

Endangered Species Act 2002 Progress Report for the Federal Columbia River Power System



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I. Introduction

Purpose and Scope of the 2002 Progress Report

For over two decades, the Action Agencies—Bonneville Power Administration (BPA), U.S. Army Corps of Engineers (Corps), and Bureau of Reclamation (Reclamation)—have been implementing measures to protect, mitigate and enhance Columbia Basin salmon and steelhead. Our efforts recently intensified with the implementation of recommended actions in the National Marine Fisheries Service (NMFS)¹ 2000 Federal Columbia River Power System (FCRPS) Biological Opinion. This *2002 Progress Report* is the second annual report developed by the Action Agencies to document the steps we have taken under the Biological Opinion. The 2002 report also includes our progress implementing the actions recommended in the U.S. Fish and Wildlife Service's (USFWS) 2000 FCRPS Biological Opinion.

In 2002, the Action Agencies implemented hundreds of actions and spent hundreds of millions of dollars to benefit endangered salmon, steelhead, bull trout, and sturgeon in the Columbia River Basin. While numerous and basin wide, the actions were part of an organized, scientifically based implementation plan. These efforts represent the continuation of our commitment to achieve biological objectives and performance standards for the FCRPS.

Overall, implementation of the 2000 NMFS and USFWS Biological Opinions (BiOp) is on track. In 2002, the combination of near average natural flows, agency flow augmentation and spill actions, and transportation resulted in hydrosystem conditions for fish that were much improved over conditions experienced in 2001. The Corps and Reclamation appropriated funds from Congress are becoming more aligned with the new BiOp implementation, while habitat improvement activities continue to ramp up. In 2002, record numbers of adult fish returned to the basin, and in-river survival of Snake River juvenile salmon was comparable to levels observed in the late 1960s—when only four of the eight mainstem dams were in place.

NOAA Fisheries has concluded in their 2002 Findings Letter that implementation by the Action Agencies is generally consistent with the NMFS BiOp. The vast majority of actions are being implemented as anticipated, although some schedules have slipped from those in the NMFS BiOp.

Later this year the Action Agencies will release the first cumulative evaluation of BiOp implementation and performance, referred to in NMFS BiOp as the *2003 Annual Progress Report*. This report is sometimes referred to as the 3-Year Check Report. The Action Agencies also plan to release

the *2004/2004–08 Implementation Plan*, after seeking input from the states, tribes, and others in the region.

The *2003 Cumulative Progress Report* will reflect a programmatic view of our progress to date. It will include a comprehensive assessment of our success in establishing programs and implementing the actions called for in the NMFS BiOp and the broader in scope *Basinwide Salmon Recovery Strategy*. The *2004/2004–08 Implementation Plan* will describe the hundreds of actions that the Action Agencies will take to benefit ESA-listed fish. It will also propose resolutions for any identified implementation issues or deficiencies.

The *2002 Progress Report* includes the following sections:

Section 1—Introduction: A general description of the purpose and scope of the report.

Section 2—2002 Fish Passage and Survival: A summary of 2002 adult returns and juvenile survival through the FCRPS.

Section 3—Summary of 2002 Progress and Results: A summary of the most notable measures implemented in the hydrosystem, habitat, hatcheries, harvest, resident fish, and research, monitoring and evaluation.

Section 4—Summary of Actions: A summary of overall Action Agency progress for each of the 199 actions listed in the NMFS BiOp.

Appendix—A list of projects and associated 2002 accomplishments for each of the 199 actions listed in the NMFS BiOp.

Summary of 2002 Progress and Results

Hydrosystem progress in 2002 was noteworthy for several reasons. In the hydrosystem, configuration improvements to enhance fish passage often require research, prototype development and testing and the final design and construction. Thus it often takes five or more years to implement configuration improvements. Our planning, research, design and construction activities continued to yield results in 2002. We are pleased to report that ten major configuration projects were completed in 2002. These projects should incrementally improve adult passage at Bonneville, Ice Harbor and Lower Granite dams, and enable continued drafting of cold water from Dworshak to aid adult migration in the Lower Snake River. Juvenile passage improvements were enhanced at Lower Monumental (Stilling Basin Repair) and Lower Granite

¹ National Marine Fisheries Service is now officially referred to as NOAA Fisheries. In this document, NMFS and NOAA Fisheries are used interchangeably.

(Removable Spillway Weir).

In 2002, water management and fishery operations generally followed the expectations in the BiOp. The year 2002 was crisis free when compared to the drought and power emergencies encountered in 2001. Over 21 million juvenile salmonids were collected in 2002—approximately 14 million of those were transported by truck or barge and released below Bonneville Dam. The remaining 7 million went through a bypass system to the tailrace.

During 2002, the Action Agencies used available storage at Libby, Hungry Horse, Grand Coulee and Dworshak dams and the upper Snake to supplement natural stream flows and to improve juvenile fish migration throughout the spring and summer seasons. Another noteworthy accomplishment was preparation of an Environmental Assessment to allow the interim implementation of variable quantity discharge (VARQ) flood control operations at Libby and Hungry Horse dams to begin in 2003 (two years earlier than planned). This will enhance the likelihood of meeting the BiOp flow targets and provide resident fish benefits. BPA also completed Environmental Impact Statements and issued Records of Decision for two transmission expansion projects that when constructed, will increase operational flexibility to benefit fish.

Habitat projects were implemented throughout the Columbia River Basin, based on biological criteria linked to likely fish benefits. Hundreds of new and continuing projects were implemented to protect and enhance habitats important to fish. In 2002, over 260 habitat projects were implemented in 25 subbasins. Projects implemented by BPA were reviewed through the Northwest Power and Conservation Council's (Council) Provincial Review process, which included the use of basin-wide criteria, independent science assessment, and additional review to provide focus on Endangered Species Act (ESA) priorities. Provincial Reviews are on track with 5 completed and the remaining 5 scheduled for completion in mid-2003.

Based on preliminary estimates of FY 2002 project accomplishments, BPA, through the Council's Fish and Wildlife Program, acquired at least 164 cubic feet per second (cfs) of instream flow enhancements, removed or improved more than 70 fish passage barriers to open nearly 700 miles of habitat, and protected or enhanced over 198 river miles

and 19,600 acres of riparian buffers and habitat.

Reclamation continued its efforts to lease or acquire stream flows. Reclamation also provided technical assistance to improve screened diversions and passage barriers in the Upper Salmon, Wenatchee, and Entiat subbasins and continued related efforts in the Upper John Day, Middle Fork John Day, Methow, and Lemhi subbasins.

The Corps continued to gather baseline data in the Walla Walla River that will eventually help develop potential alternatives to improve fish habitat. The Corps also conducted planning efforts for several estuary habitat restoration projects. The planning efforts should eventually lead to the restoration or protection of over 2500 acres of estuary habitat in the near future.

Hatchery activities were supported and funded as a tool to meet fish recovery objectives and support tribal and other fisheries. Construction of the new Nez Perce Tribal Hatchery was completed, and operation began in 2002. The Action Agencies also continued funding the operations and maintenance of over 30 major anadromous fish hatcheries. In order to protect the basin's most endangered populations, we funded 4 captive broodstock programs: three for spring/summer Chinook and one for sockeye. The Action Agencies also continued to produce and release juvenile resident fish through the Kootenai River White Sturgeon aquaculture program.

Looking ahead to future hatchery reforms, BPA funded development of hatchery genetic management plans for the Grande Ronde and Tucannon spring/summer Chinook safety-net programs. We expect these to be completed by fall 2003 and to provide the technical basis for future program reforms that will protect and benefit endangered fish. The Action Agencies continued to fund the marking of key populations of hatchery fish, which also protects listed fish by allowing more selective fisheries.

Harvest progress made in 2002 included the continuation of programs that have the potential to reduce harvest related mortality of ESA listed fish. The Action Agencies tested alternative fishing gears and provided improved gill nets to tribal commercial fishers. The Action Agencies used sonar to locate and remove eight submerged fishing nets that could have continued to take ESA listed fish in the Columbia River.

II. Fish Survival in 2002

Adult Survival and Returns

In 2001, adult fish returns between Bonneville and Lower Granite dams were among the highest on record, exceeding the BiOp goals for spring/summer Chinook, steelhead, and likely, fall Chinook (Table 1). Preliminary estimates of survival to Lower Granite in 2002 indicate another year of good survival, likely exceeding BiOp goals for spring/summer Chinook and Steelhead.² Reductions in fallback rates at Bonneville Dam and better assessment of unaccounted losses have contributed to these results.

Table 1. Spring/Summer, Fall Chinook and Steelhead Adult Survival to Lower Granite Dam.

	BiOp Goal	Actual 2001 survival to LGR*
Spring/Summer Chinook	85.5%	92.8%
Fall Chinook	74%	>85.5%
Steelhead	80.3%	92.7%

*Using the Hydro RM&E methodology

Many factors contributed to these impressive fish returns, including favorable environmental conditions in both freshwater and the ocean and benefits of recovery actions throughout the basin, such as actions implemented under the Council's Fish and Wildlife Program and the 1995, 1998 and 2000 FCRPS BiOp. The Action Agencies will report how these factors contribute to subsequent adult returns as improved information and understanding becomes available. There are many uncertainties about these contributing factors and how they will affect subsequent years' returns. Nevertheless, the Action Agencies remain cautiously optimistic that 2001 and 2002 returns reflect the improved future prospects for listed fish.

