annual Progress Reports</p> <ul style="list-style-type: none"> • Status of project implementation (including project milestones) through December of previous year for all actions identified in implementation plans.. • Report physical metrics for implementation achieved (e.g., miles of access, cfs streamflow acquired, #s of screens installed, miles or acres of habitat protected or enhanced, and miles of complexity enhanced by benefited population/s). <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> • Comprehensive report on status of project implementation (including project milestones) for all actions identified in implementation plans. • Comprehensive report of physical metrics for implementation achieved (e.g. miles of access, cfs streamflow acquired #s of screens installed, miles or acres of habitat protected or enhanced, and miles of complexity enhanced by benefited population/s). • By population, report progress toward habitat quality improvement targets.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Habitat Strategy 1—Protect and Improve Tributary Habitat Based on Biological Needs and Prioritized Actions		
	<p>Tributary Habitat Implementation 2010-2017 – Achieving Habitat Quality Improvement Targets. (continued)</p> <ul style="list-style-type: none"> • If new scientific or other information suggests that habitat quality improvement estimates for projects from the previous cycle were significantly in error, the Action Agencies will examine the information and review the project or projects in question and their estimated benefits. This review will occur as part of the Comprehensive RPA Evaluations in 2012 and 2015 and will be performed in conjunction with NMFS. In the event such review finds that habitat quality improvement benefits were significantly overstated, the Action Agencies will implement replacement projects to provide benefits sufficient to achieve the habitat quality improvement estimated for the original project or projects. b) During 2010-2017, for those populations not within category a) above (non-bolded populations in Table 5), the Action Agencies will provide funding and/or technical assistance to maintain a broad habitat program based on biological need and addressing limiting factors from the recovery/subbasin plan inventory. 	<ul style="list-style-type: none"> • Report results of all biological effectiveness monitoring/studies, including new scientific information, and identify how results will be applied to future implementation, if appropriate.

Table 5. Estimated Habitat Quality Improvements

ESU	Major Population Group	Population	Estimated Percentage Habitat Quality Improvement of 2007-2009 Actions	Total Estimated Percentage Habitat Quality Improvement of 2007-2017 Actions
Snake River Spring/Summer Chinook	Grand Ronde/Imnaha	Catherine Creek	4	23
		Lostine/Wallowa River	2	*
		Grand Ronde River upper mainstem	2	23
		Imnaha River mainstem	1	*
	Middle Fork Salmon River	Big Creek	1	*
	South Fork Salmon River	Secesh River	1	*
		South Fork Salmon River Mainstem	<1	*
	Lower Snake	Tucannon River	7	17
	Upper Salmon River	East Fork Salmon River	1	*
		Lemhi River	7	*
		Pahsimeroi River	41	*
		Salmon River lower mainstem below Redfish Lake	1	*
		Salmon River upper mainstem above Redfish Lake	14	*
		Valley Creek	1	*
		Yankee Fork	10	30
Upper Columbia Spring Chinook	Upper Columbia – Below Chief Joseph	Entiat River	10	22
		Methow River	2	6
		Wenatchee River	1	3

Table 5. Estimated Habitat Quality Improvements (continued)

ESU	Major Population Group	Population	Estimated Percentage Habitat Quality Improvement of 2007-2009 Actions	Total Estimated Percentage Habitat Quality Improvement of 2007-2017 Actions
Middle Columbia Steelhead	Cascades Eastern Slope Tributaries	Deschutes River – eastside	1	*
		Deschutes River – Westside	<1	*
		Fifteen mile Creek (winter run)	<1	*
		Klickitat River	4	*
	John Day River	John Day River lower mainstem tributaries	<1	*
		John Day River upper mainstem	<1	*
		Middle Fork John Day River	<1	*
		North Fork John Day River	<1	*
		South Fork John Day River	1	*
	Umatilla and Walla Walla River	Touchet River	4	*
		Umatilla River	4	*
		Walla Walla River	4	*
	Yakima River Group	Naches River	4	*
		Satus Creek	4	*
		Toppenish	4	*
		Yakima River upper mainstem	4	*
Snake River Steelhead	Clearwater River	Lochsa River	8	17
		Lolo Creek	5	8
		Selway River	<1	<1
		South Fork Clearwater River	5	14

Table 5. Estimated Habitat Quality Improvements (continued)

ESU	Major Population Group	Population	Estimated Percentage Habitat Quality Improvement of 2007-2009 Actions	Total Estimated Percentage Habitat Quality Improvement of 2007-2017 Actions
Snake River Steelhead	Grand Ronde River	Grand Ronde River lower mainstem tributaries	<1	*
		Grand Ronde River upper mainstem	4	*
		Joseph Creek (OR)	<1	*
		Joseph Creek (WA)	4	*
		Wallowa River	<1	*
	Hells Canyon	Hells Canyon		
	Imnaha River	Imnaha River		*
	Lower Snake	Asotin Creek	4	*
		Tucannon River	5	*
	Salmon River	Lower Middle Fork mainstem and tribs (Big, Camas, and Loon Creeks)	1	7
		East Fork Salmon River	2	*
		Lemhi River	3	*
		Pahsimeroi River	9	*
		Salmon River upper mainstem	6	*
		Secesh River	1	6
South Fork Salmon River		<1	1	
Upper Columbia Steelhead	Upper Columbia River – below Chief Joseph	Entiat River	6	8
		Methow River	2	4
		Okanogan River	12	14
		Wenatchee River	1	4

* The Action Agencies will provide funding and/or technical assistance to maintain a broad habitat program in these geographic areas based on biological need and addressing limiting factors from the recovery/subbasin plan inventory.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive Evaluations
Habitat Strategy 2—Improve Juvenile and Adult Fish Survival in Estuary Habitat		
3	<p>Estuary Habitat Implementation 2007 to 2009 The Action Agencies will provide funding to implement specific actions identified for implementation in 2007-2009 (FCRPS BA, Appendix B.2.2). If actions identified for implementation in 2007-2009 prove infeasible, the Action Agencies will implement comparable replacement projects in 2010 -2013 to provide equivalent benefits.</p>	<p>Implementation Plan</p> <ul style="list-style-type: none"> • Specific projects for implementation in the 2007-2009 period are identified in the FCRPS BA, Appendix B.2.2. <p>Annual Progress Reports</p> <ul style="list-style-type: none"> • Status of project implementation (including project milestones) through December of previous year for all 2007-2009 actions. • Report physical metrics for implementation achieved (e.g., # of acres protected/restored/enhanced; riparian miles protected).
4	<p>Estuary Habitat Implementation 2010-2017 The Action Agencies will provide funding to implement specific projects to achieve the additional estuary survival benefits identified the FCRPS BA Appendix B.2.2).</p> <ul style="list-style-type: none"> • Projects will be selected in coordination with LCREP and other regional experts, using recovery planning products and the modified LCREP project selection criteria (FCRPS BA Appendix B, Attachment B.2.2-3) to identify projects that will benefit salmon. • To support project selection, the Action Agencies will convene an expert regional technical group to determine the estimated change in survival which would result from implementation of each project proposed for implementation. • The expert regional technical group will use the approach originally applied in this BA (Appendix B.2.2) (<i>Estimated Benefits of Federal Agency Habitat Projects in the Lower Columbia River Estuary</i>, which is included as Appendix D, Attachment D-1 to the Comprehensive Analysis) and all subsequent information on the relationship between actions, habitat and salmon productivity models developed through the FCRPS RM&E to estimate the change in overall estuary habitat and resultant change in population survival 	<p>Implementation Plans</p> <ul style="list-style-type: none"> • Specific projects for a 3 year period will be identified in implementation plans in December, 2009, 2012 and 2015. Plans will include location, area extent of action, type of action, expected biological benefits, and other relevant information and authorities necessary for implementation. • Progress Guidelines: To maintain progress toward the 2017 survival benefits, each 3 year cycle will identify projects expected to achieve approximately 25% of the change needed to achieve the total 2017 survival benefits. <p>Annual Progress Reports</p> <ul style="list-style-type: none"> • Status of project implementation (including project milestones) through December of previous year for all actions identified in implementation plans. • Report physical metrics for implementation achieved (e.g. # of acres protected, restored, enhanced; riparian miles protected). <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> • Comprehensive report on status of project implementation (including project milestones) for all actions identified in implementation plans. • Comprehensive report of physical metrics for implementation achieved (e.g. # of acres protected/restored/enhanced; riparian miles protected; # of pile dikes removed).