Specific adult numbers are summarized below. The returns are reported at three locations: Bonneville Dam, Lower Granite Dam, and Priest Rapids Dam. Adult returns to Bonneville Dam are representative of returns system wide and to lower Columbia River tributaries. Lower Granite adult returns explain returns to the Snake River, and Priest Rapids returns are representative of mid-Columbia River adult returns.

Despite the substantial fish returns in 2002, the composition of the Columbia River fish stocks has changed greatly since 1938. In the earlier decades, many of the stocks were comprised largely of wild fish, whereas today, hatchery fish dominate most runs. The scientific community has considerable interest in potential differences between wild fish and hatchery fish, focusing primarily on genetics and fitness of wild-reared hatchery fish and how to improve the quality

of hatchery reared fish. Because the Columbia Basin hatchery program is a large part of the FCRPS mitigation, including ESA recovery, research into these issues will be closely monitored.

Ten-Year Adult Return Comparisons

The 2002 fish returns based on all Chinook salmon counts substantially exceeded the previous 10-year average (Figures 1, 2 and 3). Adult fish counts at Bonneville were 300 percent larger, at Lower Granite Dam, the run was 550 percent larger

and at Priest Rapids the counts were 400 percent larger (Corps, Data Reports, 2001 and 2002; UW DART, 2002). Taking into account wild spring Chinook runs destined for passing Lower Granite Dam, recent data indicates about 3–13 percent of the total adult run crossing over Bonneville Dam are wild Chinook that will ultimately pass over Lower Granite Dam as well. Given the recent sharp increase in total Chinook runs passing Lower Granite Dam, significant increases in wild fish numbers are expected.

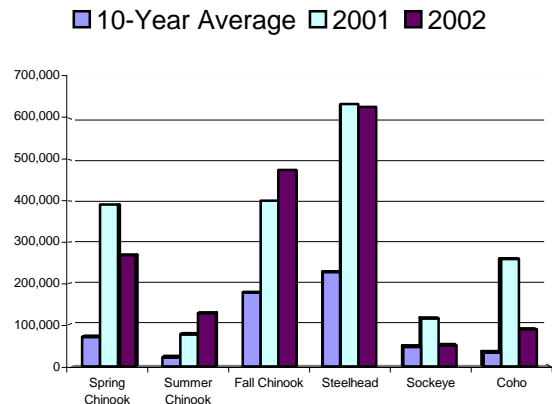


Figure 1. Adult fish passage at Bonneville Dam in 2001 and 2002 compared to the prior ten-year average.

Bonneville Adult Returns

Adult returns in 2002 to Bonneville Dam continue the high rate observed in 2001, and were the second largest numbers in recent history and among the largest since fish counts began in 1938. That year, about 272,000 Chinook passed Bonneville Dam, with the total upriver Chinook run—

² Survival rates for 2002 are not all in to make numerical estimates, but based on relative harvest, basic conversion values, and probable straying rates it is expected to be slightly less than 2001 but still above the NMFS BiOp goals.

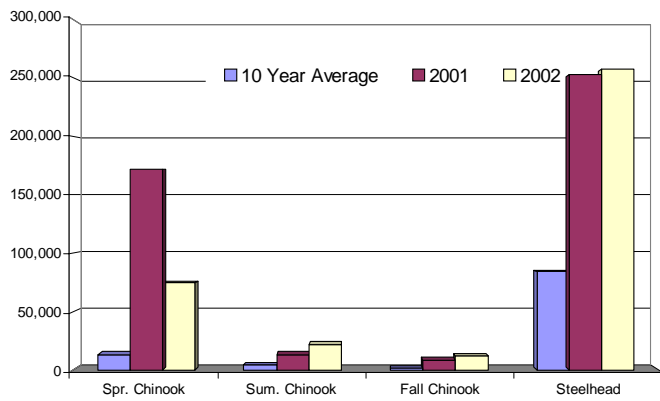


Figure 2. 2001 and 2002 Adult fish passage at Lower Granite Dam compared to the prior ten-year average returns.

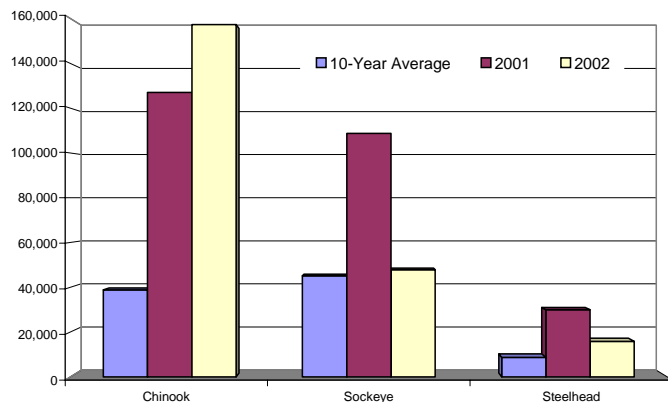


Figure 3. 2001 and 2002 Adult fish passage at Priest Rapids Dam compared to the prior ten-year average adult fish passage.

including fish harvested below Bonneville Dam—estimated to be about 756,000 fish (Columbia River Fish Runs, Status Report, 2000). This total includes smaller male “jacks.” In comparison, the 2002 total above Bonneville Dam is estimated to be about 870,800 Chinook adults (Corps, Adult Fish Counts, 2002 Data Reports, as reported by Walla Walla District, electronic files and the UW DART Data Files).

At Bonneville Dam, the total adult fish passage was about 1,635,909 salmon and steelhead, as counted by Nov. 30, 2002 (Figure 1). By comparison, the pre-BiOp 10-year average (1991–2000) was about 576,000 salmon and steelhead, indicating that the 2002 total adult fish runs were very similar to the 2001 adult returns and almost three times greater than the pre-BiOp 10-year average (Corps, Data Reports, 2001).

Lower Granite Adult Returns

To date, fish runs at Lower Granite Dam have reached levels far exceeding the previous 10-year average run sizes. By November 30, 2002, Chinook counts were about 109,535 and steelhead counts were above 256,000 (Figure 2) (Corps, Data Reports, 2001, 2002; UW DART, 2002). The Chinook runs in 2002 were composed of about 75,000 spring Chinook, 22,000 summer Chinook, and over 12,300 fall Chinook.

High levels of adult steelhead returns continued through

2002. Over 20 percent wild steelhead were represented within the 256,000 total steelhead count at Lower Granite. The high adult steelhead returns of 2001 were translated into a high kelt (adult steelhead) outmigration in 2002. As a result, of the record return the 2002 kelt emigration increased over the 2001 outmigration with an estimated run of over 117,000 kelt passing down stream over Lower Granite.

While hatchery fish continue to comprise the majority of the run-at-large, there are indications that wild fish have also benefited from improved migration conditions. This benefit was more apparent in the kelt outmigration. The wild portion of the kelt emigration in 2002 was larger than the wild portion of the returning spawning migration in 2001 and 2002 (42 percent wild kelt compared to 7 percent and 20 percent wild adult returns, respective to year). Because of the continued high level of steelhead returns through 2002, the trend of high kelt passage through the Snake River is expected to continue in 2003, with a high wild component to the run.

Priest Rapids Adult Returns

Like the Snake River fish runs, the 2002 salmon and steelhead runs continue to be high through the Mid Columbia region (Figure 3). To date, salmon runs passing Priest Rapids Dam were above 157,000 Chinook, and 15,800 steelhead. The sockeye counts in 2002 were lower than the 2001 high returns but equivalent to the prior 10-year average counts at Priest Rapids Dam. (Corps, Data Reports, 2001 and 2002; UW DART, 2002). High adult fish counts at Priest Rapids Dam indicate the year's improved adult counts are a basin-wide phenomenon.

Juvenile Survival

Total System Survival

Total juvenile system survival, which includes both in-river and transported migrants, is essential for evaluating performance because of the proportion of transported fish. Under the NMFS BiOp, a spread-the-risk transportation strategy is employed during the spring in the Snake River when flows are greater than 85,000 cubic feet per second (kcfs). This included BiOp-level spills at Lower Granite and Little Goose projects in 2002 along with transportation of collected fish at those projects. However, stilling basin repairs precluded spill at Lower Monumental in 2002, and transportation was consequently maximized.

Approximately 73 percent of Snake River Chinook and 78 percent of Snake River steelhead were transported below Bonneville Dam (NOAA Fisheries Memorandum May 9, 2003). Transportation was maximized at all four transport projects (Lower Granite, Little Goose, Lower Monumental, and McNary dams) during the summer consistent with the BiOp.

As a continuing response to regional interests and the NMFS BiOp (RPA Action 44), the Corps increased the seasonal use of barges to reduce the number of juvenile fish transported by trucks. In 2002, about three percent of all transported fish were carried in trucks versus about 2.5 percent and 5 percent in 2001 and 2000, respectively, and higher percentages in some previous years.