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive Evaluations
Habitat Strategy 2—Improve Juvenile and Adult Fish Survival in Estuary Habitat		
		<ul style="list-style-type: none"> Report results of all RM&E studies, including information from expert regional technical group, and identify how results will be applied to future implementation, if appropriate.
5	<p>Piling and 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.</p> <ul style="list-style-type: none"> In 2008, the Action Agencies will work with Lower Columbia River Estuary Program to develop a plan for strategic removal of structures that have low value to navigation channel maintenance, present low-risk to adjacent land use, support increased ecosystem function, and are cost-effective. Beginning in 2008 and 2009, the Action Agencies will begin implementation. Implementation will continue through 2017. 	<p>Implementation Plans</p> <ul style="list-style-type: none"> Specific projects for implementation in the 2008-2009 period will be identified following development of a plan for strategic removal of structures in 2008. Specific projects for a 3 year period will be identified in implementation plans in December, 2009, 2012 and 2015. Plans will include location and expected biological benefit. <p>Annual Progress Reports</p> <ul style="list-style-type: none"> Status of project implementation (including project milestones) through December of previous year for all actions identified in implementation plans. Report physical metrics for implementation achieved (e.g. # of pilings/pile dikes removed). <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> Comprehensive report on status of project implementation (including project milestones) for all actions identified in implementation plans. Comprehensive report of physical metrics for implementation achieved (e.g. # of pilings/pile dikes removed). Report describing the effect of piling and pike dike removal projects implemented.

HATCHERY ACTIONS

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
<p>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:</p> <ul style="list-style-type: none"> • Hatchery Strategy 1—Ensure that hatchery programs funded by the Action Agencies as mitigation for the FCRPS are not impeding recovery of ESUs • Hatchery Strategy 2—Preserve and rebuild genetic resources through safety-net and conservation objectives to reduce extinction risk and promote recovery <p>Each strategy consists of two specific actions. These are summarized in the following sections.</p>		
<p>Hatchery Strategy 1—Ensure that Hatchery Programs Funded by the Action Agencies as Mitigation for the FCRPS are not Impeding Recovery of ESUs.</p>		
<p>1</p>	<p>FCRPS Funding of Mitigation Hatcheries - Programmatic The Action Agencies will adopt programmatic criteria for funding decisions on mitigation programs for the FCRPS that incorporate BMPs. (Site specific application of BMPs will be defined in ESA Section 7, Section 10, or Section 4(d) consultations with NMFS to be initiated and conducted by hatchery operators with the Action Agencies as cooperating agencies.)</p>	<p>Implementation Plans</p> <ul style="list-style-type: none"> • Not applicable. <p>Annual Progress Reports</p> <ul style="list-style-type: none"> • Status of submittal/approval of HGMPs including site specific application of BMPs. <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> • Report level of compliance with NOAA approved HGMPs at all FCRPS mitigation hatchery programs.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hatchery Strategy 1—Ensure that Hatchery Programs Funded by the Action Agencies as Mitigation for the FCRPS are not Impeding Recovery of ESUs.		
2	<p>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 regularly approval) are listed in Table 6. Other reforms will be identified and implemented following the conclusion of the Columbia River Hatchery Scientific Review Group (HSRG) process.</p>	<p>Implementation Plans</p> <ul style="list-style-type: none"> • Implementation schedules for all reforms identified in Table 6 will be provided in 2008. • Actions and implementation schedules for ongoing reforms identified in Table 8 and future reforms identified by the Action Agencies following the HSRG process will be provided in implementation plans in December, 2009, 2012 and 2015. . <p>Annual Progress Reports</p> <ul style="list-style-type: none"> • Status of implementation through December of previous year for all reforms identified in Table 6. • Status of implementation of future reforms identified by the Action Agencies following the HSRG process. <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> • Comprehensive report on status of project implementation for all actions identified in implementation plans. • Report on any reform-specific monitoring and evaluation.

Table 6. Specific Projects to Implement Hatchery RPA Actions

Hatchery Action 2 - Reform FCRPS Hatchery Operations to Reduce Genetic and Ecological Effects on ESA-Listed Salmon & Steelhead	
	For Lower Columbia Chinook : The COE will review John Day Hatchery Mitigation Program.
	For Snake River Steelhead : Fund the Tucannon River steelhead supplementation program to transition to local broodstock using BMPs. ⁶
	For Middle Columbia Steelhead : Fund the Touchet River steelhead supplementation program to transition to local broodstock using BMPs. ⁷
Hatchery Action 3 - Implement Safety-Net Programs to Preserve Genetic Resources and Reduce Extinction Risk	
	For Snake River sockeye : Fund the safety-net program to achieve annual releases of 150,000 smolts.
	For Snake River Spring/Summer Chinook : Fund the Tucannon River spring/summer Chinook safety-net supplementation program as long as NMFS considers it beneficial and necessary to reduce extinction risk of the target population.
	For Snake River Spring/Summer Chinook : Fund the Upper Grande Ronde and Catherine Creek safety-net supplementation programs using BMPs.
	For Snake River Spring/Summer Chinook : Fund the Johnson Creek / South Fork Salmon River safety-net supplementation program.
	For Snake River Spring/Summer Chinook : Fund the experimental captive rearing program for East Fork and West Fork Yankee Fork Salmon River (until phased out by IDFG).
	For Snake River Steelhead , as a project to benefit primarily B-run steelhead, the Action Agencies will work with NMFS to develop a trigger for future artificial propagation safety-net planning or to identify populations for immediate safety-net planning.

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

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

Table 6. Specific Projects to Implement Hatchery RPA Actions (continued)

Hatchery Action 4 - Implement Conservation Programs to Build Genetic Resources & Assist in Promoting Recovery	
	For Upper Columbia Spring Chinook : Fund reintroduction of spring Chinook salmon into the Okanogan Basin consistent with the Upper Columbia Salmon Recovery Plan and BMPs. Reintroduction will be coordinated with the quality and quantity of available habitat in the Okanogan, and will be contingent on the availability of within ESU broodstock from the Methow Basin.
	For Upper Columbia Steelhead : Fund reconditioning of natural origin kelts for the Entiat, Methow and Okanogan basins.
	For Upper Columbia Steelhead : Fund development of a local broodstock derived from the Okanogan Basin following BMPs.
	For Middle Columbia Steelhead : Fund reconditioning of natural origin kelts in the Yakima River basin.
	For Snake River Steelhead : Fund the small-scale program trapping locally returning steelhead in the East Fork Salmon River for local broodstock supplementation program (no more than 50,000 smolts) following BMPs.
	For Snake River Spring/Summer Chinook Salmon : Fund supplementation programs in the Lostine and Imnaha rivers, contingent on a NOAA-approved management plan for the Northeast Oregon Hatchery program.
	For Snake River Sockeye : Fund expansion of the safety-net program to increase smolt releases to between 500,000 and 1 million fish.
	For Snake River Sockeye : The Action Agencies will work with appropriate parties to investigate feasibility and potentially develop a plan for ground transport of adult sockeye from LGR Dam to Redfish Lake.
	For Columbia River Chum : Fund the program to re-introduce chum salmon in Duncan Creek as long as NMFS considers it beneficial to recovery and necessary to reduce extinction risk of the target population.
	For Columbia River Chum : Fund assessment of habitat potential, development of reintroduction strategies, and implementation of pilot supplementation projects in selected Lower Columbia River tributaries below Bonneville Dam.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Hatchery Strategy 2—Preserve and Rebuild Genetic Resources Through Safety-net and Conservation Objectives to Reduce Extinction Risk and Promote Recovery		
3	<p>Implement Safety-Net Programs to Preserve Genetic Resources and Reduce 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 abundance and preserving genetic diversity, 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.</p>	<p>Implementation Plans</p> <ul style="list-style-type: none"> • Identification of ongoing safety-net programs and planning or implementation of new or modified safety-net programs will be provided in implementation plans in December, 2009, 2012 and 2015. <p>Annual Progress Reports</p> <ul style="list-style-type: none"> • Status of implementation through December of previous year for all safety-net programs identified in Table 6. <p>2012 and 2015 Comprehensive RPA Evaluation</p> <ul style="list-style-type: none"> • Comprehensive report on status of implementation of all actions identified in implementation plans. • Report on any associated monitoring and evaluation results that may inform future operations.
4	<p>Implement Conservation Programs to Build Genetic Resources and Assist in Promoting Recovery The Action Agencies will implement conservation programs for ESA-listed stocks where the programs assist in recovery. Specific conservation programs to be implemented under this action are listed in Table 6.</p>	<p>Implementation Plans</p> <ul style="list-style-type: none"> • Implementation schedules for new conservation programs identified in Table 6 will be provided in 2008. Any necessary regularly approvals will be included in implementation schedules. • Ongoing conservation programs and planning or implementation of new or modified conservation programs identified in 2008 will be provided in implementation plans in December, 2009, 2012 and 2015. <p>Annual Progress Reports</p> <ul style="list-style-type: none"> • Status of implementation through December of previous year for all conservation programs identified in Table 6. <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> • Comprehensive report on status of implementation of all actions identified in implementation plans. • Report on any associated monitoring and evaluation results that may inform future operations.

PREDATION MANAGEMENT ACTIONS

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
<p><i>The overall predation management objective for all ESUs is to improve the survival of juvenile and adult fish as they pass through the hydrosystem. The Action Agencies will pursue three strategies to meet this overall objective:</i></p> <ul style="list-style-type: none"> • <i>Predation Management Strategy 1—Implement piscivorous predation control measures to increase survival of juvenile salmonids in the lower Snake and Columbia rivers</i> • <i>Predation Management Strategy 2—Implement avian predation control measure to increase survival of juvenile salmonids in the lower Snake and Columbia rivers</i> • <i>Predation Management Strategy 3—Implement marine mammal control measures to increase survival of adult salmonids at Bonneville Dam</i> <p><i>Each strategy consists of one or more specific actions. These are summarized in the following sections.</i></p>		
<p>Predation Management Strategy 1—Implement Piscivorous Predation Control Measures to Increase Survival of Juvenile Salmonids in the Lower Snake and Columbia River</p>		
<p>1</p>	<p>Northern Pikeminnow Management Program (NPMP) The 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 this evaluation and adaptive management principles.</p>	<p><u>Implementation Plans</u></p> <ul style="list-style-type: none"> • The NPMP will be described in the 2009, 2012 and 2015 Implementation plan. <p><u>Annual Progress Report</u></p> <ul style="list-style-type: none"> • Annual progress reports will describe actions taken, including: <ul style="list-style-type: none"> - Number of pikeminnow removals - Estimated reduction of juvenile salmon consumed - Average exploitation rate <p><u>2012 and 2015 Comprehensive RPA Evaluation Reports</u></p> <ul style="list-style-type: none"> • Comprehensive Evaluation Report will summarize actions taken.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Predation Management Strategy 1—Implement Piscivorous Predation Control Measures to Increase Survival of Juvenile Salmonids in the Lower Snake and Columbia River		
2	<p>Develop strategies to reduce non-indigenous fish The Action Agencies will work with States and Tribes to coordinate the formation of a workshop to review, evaluate, and develop strategies to reduce non-indigenous piscivorous predation.</p>	<p>Implementation Plans</p> <ul style="list-style-type: none"> • Results of the workshop will be described in the 2009 Implementation Plan. <p>Annual Progress Report</p> <ul style="list-style-type: none"> • Beginning in 2010, annual progress reports will describe actions taken as a result of the workshop. <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> • Comprehensive Evaluation Report will summarize actions taken as result of the workshop.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations																												
<p>Predation Management Strategy 2—Implement Avian Predation Control Measures to Increase Survival of Juvenile Salmonids in the Lower Snake and Columbia River</p>																														
<p>3</p>	<p>Relocate Caspian terns from East Sand Island in the Columbia River estuary The Action Agencies will carry out Caspian tern management actions within the western region (California and Oregon) to effect redistribution of a majority of the Caspian terns from the Columbia River estuary. Alternative nesting locations are listed below. Once alternative habitat alterations are complete, East Sand Island tern habitat will be reduced from 6.5 to 1.5 to 2 acres. It is predicted that the target acreage on East Sand Island will be achieved in approximately 2010.</p> <table border="1"> <thead> <tr> <th>Site</th> <th>Acres</th> <th>Proposed Year of Creation</th> <th>Proposed Year in which Target Acreage is Achieved</th> </tr> </thead> <tbody> <tr> <td>Fern Ridge Lake</td> <td>1</td> <td>2007/2008</td> <td>2007/2008</td> </tr> <tr> <td>Summer Lake</td> <td>1.5</td> <td>2008</td> <td>2008</td> </tr> <tr> <td>Crump Lake</td> <td>1</td> <td>2009</td> <td>2009</td> </tr> <tr> <td>Brooks Island (San Francisco Bay)</td> <td>2</td> <td>2008/2009</td> <td>2008/2009</td> </tr> <tr> <td>Hayward Regional Shoreline (San Francisco Bay)</td> <td>0.5</td> <td>2008/2009</td> <td>2008/2009</td> </tr> <tr> <td>Don Edwards NWR (San Francisco Bay)</td> <td>0.5-1</td> <td>2009</td> <td>2009</td> </tr> </tbody> </table>	Site	Acres	Proposed Year of Creation	Proposed Year in which Target Acreage is Achieved	Fern Ridge Lake	1	2007/2008	2007/2008	Summer Lake	1.5	2008	2008	Crump Lake	1	2009	2009	Brooks Island (San Francisco Bay)	2	2008/2009	2008/2009	Hayward Regional Shoreline (San Francisco Bay)	0.5	2008/2009	2008/2009	Don Edwards NWR (San Francisco Bay)	0.5-1	2009	2009	<p>Implementation Plans</p> <ul style="list-style-type: none"> Initial plans are contained in Section B.2.5.3 of this BA. <p>Annual Progress Report</p> <ul style="list-style-type: none"> Report number of acres developed at each site, monitoring of nesting pairs and consumption rates on salmonids at East Sand Island. <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> Comprehensive Evaluation Report will summarize the effects of redistribution of caspian terns on salmonids in the Columbia River estuary.
Site	Acres	Proposed Year of Creation	Proposed Year in which Target Acreage is Achieved																											
Fern Ridge Lake	1	2007/2008	2007/2008																											
Summer Lake	1.5	2008	2008																											
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Don Edwards NWR (San Francisco Bay)	0.5-1	2009	2009																											

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Predation Management Strategy 2—Implement Avian Predation Control Measures to Increase Survival of Juvenile Salmonids in the Lower Snake and Columbia River		
4	<p>Double-Crested Cormorant The Action Agencies will develop a cormorant management plan encompassing additional research, development of a conceptual management plan, and implementation of actions if warranted in the estuary.</p>	<p>Implementation Plans</p> <ul style="list-style-type: none"> • Status of the management plan will be provided in the 2009 Implementation plan. <p>Annual Progress Report</p> <ul style="list-style-type: none"> • Annual progress reports will describe actions taken if warranted. <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> • Comprehensive Evaluation Report will summarize actions taken.
5	<p>Inland Avian Predation The Action Agencies will develop an avian management plan for Corps-owned lands and associated shallow-water habitat.</p>	<p>Implementation Plans</p> <ul style="list-style-type: none"> • Status of the management plan will be provided in the 2009 Implementation plan. <p>Annual Progress Report</p> <ul style="list-style-type: none"> • Annual progress reports will describe actions taken if warranted. <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> • Comprehensive Evaluation Report will summarize actions taken.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Predation Management Strategy 2—Implement Avian Predation Control Measures to Increase Survival of Juvenile Salmonids in the Lower Snake and Columbia River		
6	<p>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.</p>	<p>Implementation Plans</p> <ul style="list-style-type: none"> The FPP identifies avian deterrent actions at the lower Snake and Columbia River dams. The FPP is updated annually. <p>Annual Progress Report</p> <ul style="list-style-type: none"> Annual deterrent actions will not be reported. <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> Annual deterrent actions will not be reported.
Predation Management Strategy 3—Implement Marine Mammal Control Measures to Increase Survival of Adult Salmonids at Bonneville Dam		
7	<p>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 NMFS, Oregon Department of Fish and 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.</p>	<p>Implementation Plans</p> <ul style="list-style-type: none"> The FPP identifies annual installation of sea lion excluder gates. <p>Annual Progress Report</p> <ul style="list-style-type: none"> Not applicable. <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> Not applicable.

RESEARCH, MONITORING AND EVALUATION ACTIONS

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
Research, Monitoring and Evaluation Actions		
<p><i>The overall RM&E objective is to provide information needed to support planning and adaptive management and demonstrate accountability related to the implementation of FCRPS ESA hydropower and offsite actions for all ESUs. The Action Agencies will undertake RM&E through project implementation and compliance monitoring, status monitoring, action effectiveness research, and critical uncertainties research in the following nine areas:</i></p> <ul style="list-style-type: none"> • <i>RM&E Strategy 1—Monitor Status of Selected Fish Populations Related to FCRPS Actions</i> • <i>RM&E Strategy 2—Hydropower RM&E</i> • <i>RM&E Strategy 3—Tributary Habitat RM&E</i> • <i>RM&E Strategy 4—Estuary and Ocean RM&E</i> • <i>RM&E Strategy 5—Harvest RM&E</i> • <i>RM&E Strategy 6—Hatchery RM&E</i> • <i>RM&E Strategy 7—Predation Management RM&E</i> • <i>RM&E Strategy 8—Coordination and Data Management</i> • <i>RM&E Strategy 9—Project Implementation and Compliance Monitoring</i> <p><i>Each of the nine areas is identified as a strategy in the following discussion. Each strategy consists of one or more specific actions. These are summarized in the following sections.</i></p> <p><i>The Action Agencies have identified measures that will be monitored to assess progress towards achievement of performance standards (benchmarks) and performance targets (longer-term goals) to inform adaptive management actions. Two aspects of performance will be monitored:</i></p> <ul style="list-style-type: none"> • <i>Programmatic performance will be tracked through project implementation and compliance monitoring.</i> • <i>Biological and environmental performance will be tracked and evaluated through status monitoring, action effectiveness research, and critical uncertainty research in combination with existing and developing quantitative models. Performance standards will be monitored to ensure accountability and adherence to proposed actions. Biological performance targets will be evaluated over longer time periods as new information and learning is applied through analytical models. Targets allow us to check for progress toward expected life stage survival improvements and trends in evolutionarily 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> 		