Assessments of total system survival are dependent on assumptions about delayed mortality due to transport, or D-value. NOAA Fisheries estimates that the direct survival rate of transported juveniles is approximately 98 percent. From adult returns in past years, NOAA Fisheries estimated D-values for Snake River stocks are 0.63–0.73 for spring/summer Chinook and 0.52–0.58 for steelhead and 0.24 for fall Chinook (2000 NMFS BiOp). In the case of Columbia River stocks transported at McNary Dam, NOAA Fisheries assumed a range of D-values, from those used for Snake River stocks to values of from 0.8 to 1.0, based on historical estimates.

Assumptions about D-values could have an impact on the net survival benefit anticipated by transporting juveniles around the hydrosystem. For example, if the assumed or expected D-value and in-river juvenile survival through the system are similar, then the benefit of transportation compared to in-river survival vs. conditions when the D-value and in-river survival differ more substantially. In 2002, in-river survival of Snake River spring Chinook was the highest observed in recent years. As a result, the benefit of transportation, while still positive, was less than what was observed in 2001 when in-river survival was substantially lower. In the case of Snake River steelhead, transportation provided a much larger relative benefit compared to in-river migration because in-river survival was considerably lower than the expected D-value. This demonstrates the value of spread-the-risk as a balance in passage strategies for multiple species.

Snake River Chinook

Preliminary estimates of total system survival for Snake River yearling spring and summer Chinook from the head of Lower Granite to below Bonneville Dam ranged between 56.8 and 64 percent, for low and high D, respectively (Table 2).

Snake River Steelhead

Preliminary estimates of total system survival for Snake

River steelhead ranged between approximately 41.6 and 46.2 percent, for low and high D, respectively (Table 2, NMFS 2003).

In-River Juvenile Fish Survival

Under the spread-the-risk transportation policy, approximately 27 percent and 22 percent of Snake River yearling Chinook and steelhead migrated in-river during 2002, respectively. The proportion of fish left to migrate in-river was greater in 2002 than 2001, as were the survival rates for both yearling Chinook salmon and steelhead.

Snake River Chinook Migrants

In-river survival for yearling Chinook migrants from the Lower Granite tailrace to the Bonneville Dam tailrace was 57.8 percent in 2002, which is similar or greater than observed in past years (except 2001). This compares to 27.9 percent observed in 2001.

Snake River Steelhead Migrants

Survival for in-river Snake River steelhead migrants from the Lower Granite tailrace to the Bonneville Dam tailrace was 26.2 percent in 2002, which is lower than observed in recent years, though much higher than the 4.2 percent observed in 2001.

Difference in in-river survival across recent years for Snake River steelhead continues to be of considerable interest. While overall in-river steelhead survival was considerably higher in 2002 than 2001, their survival in the reach from Lower Monumental to McNary is lower than observed in recent years prior to 2001. Further, it is worthy to note that for the reach from John Day to Bonneville, in-river survival of steelhead was lower in 2002 than 2001. Explanations for why this is the case are unknown, particularly given that both flow and spill in 2001 were substantially lower than in 2002 and Chinook survival in this reach was higher in 2002 than 2001.

Losses of in-river steelhead migrants to avian predation were again high in the reach below Lower Monumental Dam. In 2001, analysis of PIT-tags recovered on Crescent Island (located in the McNary reservoir) suggested a minimum estimate of tern related mortality downstream of Lower Monumental Dam of 14 percent. In 2002, similar analysis indicates a minimum estimate of avian predation losses of nearly 10 percent.

Table 2. Estimated 2002 survival of Snake River spring migrants.

Snake River Population	In-River Survival	% Transported	Total System Survival		BiOp Performance Standard
			Low D	High D	
spring/summer Chinook	57.8	73.2	56.8	64	54.8–60.4
Steelhead	24.5	78.3	41.6	46.2	49.0–52.5

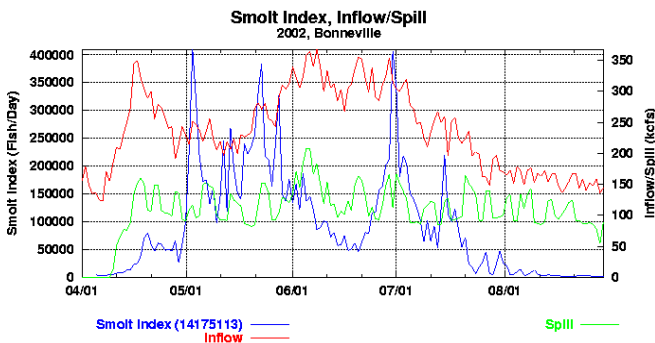


Figure 4. Smolt Index and inflow spill for Bonneville Dam.

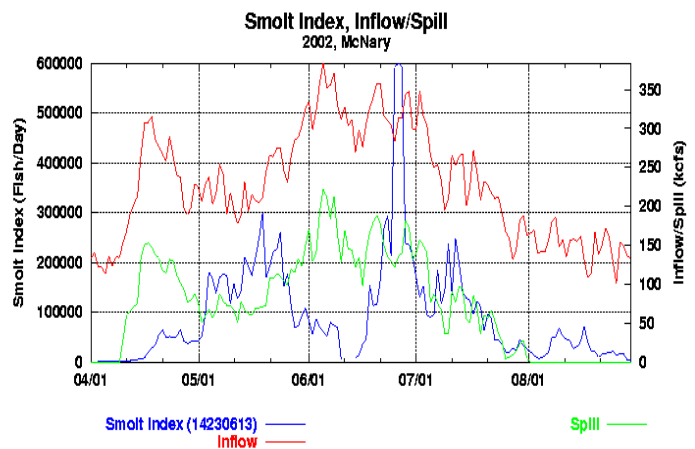


Figure 6. Smolt Index and inflow spill for McNary Dam.

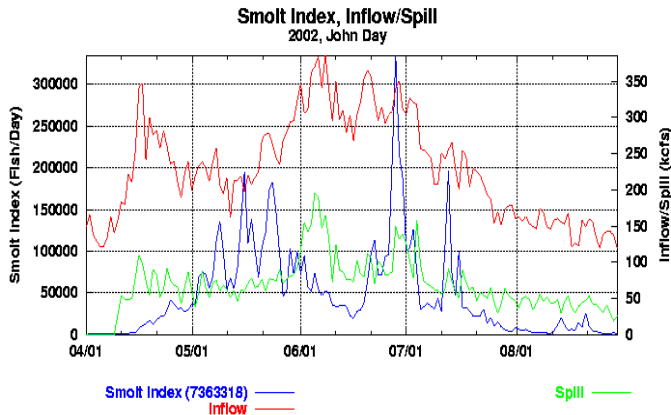


Figure 5. Smolt Index and inflow spill for John Day Dam.

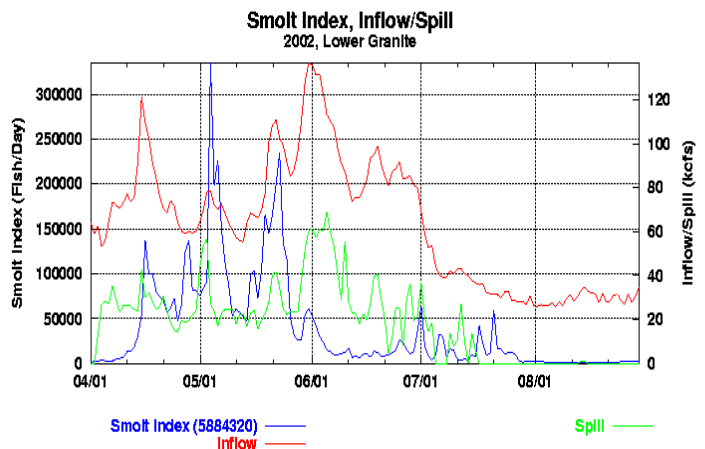


Figure 7. Smolt Index and inflow spill for Lower Granite Dam.

Run Timing

The 2002 water year was near average in total runoff volume. The shape of the runoff was delayed from what normally occurs, with peak spring flows occurring primarily during late spring and early summer (June in the Columbia and late May and June in the Snake). The fish run timing varied by dam and season, in some cases being similar to historic averages, in other cases differing from historic averages. The following graphs show inflow, spill, and smolt passage indices for the selected dams (Figures 4–7).

Water Conditions

Natural runoff in 2002 was very near normal. At The Dalles Dam the January–July 2002 runoff volume was 104 million acre-feet (MAF); normal is 107 MAF. This was much higher than the 58 MAF runoff, during the same period in 2001. This “normal” amount of runoff and Action Agencies water management actions provided much improved conditions for migrating fish when compared to the 2001 drought.

III. Summary of 2002 Progress and Results



Hydrosystem Actions

In 2002, the Action Agencies continued to implement recovery measures for the hydrosystem through strategies to configure dams, manage

water, and operate/maintain fish passage facilities to enhance fish passage and survival.

Configuration Improvements to Enhance Fish Passage and Survival

Fish passage improvements at Columbia and Snake River dams are funded through the annual Corps' Congressional appropriation to the Columbia River Fish Mitigation Project (CRFM). BPA reimburses the U.S. Treasury for that portion of the appropriations used for mitigation of the power production purposes of the FCRPS. Configuration projects are prioritized and coordinated through the NOAA Fisheries Regional Implementation Forum System Configuration Team (SCT). Significant fish passage improvements at the FCRPS dams are summarized below.