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
<p>RM&E Strategy 1—Monitor the Status of Selected Fish Populations Related to FCRPS Actions</p>		
<p><i>The Action Agencies’ strategy is to support performance monitoring and adaptive management related to the status of fish populations.</i></p>		
<p>1</p>	<p>Fish Population Status Monitoring The Action Agencies will enhance existing fish population status monitoring performed by fish management agencies through the specific actions listed below. In addition, ancillary population status and trend information is being obtained through several ongoing habitat and hatchery improvement projects (see project tables in Attachment B.2.6-1).</p> <ul style="list-style-type: none"> • Implement and maintain the Columbia River Basin passive integrated transponder (PIT)-Tag Information System. (Annually) • Monitor adult returns at mainstem hydroelectric dams using both visual counts and the PIT-tag detection system (see Hydrosystem section). (Annually) • Monitor juvenile fish migrations at mainstem hydro electric dams using smolt monitoring and the PIT-tag detection system (see Hydrosystem section). (Annually) • Fund status and trend monitoring as a component of the pilot studies in the 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) • 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) • 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) • Fund marking of hatchery releases from Action Agencies funded facilities to enable monitoring of hatchery-origin fish in natural spawning areas and the assessment of status of wild populations. (Annually) • Report available information on population viability metrics in annual and comprehensive evaluation reports. (Initiate in FY 2008) 	<p>Implementation Plans</p> <ul style="list-style-type: none"> • Specific projects for implementation in the 2007-2009 period are identified in the FCRPS BA Attachment B.2.6-1. • Specific projects for a 3 year period will be identified in implementation plans in December, 2009, 2012 and 2015. <p>Annual Progress Report</p> <ul style="list-style-type: none"> • 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. <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> • The evaluation of fish population status information will be included.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 1—Monitor the Status of Selected Fish Populations Related to FCRPS Actions		
2	<p>Collaboration Regarding Fish Population Status Monitoring The Action Agencies will enhance existing fish population status monitoring performed by fish management agencies through the following collaboration commitments:</p> <ul style="list-style-type: none"> • Support the coordination, data management, and annual synthesis of fish population metrics through Regional Data Repositories and reports such as the CBFWA State of the Resource. (Annually) • Facilitate and participate in an ongoing collaboration process to develop a regional strategy for status and trend monitoring for key ESA fish populations and an associated regional agreement for joint funding and implementation. This monitoring strategy will be coordinated with the status monitoring needs and strategies being developed for hydrosystem, habitat, hatchery, harvest, and estuary/ocean. (Initiate in FY 2008) • Provide cost-shared funding support and staff participation in regional coordination forums such as the Pacific Northwest Aquatic Monitoring Partnership (PNAMP) fish population monitoring workgroup and the Northwest Environmental Data Network to advance regional standards and coordination for more efficient and robust monitoring and information management. (Annually) 	<p><u>Implementation Plans</u></p> <ul style="list-style-type: none"> • Specific projects for a 3 year period will be identified in implementation plans in December, 2009, 2012 and 2015. <p><u>Annual Progress Report</u></p> <ul style="list-style-type: none"> • Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans. <p><u>2012 and 2015 Comprehensive RPA Evaluation Reports</u></p> <ul style="list-style-type: none"> • Progress on collaboration will be reported.

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

The Action Agencies’ strategy is to support performance monitoring and adaptive management related 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 BA, but using actual operations and configurations in place in 2012 and 2015, at the time of the comprehensive evaluation. These estimates will be based on the Comprehensive Fish Passage Model (COMPASS), calibrated and validated by the most recent years’ empirical survival data.

Juvenile Dam Passage Performance Standards

The Action Agencies juvenile performance standards are an average across Snake River and Lower Columbia River dams of 96 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 face of the dam to a standardized reference point in the tailrace. (See Hydropower RM&E, Appendix B.2.6-2).

Juvenile System Survival Performance Targets

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

Adult Performance Standards

The Action Agencies adult performance standards will track and confirm that the current high levels of adult survival are maintained. (Table 7).

Table 7. Adult Performance Standard by ESU

ESU	Adult Standard	Reach	Rationale
Snake River Spring Chinook	90%	Bonn. to Lower Granite	Longest migratory route
Snake River Summer Chinook	94%	Bonn. to Lower Granite	Longest migratory route
Upper Columbia River Spring Chinook	92%	Bonn. to McNary	Longest migratory route
Snake River Fall Chinook	92%	Bonn. to Lower Granite	Longest migratory route
Willamette River Chinook	None	None	Low encounter rate
Lower Columbia River Chinook	None	None	Surrogate of upriver ESU
Snake River Steelhead	NA	Bonn. to Lower Granite	Unaccounted harvest leads to uncertainty in calculations
Upper Columbia River Steelhead	NA	Bonn. to McNary	Unaccounted harvest leads to uncertainty in calculations
Mid-Columbia River Steelhead	NA	Variable	Unaccounted harvest leads to uncertainty in calculations
Lower Columbia River Steelhead	None	None	Upriver Steelhead ESU surrogate
Willamette River Steelhead	None	None	Low encounter rate
Snake River Sockeye	None	None	Uncertainty in data
Lower Columbia River Coho	None	None	Upriver Chinook ESU surrogate
Columbia River Chum	None	None	Low encounter rate

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 2— Hydrosystem Research, Monitoring, and Evaluation		
3	<p>Monitor and Evaluate Fish Performance within the FCRPS. The Action Agencies will monitor the following biological responses and/or environmental attributes involved in passage through the hydrosystem, and report these estimates on an annual basis:</p> <ul style="list-style-type: none"> • Monitor and evaluate juvenile salmonid dam survival rates for a subset of FCRPS projects. • Monitor and evaluate juvenile salmonid system survival through the FCRPS, including estimates of differential post-Bonneville survival of transported fish relative to in-river fish (D-value) as needed. • Monitor and evaluate adult salmonid system survival upstream through the FCRPS. • Provide additional PIT-tag marking of Upper Columbia River populations to provide ESU specific estimates of juvenile and adult survival through the Federal mainstem dams. • Assess the feasibility of PIT-tag marking of Snake River Sockeye Salmon for specific survival tracking of this ESU through the FCRPS. • Develop an action plan for conducting hydrosystem status monitoring (analytical approaches, tagging needs, methods, and protocols) in ongoing collaboration with the State and Federal fishery agencies and Tribes. This will be done in coordination with status monitoring needs and strategies being developed for estuary/ocean, habitat, hatcheries, and harvest. (Initiate in FY 2009) <p>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.</p>	<p>Implementation Plans</p> <ul style="list-style-type: none"> • Specific projects for a 3 year period will be identified in implementation plans in December, 2009, 2012 and 2015. <p>Annual Progress Report</p> <ul style="list-style-type: none"> • Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans. <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> • The evaluation will include information from these actions.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations		
RM&E Strategy 2— Hydrosystem Research, Monitoring, and Evaluation				
Table 8. Minimum Adult Fish Counting Schedule				
	Dam	Duration of Operation	Duration of Counting	Hours of Count
	Bonneville	January 1 - December 31	January 1 - December 31	04:00 - 20:00
	The Dalles	February 20 – December 7	February 20 – December 7	04:00 - 20:00
	John Day	February 20 – December 7	February 20 – December 7	04:00 - 20:00
	McNary	March 1 – December 31	March 1 – December 31	04:00 - 20:00
	Ice Harbor	March 1 – December 31	March 1 – March 31	06:00 - 16:00
			April 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 15	06:00 - 16:00

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 2— Hydrosystem Research, Monitoring, and Evaluation		
4	<p>Monitor and Evaluate Migration Characteristics and River Condition The Action Agencies will monitor and evaluate the following biological and physical attributes of anadromous fish species migrating through the FCRPS on an annual basis:</p> <ul style="list-style-type: none"> • Monitor and estimate the abundance of smolts passing index dams. • Monitor and describe the migration timing of smolts at index dams, identify potential problems, and evaluate implemented solutions. • Monitor and document the condition (e.g., descaling, injury, gas bubble trauma) of smolts at index dams, identify potential problems, and evaluate implemented solutions. • Monitor and enumerate adult salmonids passing through fishways in the FCRPS, identify potential problems, and evaluate implemented solutions. • Monitor and describe the migration timing of adults at dams in the FCRPS, identify potential problems, and evaluate implemented solutions. • Monitor and evaluate the TDG, temperature, turbidity, and flow at projects in the FCRPS relative to performance objectives. 	<p>Implementation Plans</p> <ul style="list-style-type: none"> • Specific projects for a 3 year period will be identified in implementation plans in December, 2009, 2012 and 2015. <p>Annual Progress Report</p> <ul style="list-style-type: none"> • Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans. <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> • The evaluation will include information from these actions.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 2— Hydrosystem Research, Monitoring, and Evaluation		
5	<p>Monitor and Evaluate Effects of Configuration and Operation Actions The Action Agencies will monitor and evaluate the numerous operations and configurations implemented at projects in the FCRPS identified below. These project evaluations will be conducted following modifications to configurations or operations. For project specific information on configurations or operational changes, see section B.2.1 Hydro Actions.</p> <ul style="list-style-type: none"> • Monitor and evaluate the effects of existing spillways, modifications, and operations on smolt survival. • Monitor and evaluate the effectiveness of traditional juvenile bypass systems and modifications to such, on smolt survival and condition. • Monitor and evaluate the effectiveness of surface bypass structures and modifications on smolt survival and condition. • Monitor and evaluate the effectiveness of turbine operations and modifications on smolt survival and condition. • Monitor and evaluate overall dam passage with respect to modifications at projects. • Monitor and evaluate the effectiveness of the juvenile fish transportation program and modifications to operations. • Monitor and evaluate the effects of environmental conditions affecting juvenile fish survival. • Monitor and evaluate the effectiveness of reducing predation towards improving juvenile fish survival. • Investigate, evaluate and deploy alternative technologies and methodologies for fish passage and the RM&E Action. • Determine if actions directed at benefiting juveniles have an unintended effect on migrating adults (e.g., certain spill operations). • Install and maintain adult PIT-tag detectors in fish ladders at key dams in the FCRPS. • Assess the feasibility of developing PIT-tag detectors for use in natal streams and tributaries as appropriate to support more comprehensive and integrated All-H monitoring designs and assessments of stray rates. • Monitor and evaluate the effects of fish ladder operations and configurations on adult passage rates. 	<p>Implementation Plans</p> <ul style="list-style-type: none"> • Specific projects for a 3 year period will be identified in implementation plans in December, 2009, 2012 and 2015. <p>Annual Progress Report</p> <ul style="list-style-type: none"> • Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans. <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> • The evaluation will include information from these actions.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 2— Hydrosystem Research, Monitoring, and Evaluation		
6	<p>Investigate Hydro Critical Uncertainties The Action Agencies will fund selected research directed at resolving critical uncertainties that are pivotal in lifecycle model analyses. These specific actions include:</p> <ul style="list-style-type: none"> • Investigate and quantify delayed differential effects (D-value) associated with the transportation of smolts in the FCRPS as needed. (Initiate in FY 2007-2009 Projects) • Investigate the post-Bonneville mortality effect of changes in fish arrival timing and transportation to below Bonneville. (Initiate in FY 2007-2009) • Conduct a workshop every other year with members of the Independent Scientific Advisory Board (ISAB) to review current research and monitoring approaches on post Bonneville mortality for transported and non-transported fish. (Initiate in FY 2009) • Investigate, describe and quantify key characteristics of the early life history of Snake River Fall Chinook Salmon in the mainstem Snake, Columbia, and Clearwater rivers. (Initiate in FY 2007-2009 Project) • Investigate effects of adult passage experience in the FCRPS on pre-spawning mortality. (Initiate in FY 2009) 	<p>Implementation Plans</p> <ul style="list-style-type: none"> • Specific projects for a 3 year period will be identified in implementation plans in December, 2009, 2012 and 2015. <p>Annual Progress Report</p> <ul style="list-style-type: none"> • Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans. <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> • The evaluation will include information from these actions.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
<p>RM&E Strategy 3—Tributary Habitat Research, Monitoring, and Evaluation</p>		
<p><i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to tributary habitat actions.</i></p>		
<p>7</p>	<p>Monitor and Evaluate Tributary Habitat Conditions and Limiting Factors The Action Agencies will:</p> <ul style="list-style-type: none"> • Implement research in select areas of the pilot study basins (Wenatchee, Methow and Entiat river basins in the Upper Columbia River, the Lemhi and South Fork Salmon river basins, and the John Day River Basin) to quantify the relationships between 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. • 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) • 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 and an associated regional memorandum of understanding (MOU) for joint funding and implementation. This monitoring strategy will be coordinated with the status monitoring needs and strategies being developed for hydropower, habitat, hatchery, harvest, and estuary/ocean. (Initiate in FY 2008) 	<p><u>Implementation Plans</u></p> <ul style="list-style-type: none"> • Specific projects for implementation in the 2007-2009 period are identified in the FCRPS BA Attachment B.2.6-1, Table 2. • Specific projects for a 3 year period will be identified in implementation plans in December, 2009, 2012 and 2015. <p><u>Annual Progress Report</u></p> <ul style="list-style-type: none"> • Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans. <p><u>2012 and 2015 Comprehensive RPA Evaluation Reports</u></p> <ul style="list-style-type: none"> • The evaluation will include information from these actions.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 3—Tributary Habitat Research, Monitoring, and Evaluation		
8	<p>Evaluate the Effectiveness of Tributary Habitat Actions The Action Agencies will evaluate the effectiveness of habitat actions through RM&E projects that support the testing and further development of relationships and models used for estimating habitat benefits. These evaluations will be coordinated with hatchery effectiveness studies.</p> <ul style="list-style-type: none"> • 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) • 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) • 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) • 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) • Incorporate research and monitoring results within existing or newly developed habitat relationships or models. (Initiate in FY 2008) 	<p>Implementation Plans</p> <ul style="list-style-type: none"> • Specific projects for implementation in the 2007-2009 period are identified in the FCRPS BA Attachment B.2.6-1, Table 2. • Specific projects for a 3 year period will be identified in implementation plans in December, 2009, 2012 and 2015. <p>Annual Progress Report</p> <ul style="list-style-type: none"> • Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans. <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> • The evaluation will include information from these actions.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 4—Estuary Habitat and Ocean Research, Monitoring, and Evaluation		
<i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to estuary habitat actions.</i>		
9	<p>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:</p> <ul style="list-style-type: none"> • Monitor and evaluate smolt survival and/or fitness in select reaches from Bonneville Dam through the estuary. (Initiate in FY 2007-2009 Projects) • Develop an index and monitor and evaluate life history diversity of salmonid populations at representative locations in the estuary. (Initiate in FY 2007-2009 Projects) • Monitor and evaluate juvenile salmonid growth rates and prey resources at representative locations in the estuary and plume. (Initiate in FY 2007-2009 Projects) • 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) 	<p><u>Implementation Plans</u></p> <ul style="list-style-type: none"> • Specific projects for implementation in the 2007-2009 period are identified in the FCRPS BA Attachment B.2.6-1, Table 2. • Specific projects for a 3 year period will be identified in implementation plans in December, 2009, 2012 and 2015. <p><u>Annual Progress Report</u></p> <ul style="list-style-type: none"> • Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans. <p><u>2012 and 2015 Comprehensive RPA Evaluation Reports</u></p> <ul style="list-style-type: none"> • The evaluation will include information from these actions.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 4—Estuary and Ocean Research, Monitoring, and Evaluation		
10	<p>Monitor and Evaluate Migration Characteristics and Estuary/Ocean Conditions The Action Agencies will monitor and evaluate selected ecological attributes of the estuary, which will include the following:</p> <ul style="list-style-type: none"> • Map bathymetry and topography of the estuary as needed for RM&E. (Initiate in FY 2007-2009 Projects) • Establish a hierarchical habitat classification system based on hydro-geomorphology, ground-truth it with vegetation cover monitoring data, and map existing habitats. (Initiate in FY 2007-2009 Projects) • Develop an index of habitat connectivity and apply it to each of the eight reaches of the study area. (Initiate in FY 2007-2009 Projects) • Evaluate migration through and use of a subset of various shallow-water habitats from Bonneville Dam to the mouth towards understanding specific habitat use and relative importance to juvenile salmonids. (Initiate in FY 2007-2009 Projects) • Monitor habitat conditions periodically, including water surface elevation, vegetation cover, plant community structure, primary and secondary productivity, substrate characteristics, dissolved oxygen, temperature, and conductivity, at representative locations in the estuary as established through RM&E. (FY 2007-2009 Projects) 	<p>Implementation Plans</p> <ul style="list-style-type: none"> • Specific projects for implementation in the 2007-2009 period are identified in the FCRPS BA Attachment B.2.6-1, Table 3. • Specific projects for a 3 year period will be identified in implementation plans in December, 2009, 2012 and 2015. <p>Annual Progress Report</p> <ul style="list-style-type: none"> • Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans. • Tabulate the amount of absolute acreage by habitat type that is restored or protected every year. (Initiate in FY 2007-2009 Projects) • Report annually on indices of productivity for the estuary and ocean (i.e., Pacific Decadal Oscillation, primary productivity indices). (Annually) <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> • The evaluation will include information from these actions.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 4—Estuary and Ocean Research, Monitoring, and Evaluation		
11	<p>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:</p> <ul style="list-style-type: none"> • 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 Projects) • 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) • 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 controlling factors, structures, and processes affecting salmon habitats and performance. (Initiate in FY 2007-2009 Projects) 	<p>Implementation Plans</p> <ul style="list-style-type: none"> • Specific projects for implementation in the 2007-2009 period are identified in the FCRPS BA Attachment B.2.6-1, Table 3. • Specific projects for a 3 year period will be identified in implementation plans in December, 2009, 2012 and 2015. <p>Annual Progress Report</p> <ul style="list-style-type: none"> • Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans. <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> • The evaluation will include information from these actions.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 4—Estuary and Ocean Research, Monitoring, and Evaluation		
12	<p>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, including the following:</p> <ul style="list-style-type: none"> • Continue work to define the ecological importance of the tidal freshwater, estuary, plume, and nearshore ocean environments to the viability and recovery of listed salmonid populations in the Columbia River Basin. • Continue work to define the causal mechanisms and migration/behavior characteristics affecting survival of juvenile salmon during their first weeks in the ocean. • Investigate the importance of early life history of salmon populations in tidal fresh water of the lower Columbia River. • Continue development of a hydrodynamic numerical model for the estuary and plume to support critical uncertainties investigations. 	<p><u>Implementation Plans</u></p> <ul style="list-style-type: none"> • Specific projects for implementation in the 2007-2009 period are identified in the FCRPS BA Attachment B.2.6-1, Table 3. • Specific projects for a 3 year period will be identified in implementation plans in December, 2009, 2012 and 2015. <p><u>Annual Progress Report</u></p> <ul style="list-style-type: none"> • Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans. <p><u>2012 and 2015 Comprehensive RPA Evaluation Reports</u></p> <ul style="list-style-type: none"> • The evaluation will include information from these actions.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 5—Harvest Research, Monitoring, and Evaluation		
<i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to harvest actions.</i>		
13	<p>Fund Selected Harvest Investigations The Action Agencies will fund selected harvest investigations linked to FCRPS interests:</p> <ul style="list-style-type: none"> • Evaluate the feasibility of obtaining PIT-tag recoveries in Zone 6 to determine whether recoveries can help refine estimates of in-river harvest rates, upstream survival rates, and straying rates. For FY 2007, focus on a pilot to test the feasibility of PIT-tag recoveries in Zone 6 harvest (spring, summer, and fall Chinook salmon and summer steelhead). (Initiate in FY 2007-2009 Projects) • Evaluate methods to develop or expand use of selective fishing methods and gear. (Initiate in FY 2007-2009 Projects) • Evaluate post-release mortality rates for selected fisheries. (Initiate in FY 2007-2009 Projects) • Support coded-wire tagging and coded-wire tag recovery operations that inform survival, straying, and harvest rates of hatchery fish by stock, rearing facility, release treatment, and location. (Initiate in FY 2007-2009 Projects) • Investigate the feasibility of genetic stock identification monitoring techniques. (Initiate in FY 2007-2009 Projects) 	<p>Implementation Plans</p> <ul style="list-style-type: none"> • Specific projects for implementation in the 2007-2009 period are identified in the FCRPS BA Attachment B.2.6-1, Table 4. • Specific projects for a 3 year period will be identified in implementation plans in December, 2009, 2012 and 2015. <p>Annual Progress Report</p> <ul style="list-style-type: none"> • Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans. <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> • The evaluation will include information from these actions.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 6—Hatchery Research, Monitoring, and Evaluation		