Bonneville Dam

- Initiated construction of a surface bypass system for the second powerhouse at Bonneville (the corner collector).
- Initiated construction contracts for improvements in function and reliability of fish-ladder auxiliary water-supply systems and ongoing investigation of fallback problems at Bonneville and Snake River dams, and preparation of designs.
- Built six additional spillway deflectors.
- Set new spill patterns and evaluated the effectiveness of the spill patterns on adult and juvenile fish.
- Evaluated two daytime spill levels to determine adult fallback rates.
- Evaluated the survival of fish passing the Bonneville first powerhouse downstream migrant system and through the new minimum gap runners.
- Continued evaluation of fish passage screen intake improvements at the Bonneville second powerhouse.

The Dalles Dam

- Investigated spill survival issues.
- Continued ongoing investigations and testing of improvements to existing juvenile bypass and collection facilities at several projects and testing of prototype surface bypass systems.

John Day Dam

- Continued investigations for extended length bypass screens.
- Continued investigations of ladder temperature effects on adult passage.

- Action initiated to reduce adult fall Chinook delay.

McNary Dam

- Built additional spillway deflectors and terminated split-leaf spill, and monitored spill survival following modification.
- Initiated a new study to investigate McNary forebay temperature effects on juvenile passage facilities.
- Installed Passive Integrated Transponder (PIT) detection in fish ladders.
- Installed PIT detection on juvenile bypass system, to allow bypass of fish around the Juvenile Fish Facility and sampling facilities while allowing for non-intrusive monitoring of the PIT-tagged outmigration and detection of research fish.
- Installed new, 10-inch juvenile transport, facility bypass pipes to eliminate problem debris plugging areas.
- Estimated juvenile salmon survival rates through a turbine at a range of discharges.
- Modified juvenile fish facility to provide PIT-tag diversion to the raceways to reduce impact of future transport studies on the general juvenile out migration.
- Tested new juvenile salmon separator design.
- Tested prototype cylindrical dewatering system.

Ice Harbor Dam

- Upgraded electrical supply system for the south shore fish ladder fish pumps to increase reliability.
- Conducted a survival study of yearling and subyearling Chinook passing through the spillway.
- Designed a PIT-tag detection system on the adult fishway; construction completed in the winter of 2003.
- Continued investigations of water temperature effects on adult passage through ladders.

Lower Monumental Dam

- Completed spillway repairs.
- Modified barge loading techniques, and redesigned loading system. New loading system was completed in the spring of 2003.
- Continued investigations of water temperature effects on adult passage.

Little Goose Dam

- Modified the PIT-tag detection/diversion system at the juvenile fish facility to improve the quality of operation, diversion and handling operations on fish.
- Continued investigations of water temperature effects on adult passage through ladders.

Lower Granite Dam

- Continued ongoing investigations and testing of improvements to existing juvenile bypass and collection facilities at several projects and testing of prototype surface bypass systems.

- Installed and conducted passage tests of the removable spillway weir.
- Conducted final year of testing prototype fish ladder transition pool modification.
- Initiated upgrades to adult fishway auxiliary water supply (AWS) system to increase reliability.
- Designed a PIT-tag detection system on the adult fishway; construction completed in the winter of 2003.
- Continued investigations of water temperature effects on adult passage through ladders.

Dworshak Dam

Improvements to the Dworshak National Fish Hatchery water supply system were completed in early 2003. BPA funded the acceleration of these improvements as an offset to the effects of reduced spill in 2001. The improved water heating and filtration capabilities enable the hatchery to provide enhanced fish growth conditions than is currently possible due to the cold water temperatures in the Clearwater River. These improvements thus enable the continuation of cold water releases from Dworshak in the summer to reduce water temperatures in the lower Snake River.

Chief Joseph Dam

- Requested funding in the President's budget for spillway deflectors, and received funding for FY 2003 initiation of design effort.
- Performed additional analyses and modeling studies to facilitate design and construction of spillway deflectors.

Water Management and Fishery Operations

Flow and Reservoir Operations

The Action Agencies managed the storage projects (Libby, Hungry Horse, Grand Coulee, and Dworshak dams) to improve flow conditions for both resident and anadromous fish. The Action Agencies balanced fish and wildlife operations with other system uses, including power production, flood control, irrigation, navigation, and recreation, through the NOAA Fisheries Regional Implementation Forum Technical Management Team (TMT).

Seasonal highlights of operations that benefited migrating fish include:

- Provided flows to protect Chum salmon below Bonneville Dam from November 11, 2001, until May 12, 2002.
- Operated the storage projects to be near the April 10th flood control elevation.
- Refilled storage projects close to the June 30th target date.
- Drafted storage projects to be near August 31 draft limits to provide summer flow augmentation.
- Reclamation provided 286,534 acre-feet in 2002 from storage and natural flow rentals. Water supplies for rentals were limited due to the lingering effects of the 2001 drought.

The Action Agencies operated storage projects to augment flows for migrating fish. The BiOp anticipates that flow objectives will not be achieved at all times. Flow augmentation highlights were:

Lower Granite Dam

- Spring flow objective was 97 thousand cubic feet per second (kcfs). Actual flow during the spring period averaged 83 kcfs. Natural flows and Action Agencies' efforts resulted in meeting the flow objective 3 out of the 10 weeks.
- Summer flow objective was 51 kcfs. The actual summer flow averaged 41 kcfs. The flow objective was met 2 out of the 10 weeks.

McNary Dam

- Spring flow objective was 246 kcfs. Actual flow during the spring period averaged 269 kcfs. The flow objective was met 7 out of 11 weeks.
- Summer flow objective was 200 kcfs. The actual flow during the summer period was 189 kcfs. The flow objective was met 3 out of 8 weeks.

Priest Rapids Dam

- Spring flow objective was 135 kcfs. The actual flow during the spring period averaged 181 kcfs. The flow objective was met all 11 weeks.
- Resident fish benefited from the following reservoir operations:

Libby Dam

- A sturgeon pulse was provided in the spring.
- All minimum flow levels for resident fish were met.
- A spill test was conducted in June to determine total dissolved gas (TDG) production levels.
- Released water through selective withdrawal systems to control water temperatures.

Hungry Horse Dam

- Operated to meet its minimum flows year round with hourly and daily changes within ramping limits.
- Provided water for summer flow augmentation while limiting "double peaking." Released water through selective withdrawal systems to regulate water temperatures.

Dworshak Dam

- Released water through selective withdrawal systems to provide cooler water for summer migrating fish in the lower Snake River.

Spill for Fish Passage

The Action Agencies provided spill to improve juvenile fish passage and increase survival. Spring and summer spill was provided as specified in the BiOp at Snake and Columbia River projects, except at Lower Monumental, which was undergoing stilling basin repairs. Spill was managed on a

system basis according to a spill priority list to distribute spill across the region to minimize dissolved gas supersaturation impacts while maximizing fish passage survival.

Juvenile Fish Transportation

Juvenile fish collection and transport operations were conducted in concert with juvenile passage spill operations to “spread the risk.” The barging season was extended through August 16 for Snake River dams and August 17 at McNary Dam. Research was continued to better determine transportation benefits across a range of hydraulic conditions, including delayed transportation mortality (“D”). Emphasis was placed on early season transport in 2002 to better define potential survival differences for early versus late spring transport.

Other Water Management Actions

The Action Agencies also conducted a number of miscellaneous water management activities to benefit fish, including:

- Analyzed the effects of operating Banks Lake 10 feet from full pool during August for summer flow augmentation, and completed a Draft EIS on this topic in January 2003.
- Continued ESA consultations with NOAA Fisheries and the USFWS on several of Reclamation’s tributary projects below Chief Joseph Dam.
- On the Columbia Basin Project, Reclamation completed the construction of screens at the Burbank No. 2 and 3 pumps. Monitoring was initiated for salmonid attraction to the wasteways and drains. Water quality monitoring of return flows was initiated.
- TDG and temperature models are being developed to further improve decision making on water-management actions. BPA funded the installation and operation of nine weather stations in 2002 that will provide comprehensive data for gas and water temperature models.

Operations and Maintenance of Fish Passage Facilities

In 2002, the Corps continued to operate and maintain (O&M) fish passage facilities according to the annual Fish Passage Plan, including juvenile bypass systems, fish ladders and adult fish counting. Noteworthy O&M capital improvements included:

Bonneville Dam

- Continued rehabilitation of second powerhouse submersible traveling screens.
- Continued rehabilitation of the Bradford Island/Cascade Island ladder system.

The Dalles Dam

- Procured new diffuser gratings for north shore fish ladder.

McNary Dam

- Initiated fabrication of spare set of generator coils for the adult fish collection system auxiliary water supply pumps.

Ice Harbor Dam

- Upgraded adult fishway entrances.
- Started five-year program to rehabilitate the south shore auxiliary water-supply fish pumps. Awarded contract to replace fish pump hydraulic systems.

Transmission Reinforcements

BPA completed a Final EIS for a new Grand Coulee–Bell 500-kV transmission line in 2002 and in January 2003 issued a Record of Decision to proceed with construction of the project. Construction of the line will begin this February with completion expected in November 2004. Thus, BPA has taken actions that will enable RPA Action 56 to be implemented by 2004 as requested in the BiOp and provide additional flexibility for fish operations.