<i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to hatchery actions.</i>		
14	<p>Monitor Hatchery Effectiveness The Action Agencies will continue to fund selected monitoring and evaluation of the effectiveness of Hatchery Actions. The evaluation of hatchery projects will be coordinated with the Tributary Habitat monitoring and evaluation program. These actions include:</p> <ul style="list-style-type: none"> • Determine the effect that safety-net and conservation hatchery programs have on the viability and recovery of the targeted populations of salmon and steelhead. (Initiate in FY 2007-2009 Projects) • Determine the effect that implemented hatchery reform actions have on the recovery of targeted salmon and steelhead populations. (Initiate in FY 2007-2009 Projects) 	<p>Implementation Plans</p> <ul style="list-style-type: none"> • Specific projects for implementation in the 2007-2009 period are identified in the FCRPS BA Attachment B.2.6-1, Table 5. • Specific projects for a 3 year period will be identified in implementation plans in December, 2009, 2012 and 2015. <p>Annual Progress Report</p> <ul style="list-style-type: none"> • Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans. <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> • The evaluation will include information from these actions.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 6—Hatchery Research, Monitoring, and Evaluation		
15	<p>Investigate Hatchery Critical Uncertainties The Action Agencies will continue to fund selected research directed at resolving artificial propagation critical uncertainties:</p> <ul style="list-style-type: none"> • Estimate the relative reproductive success of hatchery-origin salmon and steelhead compared to reproductive success of their natural-origin counterparts. (Initiate in FY 2007-2009 Projects) • Determine if hatchery reforms reduce the deleterious effects of artificial production on listed populations, thereby contributing to a reduction of extinction risk for the affected natural populations. (Initiate in FY 2007-2009 Projects) • Determine if properly designed intervention programs using artificial production make a net positive contribution to recovery of listed populations. (Initiate in FY 2007-2009 Projects) 	<p>Implementation Plans</p> <ul style="list-style-type: none"> • Specific projects for implementation in the 2007-2009 period are identified in the FCRPS BA Attachment B.2.6-1, Table 5. • Specific projects for a 3 year period will be identified in implementation plans in December, 2009, 2012 and 2015. <p>Annual Progress Report</p> <ul style="list-style-type: none"> • Status of project implementation (including project milestones) through December of previous the year for all actions identified in implementation plans. <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> • The evaluation will include information from these actions.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 7—Predation Management Research, Monitoring, and Evaluation		
<i>The Action Agencies' strategy is to support performance monitoring and adaptive management related to predation management actions.</i>		
16	<p>Monitor and Evaluate the Caspian Tern Population in the Columbia River Estuary The Action Agencies will monitor the tern population in the estuary and its impacts on outmigrating juvenile salmonids, as well as the effectiveness of the Caspian tern management plan. Specific actions include:</p> <ul style="list-style-type: none"> • Estimate annual Caspian tern predation rates on juvenile salmonids and the estimated change in juvenile salmonids survival rates. (Initiate in FY 2007-2009 Projects) • Determine the size, habitat use, nesting success, and factors limiting the nesting success of the Caspian tern colony on East Sand Island. (Initiate in FY 2007-2009 Projects) • Determine diet composition of Caspian terns nesting on East Sand Island. • Detect the formation of tern colonies at other dredged-material disposal sites in the estuary. (Initiate in FY 2007-2009 Projects) • Determine the accuracy of tern predation rates on salmonids based on smolt PIT-tag recoveries on colony. (Initiate in FY 2007-2009 Projects) • Continue ongoing research to detect PIT-tags deposited on avian bird colonies in the estuary. (Initiate in FY 2007-2009 Projects) 	<p><u>Implementation Plans</u></p> <ul style="list-style-type: none"> • Specific projects for implementation in the 2007-2009 period are identified in the FCRPS BA Attachment B.2.6-1, Table 6. • Specific projects for a 3 year period will be identified in implementation plans in December, 2009, 2012 and 2015. <p><u>Annual Progress Report</u></p> <ul style="list-style-type: none"> • Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans. <p><u>2012 and 2015 Comprehensive RPA Evaluation Reports</u></p> <ul style="list-style-type: none"> • The evaluation will include information from these actions.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 7—Predation Management Research, Monitoring, and Evaluation		
17	<p>Monitor and Evaluate the Double-Crested Cormorant Population in the Columbia River Estuary The Action Agencies will monitor the cormorant population in the estuary and its impacts on outmigrating juvenile salmonids in an effort to determine if management is warranted and to determine potential management techniques to decrease predation rates. Specific actions include:</p> <ul style="list-style-type: none"> • Estimate annual double-crested cormorant predation rates on juvenile salmonids and the estimated change in juvenile salmonids survival rates. (Initiate in FY 2007-2009 Projects) • Determine the colony size, habitat use, nesting success and factors limiting nesting success of double-crested cormorants nesting on East Sand Island. (Initiate in FY 2007-2009 Projects) • Determine diet composition of cormorants nesting on East Sand Island. (Initiate in FY 2007-2009 Projects) • Determine the accuracy of cormorant predation rates on salmonids based on smolt PIT-tag recoveries on colony. (Initiate in FY 2007-2009 Projects) • Determine the geographic boundaries of the Pacific Coast subspecies of double-crested cormorant so that the size of the population and management unit that includes the East Sand Island cormorant colony can be ascertained. (Initiate in FY 2007-2009 Projects) • Determine the potential to use social attraction and habitat improvements to attract double-crested cormorants to alternative nesting locations. (Initiate in FY 2007-2009 Projects) • Continue ongoing research to detect PIT-tags deposited on avian bird colonies in the estuary. (Initiate in FY 2007-2009 Projects) 	<p>Implementation Plans</p> <ul style="list-style-type: none"> • Specific projects for implementation in the 2007-2009 period are identified in the FCRPS BA Attachment B.2.6-1, Table 6. • Specific projects for a 3 year period will be identified in implementation plans in December, 2009, 2012 and 2015. <p>Annual Progress Report</p> <ul style="list-style-type: none"> • Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans. <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> • The evaluation will include information from these actions.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 7—Predation Management Research, Monitoring, and Evaluation		
18	<p>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 in an effort to determine if management of the colonies is warranted and to determine potential management techniques to decrease predation rates. Specific actions include:</p> <ul style="list-style-type: none"> • Determine colony locations, size, and distribution, and habitat use and nesting success of avian predators on Corps-managed lands in the lower Snake and middle Columbia rivers towards developing a land management plan. (Initiate in FY 2007-2009 Projects) • Determine diet composition and consumption of juvenile salmonids by inland avian predators (including terns nesting on Crescent Island and by cormorants nesting on Foundation Island). (Initiate in FY 2007-2009 Projects) • Determine the effects of operational strategies on avian predation rates on juvenile salmon. (Initiate in FY 2007-2009 Projects) 	<p>Implementation Plans</p> <ul style="list-style-type: none"> • Specific projects for implementation in the 2007-2009 period are identified in the FCRPS BA Attachment B.2.6-1, Table 6. • Specific projects for a 3 year period will be identified in implementation plans in December, 2009, 2012 and 2015. <p>Annual Progress Report</p> <ul style="list-style-type: none"> • Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans. <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> • The evaluation will include information from these actions.
19	<p>Monitoring Related to Marine Mammal Predation The Action Agencies will:</p> <ul style="list-style-type: none"> • Estimate overall sea lion abundance immediately below Bonneville Dam. (Initiate in FY 2007-2009 Projects) • Monitor the spatial and temporal distribution of sea lion predation attempts and estimate predation rates. (Initiate in FY 2007-2009 Projects) • Monitor the effectiveness of deterrent actions (e.g., exclusion gates, acoustics, and harassment) and their timing of application on spring runs of anadromous fish passing Bonneville Dam. (Initiate in FY 2007-2009 Projects) 	<p>Implementation Plans</p> <ul style="list-style-type: none"> • Specific projects for implementation in the 2007-2009 period are identified in the FCRPS BA Attachment B.2.6-1, Table 6. • Specific projects for a 3 year period will be identified in implementation plans in December, 2009, 2012 and 2015. <p>Annual Progress Report</p> <ul style="list-style-type: none"> • Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans. <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> • The evaluation will include information from these actions.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 7—Predation Management Research, Monitoring, and Evaluation		
20	<p>Monitoring Related to Piscivorous (Fish) Predation The Action Agencies will:</p> <ul style="list-style-type: none"> • Continue to update and estimate the cumulative benefits of sustained removals of northern pikeminnow since 1990. (Initiate in FY 2007-2009 Projects) • Continue to evaluate if inter and intra compensation is occurring. (Initiate in FY 2007-2009 Projects) • Evaluate the benefit of additional removals and resultant increase in exploitation rate’s effect on reduction in predator mortality since the 2004 program incentive increase. (Initiate in FY 2007-2009 Projects) • Develop a study plan to review, evaluate, and develop strategies to reduce non-indigenous piscivorous predation. (Initiate in FY 2007-2009 Projects) 	<p>Implementation Plans</p> <ul style="list-style-type: none"> • Specific projects for implementation in the 2007-2009 period are identified in the FCRPS BA Attachment B.2.6-1, Table 2. • Specific projects for a 3 year period will be identified in implementation plans in December, 2009, 2012 and 2015. <p>Annual Progress Report</p> <ul style="list-style-type: none"> • Status of project implementation (including project milestones) through December of the previous year for all actions identified in implementation plans. <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> • The evaluation will include information from these actions.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 8—Coordination and Data Management Research, Monitoring, and Evaluation		
<i>The Action Agencies are committed to making coordination and data management more effective, since FCRPS RM&E is part of the overall RM&E for recovery of salmon in the Columbia River Basin</i>		
21	<p>Coordination The Action Agencies will coordinate RM&E activities with other Federal, State and Tribal agencies on an ongoing annual basis, including:</p> <ul style="list-style-type: none"> • Organizing and supporting the Corps AFEP. • Supporting and participating in the Council’s Columbia River Basin Fish and Wildlife Program project planning and review efforts. • Supporting the standardization and coordination of tagging and monitoring efforts through participation and leadership in regional coordination forums such as PNAMP. • Working with regional monitoring agencies to develop, cooperatively fund, and implement standard metrics, business practices, and information collection and reporting tools needed to cooperatively track and report on the status of regional fish improvement and fish monitoring projects. • Coordinating the further development and implementation of Hydrosystem, Tributary Habitat, Estuary/Ocean, Harvest, Hatchery, and Predation RM&E through leadership and participation in ongoing collaboration and review processes and workgroups. • Coordinating implementation with other appropriate regional collaboration processes. This includes coordination related to statutory provisions for the Federal government (BPA/Council), voluntary coordination among Federal agencies (Federal Caucus), and coordination with regional processes for Federal/non-Federal engagement [Technical Management Team (TMT), System Configuration Team (SCT), PNAMP, Northwest Environmental Data-Network (NED), and others]. 	<p>Implementation Plans</p> <ul style="list-style-type: none"> • N/A <p>Annual Progress Report</p> <ul style="list-style-type: none"> • Status of coordination of RM&E projects through December of the previous year will be provided. <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> • The evaluation will include a report on coordination efforts, projects and associated products.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 8—Coordination and Data Management Research, Monitoring, and Evaluation		
22	<p>Data Management The Action Agencies will ensure that the information obtained under the auspices of the FCRPS RM&E Program is archived in appropriate data management systems. Actions include:</p> <ul style="list-style-type: none"> • Continue to work with regional Federal, State and Tribal agencies to establish a coordinated and standardized information system network to support the RM&E program and related performance assessments. The coordination of this development will occur primarily through leadership, participation, and joint funding support in regional coordination forums such as the NED workgroup, and PNAMP and the ongoing RM&E pilot studies in the Wenatchee River, John Day River, Upper Salmon River, and Columbia River Estuary. (Initiate in FY 2007-2009 Projects) • Contribute funding for data system components that support the information management needs of individual Hydrosystem, Tributary Habitat, Estuary/Ocean, Harvest, Hatchery, and Predation RM&E. (Initiate in FY 2007-2009 Projects) • Participate in Northwest regional coordination and collaboration efforts such as the current PNAMP and NED efforts to develop and implement a regional management strategy for water, fish and habitat data. (Initiate in FY 2007-2009 Projects) 	<p>Implementation Plans</p> <ul style="list-style-type: none"> • N/A <p>Annual Progress Report</p> <ul style="list-style-type: none"> • Status of data management projects through December of the previous year will be provided. <p>2012 and 2015 Comprehensive RPA Evaluation Reports</p> <ul style="list-style-type: none"> • The evaluation will include a report on data management projects.