BPA also continued to work on the EIS for the Schultz–Wautoma 500-kV line in 2002.



Habitat Actions

The Action Agencies habitat priorities include actions that generate immediate benefits to fish, implementing an integrated RM&E program and facilitating subbasin assessments and plans. In 2002, the Action Agencies implemented projects consistent with these priorities in tributary, mainstem, and estuary habitats important to fish. Table 3 shows the number of habitat projects by subbasin that were implemented by the Action Agencies in 2002. Generally, the Action Agencies met or exceeded expectations for implementing these priorities during FY 2002. A brief summary of tributary, mainstem and habitat improvements is provided below.

Tributary Habitat

Major tributary habitat accomplishments during FY 2002 addressed water quantity, water quality, fish passage and screening projects, riparian protection and enhancement, and subbasin assessments and planning as recommended by Actions 149 through 154 of the NMFS BiOp.

Water-Quantity Improvements

BPA established the Columbia Basin Water Transactions Program to serve the primary water brokerage functions under Action 151. BPA contracted the National Fish and Wildlife Foundation as the regional water entity to facilitate the review and development of water transactions and related innovative transactional strategies proposed by qualified local entities. This innovative experimental program to increase tributary flows includes efforts by the Oregon Water Trust, Oregon Water Resources Department, and Deschutes Resources

Table 3. Number of habitat projects implemented by the Action Agencies in 2002.

Subbasin	Lead Agency	Tributary	Mainstem	Estuary	Total
Asotin	BPA	9			9
Clearwater	BPA	8			8
Clearwater	Reclamation	2			2
Columbia Estuary	BPA			2	2
Columbia Estuary	Corps			7	7
Columbia Gorge	Corps			1	1
Columbia Lower	BPA		3	1	4
Columbia Lower	Corps		1		1
Columbia Lower Middle	BPA		1		1
Cowlitz	BPA			1	1
Deschutes	BPA	6			6
Deschutes	Corps	1			1
Entiat	Reclamation	4			4
Fifteenmile	BPA	4			4
Grande Ronde	BPA	37			37
Grays	Corps	1			1
Hood	BPA	2			2
Imnaha	BPA	1			1
John Day	BPA	17			17
John Day	Reclamation	18			18
Klickitat	BPA	2			2
Methow	BPA	8			8
Methow	Reclamation	20			20
Okanogan	BPA	3			3
Salmon	BPA	20			20
Salmon	Corps	1			1
Salmon	Reclamation	34			34
Tucannon	BPA	2			2
Umatilla	BPA	7			7
Walla Walla	BPA	9			9
Walla Walla	Corps	1			1
Wenatchee	BPA	1			1
Wenatchee	Reclamation	6			6
Willamette	BPA	2			2
Yakima	BPA	18			18
Mainstem	BPA		1		1
Mainstem	Corps		1	1	2
Systemwide	BPA	4			4
Total		248	7	13	268

Conservancy in Oregon, the Washington Water Trust, Washington Department of Ecology, and the Walla Walla Watershed Alliance in Washington, and the Idaho Water Resources Department to implement innovative approaches to acquire and secure instream flows for fish.

Reclamation leased late-summer flows in the lower Lemhi River of Idaho to assure fish access to spawning areas. Reclamation also initiated or continued instream flow studies to ascertain fish flow needs in sections of four of the priority subbasins, and also installed gauging stations or headgate control structures to help with diversion measurements.

More progress could accrue for tributary habitat improvements when NOAA completes its promised protocols for instream flows. Absent those protocols, the Action Agencies and others will continue to make progress but with less certainty about the precise benefits to fish populations.

Passage and Diversion Improvements

Programs in the tributaries continued by all Action Agencies. Reclamation provided technical assistance including engineering designs, environmental compliance, and permit assistance to landowners during FY 2002 (Engineering criteria, however, for designing effective fish passage projects still has not been provided by NOAA Fisheries as promised under Action 149). BPA complemented the efforts of Reclamation in the priority subbasins and in other areas by expanding on RPA 149 related measures under the Council program. This included funding a number of passage and screening projects across the basin, as well as acquiring additional flows for fish.

The numbers of barriers removed or improved and additional water acquisitions or enhancements by BPA for fish flows are listed by subbasin in Tables 4 and 5.

Reclamation and BPA activities included:

- Reclamation initiated priority subbasin programs in the Upper Salmon, Wenatchee, and Entiat subbasins and

Table 4. BPA FY 2002 Fish flow enhancements.

Subbasin	CFS acquired or enhanced
Deschutes	17.9
Fifteenmile	1.8
John Day	42.4
Methow	25.0
Okanogan	0.0
Salmon	33.7
Umatilla	17.2
Walla Walla	5.5
Yakima	21.2
Total flow acquired in FY 2002	164.7

continued its programs in the Upper John Day, Middle Fork John Day, Methow, and Lemhi subbasins to address unscreened diversions and diversion migration blockages.

Table 5. BPA FY 2002 passage improvements.

Subbasin	Number of barriers	Miles of stream habitat opened
Clearwater	3	4.0
Grande Ronde	2	10.0
John Day	8	0.0
Klickitat	3	198.0
Methow	1	1.3
Okanogan	2	21.0
Salmon	18	16.4
Umatilla	10	225.0
Walla Walla	2	35.0
Wenatchee	8	2.5
Willamette	2	5.9
Yakima	12	178.5
Total passage improvements and river miles of stream opened	71	697.5

- Reclamation Liaison Offices are established in John Day, Oregon; Salmon, Idaho; Twisp, Washington; and Wenatchee, Washington to facilitate passage, diversion, and water acquisition work by coordinating with landowners and local entities.
- Programmatic National Environmental Policy Act (NEPA) investigations continued for work in the Idaho subbasins and the John Day subbasins with completion scheduled for FY 2003.
- Reclamation continued to work with the Administration to draft legislation to acquire the authority needed to fund construction of screen and diversion replacement projects.
- Ten diversion replacement projects were initiated and six diversion replacement projects were completed in priority subbasins.
- Four screen projects were initiated and five screen projects were completed. Details about the location of these projects and the construction funding sources may be found in the project tables.
- Fish flow studies were initiated in several subbasins to ascertain fish flow needs in preparation for water acquisition projects in the subbasins.

Riparian Protection and Enhancement

The Action Agencies initiated several riparian protection and enhancement projects, including:

- Helped facilitate the protection of nearly 200 miles of riparian buffer protection in 2002 alone. This facilitation included funding to leverage resources for the Conservation Reserve and Enhancement Program (CREP) and other incentive program coordinators to enroll land into riparian protection programs, as well as providing financial assistance for fencing and planting of riparian buffer areas. While all of this protection may not be legally protected for 30 or more years, opportunities may exist to extend the duration of the protection at a future time.
- Funded and maintained the long-term protection for many acres of currently productive, self-sustaining habitat.

- Completed restoration of a mile of steelhead spawning and rearing area in East Birch Creek in the Umatilla watershed.
- Completed concept designs for five sites in the 12-mile stretch of the Salmon River near Challis, Idaho.
- Gathered baseline data and held scoping meetings for the Walla Walla River feasibility study.
- Completed plans and began work to reestablish riparian forest and native wetland plant communities in the Salmon Creek floodplain near Vancouver, Washington.
- Continued designs for a project to remove levees, dikes, and berms along a four to five mile stretch of Trout Creek in the Deschutes subbasin.
- Worked with potential sponsors on possible cost-share projects in the Grande Ronde and Milton-Freewater subbasins. Tributary protection and enhancement projects included a number of projects to negotiate and fund protection of riparian habitat.
- Continued to strengthen support for riparian protection through CREP and other incentive programs working with NOAA, Farm Services Administration, Natural Resources Conservation Service (NRCS), the states and others.
- Continued to work on a collaborative process to develop a mechanism for longer term or permanent easement protection of riparian buffer areas. Table 6 lists the acres and river miles by subbasin of productive fish habitat on non-Federal lands that was protected by BPA in FY 2002.

Provincial Reviews

In 2002, the Action Agencies, particularly BPA, used the Council's Provincial Review process to solicit project proposals

Table 6. Amount of productive fish habitat protected by BPA in FY 2002.

Subbasin	River Miles	Acres
Deschutes	6.4	114
Fifteenmile	65.3	760
Grande Ronde	36.7	2994
Hood	0.1	3
Imnaha	12.0	27
John Day	64.3	14775
Okanogan	0.8	60
Salmon	3.0	14
Umatilla	1.7	0
Walla Walla	0.5	12
Yakima	8.4	820
Total river miles/acres of non-Federal habitat protection	199.4	19579

to address BiOp actions. The review process included application of biological criteria, scientific review by the Independent Scientific Review Panel (ISRP), public review, and NOAA assessments using ESA priorities. In FY 2002 the Provincial Reviews for the Blue Mountain, Columbia Plateau, Mountain Columbia and Mountain Snake provinces were used by BPA for funding decisions. In FY 2002 BPA also commented on projects received through the Columbia

Cascade, Columbia Estuary, Lower Columbia Middle Snake, and Upper Snake Provincial Reviews. The first cycle of Provincial Reviews will be completed in FY 2003. This will allow BPA and the Council to implement on-the-ground projects that address specific RPA actions. Collectively these actions represent a range of ESA responses. This range could include the initial implementation phase of new, or expanded, projects directed at specific, ESA listed salmon and/or steelhead populations to re-configuration of existing Council Fish and Wildlife Program efforts to more efficiently target those same listed populations.

Subbasin Planning and Assessments

Subbasin planning and assessments provide the framework critical to the Action Agencies' longer term implementation of offsite mitigation. The subbasin plans will provide the ecological context for future project identification. Subbasin planning under the Council's process continued in FY 2002. The Council established its management plan, and BPA issued the master contracts for the Council to produce the subbasin plans. BPA funded contracts for State subbasin planning coordinators to facilitate preparation of the subbasin plans by 2004. Subbasin planning will use over \$15 million in funds provided by BPA. The Council developed guidance for that planning in concert with NOAA Fisheries so that the Council's subbasin plans can also be utilized as anadromous fish recovery plans under the ESA. The Action Agencies continued to provide a share of technical support for the development of subbasin assessments and plans as requested by the subbasin planners.

Mainstem Habitat

In FY 2002, our mainstem habitat focus was on the lower Columbia and lower Snake rivers. The Action Agencies funded efforts toward developing improvement plans for mainstem reaches and improving spawning conditions for chum salmon for RPA 155, 156 and 157. Projects included:

- Improving spawning conditions in the vicinity of Ives Island.
- Reintroducing Chum salmon into Duncan Creek.
- Implementing avian predation deterrent actions in coordination with FPOM.
- Evaluating factors limiting Columbia River Gorge Chum salmon populations.
- Continued planning and design for a major effort to restore woody riparian habitat in the lower Snake River.
- BPA will continue to annually monitor catch and harvest rates of Northern Pikeminnow. BPA will collect information on population dynamics and the diet of Northern Pikeminnow, Small Mouth Bass, and Walleye every 3–5 years.
- Avian predation monitoring continued under the estuary

monitoring program and was started at Crescent Island (McNary).

Estuary Habitat

Estuary Planning

BPA funded a Battelle project in 2002 to develop a plan addressing the habitat needs of salmon and steelhead in the estuary, as called for in RPA 159. This project is being conducted with the Corps, LCREP and the Columbia River Estuary Study Task Force and is scheduled for completion in 2003. The plan will include further development of the conceptual model called for in RPA 162. The Corps continued coordination on a General Investigation study for ecosystem restoration in the Columbia River estuary, covering the river from the mouth to Bonneville Dam. Efforts in 2002 focused on identifying a cost-sharing partner and scoping.

Estuary Restoration

No actual construction of restoration projects in the estuary occurred in 2002. However, planning efforts were conducted for several habitat restoration projects in the estuary in 2002 that will help meet the requirements of RPA 160 when implemented.

Planning continued for the Brownsmead Project located approximately 3 miles northeast of Knappa, Oregon, and 17 miles east of Astoria, at river mile 30. This project is expected to restore tidal flow to about 9.2 miles of sloughs in an area consisting of about 2,068 acres of diked flood plain.

Studies were initiated on the following projects:

- **Southwest Washington Streams.** This project is located beginning about 2 miles upstream of Chinook, Washington and extends between river mile 11 and 15. It would involve replacement of 9 culverts along highways 101 and 401 that are blocking or restricting access to small tributary streams to the Columbia River, affecting access to 8 miles of former stream and 15 acres of wetlands.
- **Crims Island Restoration.** This project is located near the town of Clatskanie, Oregon, at river mile 56. The project would acquire and restore approximately 425 acres of tidal emergent marsh, swamp, slough, and riparian forest habitat on Crims Island in the upper Columbia River Estuary to benefit fish and wildlife. Although this project is located above river mile 46, it stands to provide significant benefits to salmonids in the estuary.

Estuary Habitat-Related Research, Monitoring and Evaluation (RM&E)

The Estuary/Ocean RM&E Work Group was established in the summer of 2002 and began developing an RM&E plan for the estuary. The work group includes NOAA Fisheries and a representative from the Lower Columbia River Partnership (LCREP). Initial efforts focused on assessing the

ongoing RM&E efforts and identifying any gaps (gap analysis). This gap analysis was provided to the RM&E Planning Group for incorporation into the RM&E Framework document. The Action Agencies also reviewed proposals for estuarine research in the Council's Provincial Review Process and provided recommendations on which to help meet FCRPS BiOp requirements. The following RM&E efforts were funded in the estuary and ocean plume in 2002:

- A study to estimate salmonid survival through the estuary using acoustic tags.
- Estuarine habitat and juvenile salmon—current and historic linkages in the Lower Columbia River and estuary.
- Monitoring effectiveness of Chum egg-to-fry survival in restored channels of Duncan Creek.
- Evaluation of the relationship among time of ocean entry, physical and biological characteristics of the estuary and plume environment, and adult return rates.
- Sampling PIT-tagged juvenile salmonids migrating in the Columbia River estuary.
- Evaluation of migration and survival of juvenile steelhead and fall Chinook following transportation.
- Survival and growth of juvenile salmon in the Columbia River plume.
- Lower Columbia River habitat classification and assessment mapping.

While several studies addressed juvenile use of the estuary and plume, studies of adult use of the Columbia River estuary plume were given a low priority at the Studies Review Work Group (SRWG) and no proposals were received. The Action Agencies recognize the RPA requirement for adult studies and began discussions with NOAA Fisheries to develop a study plan that identifies the needed studies and establish the priority, scope and time line for adult use studies. The Action Agencies are continuing to work with NOAA to establish the scope, including identifying components and responsibilities for those components for Columbia River estuary research.



Hatchery Actions

In 2002, the Action Agencies continued to support a unified regional approach to use artificial production as an important tool for meeting fish recovery objectives and a means to support tribal and other fisheries. BPA and the other Action Agencies continued funding the four-step planning process of the Artificial Propagation Safety-Net Program (RPA Action 175), funded the regional planning and coordination required for development of a comprehensive marking plan (RPA Action 174) and began Phase I of the development of new or updated Hatchery and Genetic Management Plans (HGMPs) to guide hatchery reform and aid recovery of listed stocks



Figure 8. Locations of FCRPS mitigation hatcheries.

(RPA Action 169). Implementation of these actions has been, and will continue to be a major, region-wide undertaking, requiring substantial coordination with state and federal fishery managers, tribes, the Council and other entities.

The Action Agencies continued to operate FCRPS mitigation hatcheries that contribute to tribal and other harvest of salmon and steelhead (Figure 8), and BPA continued to implement ongoing Snake River spring/summer Chinook and Sockeye salmon safety-net artificial propagation projects, as well as hatchery RM&E projects (RPA Actions 182 and 184), under the Council's Fish and Wildlife Program.

Captive Broodstock Program

BPA continued to support ongoing artificial propagation safety-net programs designed to prevent extinction of critically depressed populations of ESA-listed salmon (RPA Action 177).

Major safety-net programs funded through the regional prioritization process by BPA include:

- The Grande Ronde captive broodstock program for Lostine

River, Catherine Creek and Upper Grande Ronde River spring/summer Chinook populations in Oregon;

- The Salmon River captive rearing program for Lemhi River, East Fork Salmon River and West Fork Yankee Fork spring/summer Chinook populations in Idaho;
- The Tucannon River spring/summer Chinook captive broodstock program in Washington and
- The Snake River (Redfish Lake, Idaho) Sockeye salmon captive broodstock program.

Safety-Net Program

BPA initiated the Safety-Net Artificial Propagation Program (SNAPP) (RPA Action 175) in 2001 by working with NOAA Fisheries and the USFWS to scope the program and determine how best to implement the program over the next few years. The Safety Net Program targets some of the most endangered populations of listed fish to ensure their continued survival. The effort resulted in BPA funding a SNAPP Coordinator to facilitate the four-step planning process for the program. States, tribes, NOAA Fisheries,

USFWS and BPA have met to provide oversight and help implement the program. That group determined that the initial list of 10 safety-net populations identified in RPA Action 175 should receive additional scrutiny and developed a new list of 38 populations that will proceed to the first step of the four-step, SNAPP planning process, extinction risk analysis.

In August 2002, BPA began initiating contracts for the SNAPP extinction risk analysis and state and tribal co-manager participation in SNAPP.

BPA funded the Grande Ronde and Tucannon safety-net HGMPs (RPA Action 176) under a Memorandum of Agreement with the USFWS, which oversees the Congressionally mandated Lower Snake River Compensation Plan (LSRCP). Oregon Department of Fish and Wildlife completed a Phase I HGMP for Grande Ronde River Spring Chinook salmon program. Washington Department of Fish and Wildlife completed a Phase I HGMP for Tucannon River Spring Chinook salmon program. Both of these Phase I products were submitted to USFWS. USFWS is expected to submit these to NOAA Fisheries in early FY 2003, leading to future actions consistent with ESA and the needs of listed fish.

Hatchery Reforms

In January 2002, federal, tribal, and state parties convened to discuss development and implementation of the HGMP process (RPA Action 169). NOAA Fisheries, Action Agencies and cooperators developed a plan to split the HGMP process into three phases.