Action No.	Action Description	Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations
RM&E Strategy 9—Project Implementation and Compliance Monitoring Research, Monitoring, and Evaluation		
<i>The Action Agencies have identified specific commitments or actions for each of the hydrosystem, estuary/ocean, tributary habitat, hatchery, and predation management 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>		
23	<p>Implementation and Compliance Monitoring The Action Agencies will:</p> <ul style="list-style-type: none"> • annually monitor the successful implementation of projects through standard procedures and requirements of contract oversight and management, and review of project deliverables and final reports. • 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. 	<p><u>Implementation Plans</u></p> <ul style="list-style-type: none"> • Not applicable <p><u>Annual Progress Report</u></p> <ul style="list-style-type: none"> • The Action Agencies will use the project-level detail contained in the Action Agencies’ BiOp 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 2012 and 2015 comprehensive reports. <p><u>2012 and 2015 Comprehensive RPA Evaluation Reports</u></p> <ul style="list-style-type: none"> • The Action Agencies will use the project-level detail contained in the Action Agencies’ BiOp 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 2012 and 2015 comprehensive reports.

3. EFFECTS AND ANALYSIS OF THE FCRPS PROPOSED RPA

As previously noted, the analysis of effects for the Upper Snake River Biological Opinion (BiOp) Remand is integrated with the analysis of effects for the Remand of the 2004 Federal Columbia River Power System (FCRPS) BiOp to ensure a “comprehensive analysis” of the effects of the combined actions on the Endangered Species Act (ESA)-listed species and designated critical habitat as required by Court Order. The Federal agencies have developed the Comprehensive Analysis of the FCRPS and Mainstem Effects of Upper Snake River and other Tributary Actions (Comprehensive Analysis) to evaluate the effects of (1) the FCRPS Proposed Reasonable and Prudent Alternative (RPA); (2) the Upper Snake River Proposed Actions (PA); (3) the environmental baseline; and (4) cumulative effects. This analysis of effects also takes into account recent information on the status of the listed species, and assesses information based on the jeopardy framework described in memoranda prepared by Robert Lohn, NMFS Regional Administrator, dated July 12, 2006, and September 11, 2006 (Lohn 2006a and 2006b).