Phase I—Hatchery operators and all relevant parties will complete a “Phase I HGMP” for each facility/program that establishes requirements, including any adjustments or reforms necessary to comply with the ESA.

Phases II and III—The Phase I HGMPs will be distributed to other relevant parties and will serve as the focus for the collaborative, Phase II part of the process. Phase II options will be provided to subbasin planning processes and the appropriate technical recovery teams for consideration and interaction with those groups. Phase II draft HGMPs will be completed and set aside until all HGMPs relevant to an Evolutionarily Significant Unit (ESU) are completed, allowing for ESU-wide considerations and feedback with the TRT/Recovery Planning processes. The HGMP collaborators will incorporate TRT advice as appropriate to ensure consistency with broader recovery objectives. This step culminates in Phase III drafts, which become final and ready to implement after approval by NOAA Fisheries.

Early in the developmental process, it became clear that data requirements for HGMP and the Council’s Artificial Production Review Evaluation (APRE) would be collecting

very similar data from the same people. Toward this end, NOAA Fisheries and Council staff collaborated on an approach where the APRE and the HGMP process will work together to assemble the necessary information. Once this “in-common” step is completed, the two processes will separate to meet their different obligations and requirements.

BPA negotiated a Scope of Work and corresponding budget to achieve Phase I of the HGMP work with the Council. The contract is expected to be signed by the Council in early FY 2003. States and tribes were subcontractors under this contract for Phase I activities. Provincial meetings are anticipated to start in the third and fourth quarters of FY 2003.

BPA negotiated a Scope of Work from December 2002 to September 2003 and corresponding budget for a “Process Manager” to oversee Phase II and participate in early Phase III development of the HGMP work with a private contractor. The contract was signed in February 2003.

BPA negotiated budgets for states and tribes to fully participate in all of Phases II and III. The contracts are expected to be signed by all cooperating states and tribes by late FY 2003.

The other RPA Actions involving implementation of hatchery reforms by the Corps, Reclamation, and BPA (RPA Actions 170–173) cannot be accomplished until the HGMPs are complete and approved by NOAA Fisheries.

Hatchery Production

Artificial production is needed to meet harvest mandates and to mitigate overall FCRPS losses. In 2002, the Action Agencies continued to operate legally mandated FCRPS mitigation hatchery projects in conformity with the ESA. Hatcheries in operation during 2002 included eleven LSRCP hatcheries (Dworshak [*the Chinook program*], Lookingglass, Lyons Ferry Complex [Lyons Ferry and Tucannon], Clearwater, Magic Valley, McCall, Sawtooth, Irrigon, Wallowa, and Hagerman hatcheries), eight Corps hatcheries (Dworshak [*the Steelhead program*], Bonneville, Spring Creek, Leaburg, McKenzie, Marion Forks, South Santiam, and Willamette hatcheries) and three USBR hatcheries (Leavenworth, Entiat and Winthrop hatcheries).

BPA continued funding experimental and production hatchery facilities under the Council’s Columbia River Basin Fish and Wildlife Program. Major facilities in operation in 2002 included the Umatilla Hatchery and the Cle Elum Supplementation and Research Facility. Construction of the Nez Perce Tribal Hatchery was completed and operation began in 2002. Planning/design for the Northeast Oregon Hatchery continued in 2002.

Comprehensive Marking Program

The Action Agencies experienced delay in developing a comprehensive plan to mark hatchery produced salmon. The delay was needed to enable differentiation between hatchery and naturally produced salmon and ensure that appropriate tagging and sampling rates are being implemented. This delay is attributable to a number of factors, including the time it took for the regional ad hoc marking group, which comprised representatives of NOAA Fisheries and Columbia Basin fishery managers, to refine and focus the scope of the plan, and delays attributable to contractor performance. The effect of the delay is mitigated to some degree, by the fact that the Action Agencies continue to fund marking at federal facilities that was not occurring prior to the BiOp for key hatchery populations identified in the NMFS BiOp. Progress has been made toward completion of the plan and the ad hoc group continues its efforts to address the key tagging and sampling questions including the difficult task of synthesizing its effort with similar extra-regional undertakings that extend well beyond the Columbia Basin.



Harvest Actions

Fishing Techniques

In 2002, BPA implemented its second year of gear efficacy testing studies of tooth-tangle gear to determine their potential for reducing mortality of ESA-listed salmonids for the non-treaty spring fisheries downstream of Bonneville Dam. Nearly 22,000 steelhead were unintentionally intercepted in this fishery using this gear. Subsequently, outyear continuation of this study will include the development of alternative gear strata and /or methods to both assess and reduce the impact to steelhead in addition to continuing assessment of spring Chinook impacts.

Other ongoing activities include the continuation of implementation of the Tribal Gillnet Exchange Program. Larger mesh gill nets were provided to tribal commercial fishers in 2000 to reduce steelhead interceptions while increasing Chinook harvest under current impacts. Analysis of catch statistics suggest that the increased use of larger (≥ 9 in.) mesh gill nets has allowed tribal commercial fishers to access over 11,000 additional fall Chinook within the prescribed steelhead harvest limit. Similar outyear benefits are expected during runs in which Chinook to steelhead ratios are similarly large and use of gear continues.

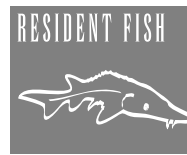
Harvest Management Assessments, Decisions and Evaluations

BPA funded a feasibility study in tribal Management Zone 6 in 2002 to determine the existence and impact of lost fishing nets. Researchers confirmed the feasibility to detect gear using sonar technology. Eight fishing nets of various length, diameter

and condition were removed, and 80 white sturgeon carcasses and/or notochords were retrieved from the nets. No other fish species were found in the nets.

Support Sustainable Fisheries

In 2002, the Action Agencies continued implementation of the Columbia River Terminal Fisheries Project (BPA 1993-060) for Chinook and Coho in Youngs Bay and other sites in the lower river below Bonneville Dam. Increased release numbers and improved ocean rearing conditions have resulted in increased returns in recent years. Project sponsors estimate the combined economic value of select area fish to regional commercial and recreational fisheries was \$1.5 million in 2002.



Resident Fish Actions

White Sturgeon Aquaculture and Monitoring

The Action Agencies continued producing and releasing juveniles through the Kootenai River white sturgeon aquaculture program. They also continued all ongoing monitoring for natural production and post-release survival of hatchery-produced juveniles.

Other actions taken for the benefit of Kootenai white sturgeon include:

- Provided flows recommended by the USFWS.
- Conducted monitoring of scheduled and emergency spill to quantify water-quality limitations on using spillway to provide additional flows for Kootenai white sturgeon.
- Initiated NEPA process for interim implementation of VARQ at Libby to increase reliability of providing sturgeon flows.

Flows and Ramp Rates

The Action Agencies aided bull trout by adjusting flows within the ramp rates and providing minimum flows below Hungry Horse and Libby dams. Modifications to the ramp rates, to benefit fish needs in the basin, were coordinated in the Technical Management Team. Minimum flows from Hungry Horse were provided on all days except two, when outflow was reduced for local flood control. Minimum flows were maintained at Columbia Falls except for minor reductions on 12 days, when natural flows subsided faster than Hungry Horse operations could compensate, given the three-hour water travel time to Columbia Falls. The Action Agencies provided USFWS-requested sturgeon flows from Libby.

Other actions taken included:

- Managed winter elevations in Lake Pend Oreille (regulated by Albeni Falls Dam) to help promote a healthier forage base of kokanee for bull trout in the lake.
- Managed flows from Hungry Horse and Libby dams to

minimize downstream effects on bull trout.

- Provided ways to pass seasonally appropriate water flows and temperatures at Libby Dam and evaluated the effects of those flows on Kootenai River white sturgeon reproduction and on dikes and human uses of the Kootenai River flood plain from Bonners Ferry, Idaho, to Kootenay Lake, British Columbia.
- Implemented VARQ at Hungry Horse.

Water Storage

The Action Agencies implemented VARQ flood control at Hungry Horse for 2002 spring operations. Environmental documentation was completed and a decision made to commence VARQ implementation at Libby in 2003.

Bull Trout Monitoring

So little is known about the nature and magnitude of the FCRPS impacts on bull trout that much of the early effort in 2002 focused on monitoring and evaluation. Results will determine whether mitigation would be appropriate and to define the performance standards that might be applied to mitigation efforts.

The Action Agencies monitored the effects of the 2002 Libby spill test on the fish (including bull trout) downstream of the dam in the Kootenai River. Also continued was the monitoring of bull trout entering the Hood River from Bonneville Pool, bull trout movement through FCRPS dams on the lower Columbia and Snake rivers and kokanee (bull trout prey) dynamics in Lake Pend Oreille. New studies of the bull trout behaviors at Albeni Falls Dam (potentially leading to a study of the feasibility of providing bull trout passage facilities over the dam), predator/prey abundances in Lake Pend Oreille, bull trout population use of Dworshak Reservoir, and bull trout migrations in the Tucannon River and lower Snake River reservoirs were initiated.