The specific effects of the FCRPS and other activities have been analyzed in detail in both the National Marine Fisheries Service (NMFS) 2000 and 2004 BiOps¹⁰. In the 2000 BiOp, NMFS analyzed the effects of the Action Agencies’ Proposed FCRPS Operations in Chapter 6¹¹. Specifically, NMFS analyzed:

- the effects on habitat in the Columbia River mainstem, estuary, and plume (6.2.1);
- effects of project operations on juvenile salmonid passage (6.2.2);
- effects of FCRPS operations on juvenile passage and survival (6.2.3);
- effects of project operations on adult salmonid passage (6.2.4);
- effects of water regulation and impoundments on salmonid migration and survival (6.2.5);
- effects of project operations on water quality(6.2.6); effects of predator control programs (6.2.7); and
- effects of FCRPS juvenile transportation program (6.2.7).

In addition, the analysis of effects of the Proposed Action on biological requirements over the full lifecycle was conducted (6.3). The overall adverse and beneficial effects of the Proposed Action were discussed, and NMFS concluded that the Proposed Action would likely jeopardize the continued existence of several Evolutionarily Significant Units (ESUs) and set forth a Reasonable and Prudent Alternative. The 2000 BiOp RPA included hydropower, habitat, hatchery, and harvest actions, and the analysis of the effects of the RPA was included in Chapter 9.

The effects of the actions undertaken to date, as identified in the 2000 and 2004 BiOps are expected to continue into the future, and are reflected in the analysis of historical information used to develop the base conditions identified in the Comprehensive Analysis.

The analytical approach employed in the Comprehensive Analysis considers the biological requirements for survival and recovery of the listed species considered in these consultations, and evaluates whether the species are likely to survive and trend toward recovery. It is a lifecycle analysis that necessarily considers

¹⁰ A summary of these effects can be found in Chapter 2, Environmental Baseline in the Comprehensive Analysis. These effects are expected to continue into the future.

¹¹ Although the Action Agencies may not fully agree with all information in Chapter 6, some of which is dated, this chapter details, from NMFS’ perspective, the effects associated with operation and maintenance of the FCRPS and the mainstem effects of tributary projects included in this consultation.

all mortality factors affecting the listed species, as well as all actions that have an impact on the species' survival, productivity, and population growth rates. In effect, the analysis makes no distinction between the federal action, the environmental baseline, or cumulative effects. All impacts on the salmon lifecycle are combined for the purposes of this analysis. The effects of the Proposed RPA are addressed in the Comprehensive Analysis (Chapters 4 to 16), along with these other factors.

A thorough discussion of the analytical approach and methods, as well as detailed information about individual salmonid stocks, is found in the Comprehensive Analysis. The Comprehensive Analysis includes supporting material that describes the Action Agencies' evaluation of the Environmental Baseline in Chapter 2. Chapter 3 describes the general analytical approach and methodologies as well as details the numerical analysis for the interior Columbia River ESU/DPSs. This chapter is supported by Appendices A through F, which contain resource area (All-H) specific analytical information. Chapters 4 through 16 provide the detailed ESU/DPS specific biological analyses. Chapters 17 and 18 explain the Action Agencies' analysis of the Cumulative Effects and Other Federal Actions to Conserve Species, respectively. Chapter 19 contains the analysis of the effects of the FCRPS Proposed RPA and the Upper Snake River Proposed Actions on designated Critical Habitat.

Table 3-1 summarizes the determination of effects for listed species and designated critical habitat based on the discussion and analysis of effects in the Comprehensive Analysis.

Table 3-1. Summary of Determinations of Effects for Species and Designated Critical Habitat

ESU/DPS	Determination Of Effects For Species	Determination Of Effects For Critical Habitat
Snake River Spring/Summer Chinook Salmon ESU (<i>Oncorhynchus tshawytscha</i>)	May Affect, Likely to Adversely Affect	Affect
Snake River Fall Chinook Salmon ESU (<i>O. tshawytscha</i>)	May Affect, Likely to Adversely Affect	Affect
Snake River Sockeye Salmon ESU (<i>O. nerka</i>)	May Affect, Likely to Adversely Affect	Affect
Snake River Basin Steelhead DPS (<i>O. mykiss</i>)	May Affect, Likely to Adversely Affect	Affect
Upper Columbia River Spring Chinook Salmon ESU (<i>O. tshawytscha</i>)	May Affect, Likely to Adversely Affect	Affect
Lower Columbia River Chinook Salmon ESU (<i>O. tshawytscha</i>)	May Affect, Likely to Adversely Affect	Affect
Upper Willamette River Steelhead DPS (<i>O. mykiss</i>)	May Affect, Likely to Adversely Affect	Affect
Upper Columbia River Steelhead DPS (<i>O. mykiss</i>)	May Affect, Likely to Adversely Affect	Affect
Middle Columbia River Steelhead DPS (<i>O. mykiss</i>)	May Affect, Likely to Adversely Affect	Affect
Lower Columbia River Steelhead DPS (<i>O. mykiss</i>)	May Affect, Likely to Adversely Affect	Affect
Upper Willamette River Chinook Salmon ESU (<i>O. tshawytscha</i>)	May Affect, Likely to Adversely Affect	Affect
Columbia River Chum Salmon ESU (<i>O. keta</i>)	May Affect, Likely to Adversely Affect	Affect
Lower Columbia River Coho Salmon ESU (<i>O. kisutch</i>)	May Affect, Likely to Adversely Affect	Affect

4. ASSESSMENT OF EFFECTS ON ESSENTIAL FISH HABITAT DESIGNATED PURSUANT TO THE MAGNUSON-STEVENSONS FISHERY CONSERVATION AND MANAGEMENT ACT

4.1 BACKGROUND

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), provides for identification, conservation, and enhancement of Essential Fish Habitat (EFH) for species regulated under a Federal fisheries management plan [MSA § 305(b), 16 USC § 1855(b)]. Fishery Management Councils designate EFH, Federal agencies consult with National Marine Fisheries Service (NMFS) with respect to effects of their actions, NMFS gives Federal agencies recommendations respecting how to conserve EFH and offset the effects of agency actions, and Federal agencies must inform NMFS how they will act consistent with NMFS' recommendations and, if not, explain the agency's reasons for not following recommendations.

The MSA consultation on EFH may be part of a consultation pursuant to the ESA [50 CFR § 600.920(f)]. Consequently, the FCRPS Action Agencies are including consultation on EFH as part of their consultation with NMFS under the ESA.

As part of the EFH consultation, an agency should provide an EFH Assessment [50 CFR § 600.920(e)]. The EFH Assessment may be part of an ESA BA. Consistent with this provision, the FCRPS Action Agencies include this section in their ESA BA as their assessment of effects of the FCRPS Proposed RPA upon EFH.

4.2 DESIGNATION OF EFH

Pursuant to the MSA, the Pacific Fishery Management Council has designated EFH for salmon, groundfish, and coastal pelagic species. For salmon EFH, see Amendment 14 to the 1997 Pacific Coast Salmon Plan, available at <http://www.pcouncil.org/salmon/salfmp/a14.html>. For groundfish EFH, see Amendment 19 to the Pacific Coast Groundfish Fishery Management Plan for the California, Oregon, and Washington Groundfish Fishery (November 2005), pp 62 et seq, available at <http://www.pcouncil.org/groundfish/gffmp/gfa19.html>, or the entire Fishery Management Plan, including Amendment 19, at <http://www.pcouncil.org/groundfish/gffmp/fmpthru19.html>. For coastal pelagic species EFH, see The Fishery Management Plan for Coastal Pelagic Species (December 1998), Appendix D, available at <http://www.pcouncil.org/cps/cpsfmp.html>.

4.3 FCRPS PROPOSED RPA

The FCRPS Action Agencies describe the action area and the Proposed RPA in Sections 1.3 and 2.0 of this BA.

4.4 EFFECTS OF THE FCRPS PROPOSED RPA ON EFH

The Action Agencies provide detailed descriptions of the effects of the FCRPS Proposed RPA on salmonids in the Comprehensive Analysis (see Chapters 4 through 16 and Appendix B), as well as in Appendix B.2.2 to this document. These appendices include a discussion of the effects on the Columbia River estuary, which is part of designated EFH for salmon, groundfish, and coastal pelagic species, and areas in the Columbia River occupied by salmonids during portions of their lifecycles. Consequently, the FCRPS Proposed RPA may affect this EFH, and the Action Agencies consider effects of the Proposed RPA on these species' EFH.

4.4.1 Effects on Salmon EFH

The Comprehensive Analysis describes effects of the FCRPS Proposed RPA on salmonids.

4.4.2 Effects on Groundfish and Coastal Pelagic EFH

NMFS has addressed effects of FCRPS actions on groundfish and coastal pelagic EFH in Section 11.4 of the 2004 FCRPS BiOp and Section 12.3 of the 2000 FCRPS BiOp. The Action Agencies believe these analyses are still pertinent and refer to them instead of repeating much of the same information. See also the Pacific Fishery Management Council's designations of EFH.

4.5 MITIGATION

The Action Agencies plan to implement the various measures described in the FCRPS Proposed RPA. These measures provide improve effects of the FCRPS action on EFH for salmon and will also improve the effects of the FCRPS action on groundfish and coastal pelagic EFH. The measures are similar to those recommended by NMFS in the 2004 and 2000 FCRPS BiOps.

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