Other actions implemented in 2002 include:

- Continued counting bull trout that pass through monitoring facilities at mainstem dams and implemented a study of bull trout use of lower Snake River reservoirs
- Continued studying bull trout distribution and use of Dworshak Reservoir, including movements in the reservoir and tributaries. Also began bull trout–passage studies at some FCRPS dams, based on priorities set in 2001 (per USFWS BiOp action 11.5).
- In cases where there already is a relatively clear link between the FCRPS and the welfare of bull trout, we continued to implement protective measures.
- In cooperation with the USFWS, in 2002 the Action Agencies developed ways to gauge how well the FCRPS is mitigating its impacts on bull trout.
- Began a two-year study of bull trout behavior in the Lake Pend Oreille basin to provide data for making a decision

- on potential bull trout passage needs at Albeni Falls Dam.
- Adhered to USFWS recommendations for reservoir operation, ramping rates and minimum flows, in operating Libby and Hungry Horse Dams.



Research, Monitoring and Evaluation (RM&E) Actions

In 2002, NOAA Fisheries and the Action Agencies began to develop a proposed RM&E Plan as the initial step in developing the RM&E Programs called for under the NMFS BiOp and Basinwide Salmon Recovery Strategy. The RM&E Program is needed for the 2005 and 2008 check-in assessments of salmon and steelhead populations. This program will inform the identification and prioritization of actions that are the most effective toward improved stock performance and provide information for the NMFS BiOp.

The RM&E Program focuses on six principal categories or strategies that must be addressed to meet the BiOp requirements:

- Population and environmental status monitoring,
- Action effectiveness research,
- Critical uncertainty research,
- Project implementation monitoring,
- Data management and
- Regional coordination.

In 2002 the Action Agencies implemented three primary strategies or categories for RM&E:

- Status and effectiveness monitoring,
- Uncertainties research and
- Regional coordination and integration.

An RM&E Oversight Workgroup convened the following six technical working groups:

- Status Monitoring,
- Action effectiveness research (for tributary habitat actions),
- Hydro,
- Estuary/ocean,
- Hatchery/harvest and
- Data management.

These groups included participants from the Action Agencies, NOAA Fisheries, LCREP, and USFWS. The groups addressed different levels of the three categories and the associated RPA actions.

Each of the work groups was asked to:

- Identify the RM&E requirements of the BiOp within their workgroup area,

- Identify ongoing and planned research or monitoring projects that address these RM&E requirements within the Corps' Anadromous Fish Evaluation Program (AFEP) forum, Reclamation's priority subbasin program, and the BPA-funded Council Fish and Wildlife Program,
- Compare the RM&E requirements of the BiOp with the existing and planned research projects to identify gaps in existing coverage and
- Recommend any necessary additional research or changes to planned research. Each work group produced an RM&E Plan specific to their areas of RM&E component coverage and the related BiOp actions.

Status and Effectiveness Monitoring

Status monitoring projects help assess the condition or trend of ESU populations and key environmental attributes relative to performance targets. Effectiveness projects help assess the expected benefits of different categories of required BiOp hydrosystem and offsite mitigation actions.

Projects grouped under this strategy address BiOp requirements to provide or support status information on adult and juvenile fish abundance, distribution, and survival, as well as information on environmental condition identified as key measures of fish performance. Effectiveness projects address BiOp requirements to provide or support information on the physical and biological responses of hydrosystem and offsite mitigation actions.

In 2002, the Action Agencies' implementation of status and effectiveness monitoring projects included:

- Monitoring adult and juvenile migration at Columbia and Snake River dams, including on going programs such as the PIT-tagging and monitoring program and the hatchery marking program.
- Determining the effectiveness of the first in-ladder adult PIT-tag detection system at Bonneville Dam's Washington-shore ladder.
- Monitoring Snake River fall Chinook emergence and migration timing.
- Implementing the small-stream prototype PIT-tag detection system.
- Evaluating the relationship between estuary, plume, and near-shore ocean conditions and juvenile salmon growth survival,
- Finalizing a report that identifies data collection protocols and approaches to monitor tributary habitat indicators, performance standards, and measurement methods.
- Effects of limited spill, low flow conditions, and higher summer temperatures on passage and survival of adults through the hydrosystem.
- Estimating juvenile abundance and timing in the estuary and implementing newly developed sonic tags.
- The effects of supplementation and hatchery management

practices on wild fish production and genetics.

- The effectiveness of reconditioning wild steelhead kelts.
- Implementation of Reclamation RM&E actions through contracts, interagency and cooperative agreements.

Critical Uncertainties

Projects under this category help resolve or reduce key uncertainties or unknown causes in mortality and indeterminate impacts of artificial production. The projects also assist in assessing survival and recovery requirements of the ESUs.

Projects implemented under this strategy focus on NMFS BiOp requirements to address large, systematic research needs and identify improvements in analytical methods required for more robust and confident assessments of population extinction risks, probabilities of recovery, and needed survival improvements for each ESU. The following are current key uncertainties:

- Delayed effects in mortality possibly related to transportation (D),
- Unexplained extra mortality (EM) that may be related to hydro system passage, and,
- Effectiveness of hatchery spawners—reduction of uncertainty in the ability of hatchery fish to successfully reproduce in wild.

Projects initiated in 2002 will help reduce the uncertainties associated with the differences in survival of transported and non-transported juvenile fish (D) by focusing on providing better estimates of "D" for mid Columbia and Snake River stocks, and on identifying factors that either contribute to the occurrence of "D" or confound the estimation of "D." A series of research, fish marking and monitoring actions were conducted to reduce the confidence intervals around current estimates of "D" for stocks throughout the region. To help determine causes of "D," several areas of evaluations were conducted. One area was to determine the role that physiology plays in "D"; the second was to determine where "D" occurs in the post-release environment; and the third was to identify logistical processes of barge transport that may contribute to "D." In addition, a myriad of monitoring actions throughout the region supported the fundamental research actions addressing "D" in 2002. These actions range from the Comparative Survival Studies on the Snake River to the PIT-tag recovery efforts in the estuary and on avian colony islands along with the development of specialized technology to provide information on incremental differences in mortality through the complex estuarine and near ocean environment to the installation of primary bypass and adult PIT-tag detectors throughout the hydrosystem.

Projects implemented in 2002 for the critical uncertainty of "D" included the following:

- Snake River spring Chinook and Steelhead comparative survival studies between transported fish and fish allowed to remain in river during their out migration were continued in 2002. The adult return data from this work will establish more robust estimates of “D.”
 - Mid Columbia spring Chinook comparative survival studies were started in 2003. Adult return data from this study will establish the survival relationships between bypassed, transported and spill-bypassed fish, in addition to estimations of “D” for mid Columbia spring Chinook. 2002 was the first year of this evaluation and is expected to continue through 2006 with juvenile release incorporating mid Columbia Steelhead and fall Chinook.
 - Continued the hatchery marking of the Snake River hatchery Chinook for the comparative survival study in 2002. Adult returns from this study provide a range of survival and “D” estimates that are used to evaluate the relationship of fish condition, migration distance and natural culling effects on juvenile survival, adult returns and on estimates of “D.”
 - A comparative rearing evaluation was conducted in 2002 to document “D” and investigate physiological causes of “D.” Short-term survival rates were compared over a six-month period to evaluate the effect that migration route (multiple bypass, transport, and spill-bypass) has on delayed mortality.
 - Post-mortem evaluation of the physiological causes of mortality was compared between the different groups fish. Physiological causes of mortality were correlated to migration history to determine the long-term contribution that route of passage has in the estimation of “D.”
 - The performance of the immune response in fish with different migration histories (multiple bypass, transport and spill-bypass) were compared to determine the effect these passage routes have on post-hydrosystem survival and thus a factor that contributes to “D.”
 - Physiological condition (growth, stress levels, energy reserves and smoltification) of fish prior to transport and in-river passage were compared to the changes that occurred as a result of the transportation process and in river (spill-bypassed) passage through the hydrosystem. Results are being correlated to the observed returns and “D” estimates for the comparative survival study fish and the rearing studies to correlate the role that fish condition and energy consumption have on survival and observations of “D.”
 - Differences in physiological responses (including cumulative stress) between hatchery and wild Chinook and Steelhead that are transported and those passing multiple dams.
 - Differences in migration behavior of post-release transported fish vs. in-river migrants, and how that may affect chances of survival (travel time, predation rates and migration routes) in the estuary and near-shore ocean environment. Steelhead and fall Chinook were radio-tracked from Bonneville Dam or the transport release location through the upper estuary to the saltwater interface. Information from this study will help improve transportation programs, identify problem areas in the estuary, and provide travel times, holding, and survival rates.
 - Avian predation studies.
 - Implementation of acoustic tag development.
 - Canadian/U.S. Continental Shelf salmon monitoring program.
 - Estuarine habitat and juvenile salmonid use.
 - Smolt survival monitoring.
 - Juvenile survival estimates through the estuary.
 - Use of cool water corridors and refugia during the upstream migration of steelhead and fall Chinook. A component of this evaluation was to determine the potential benefits of cool water releases from Dworshak on adult salmon migration.
 - Comparative differences in the homing and straying of adult fish with known juvenile passage histories and sites of origin.
- As part of additional research efforts on delayed mortality and extra mortality, the Action Agencies continued studies for implementation in 2002 to evaluate the use of acoustic tags to estimate survival below Bonneville Dam, through the estuary and along the continental shelf. Several studies addressing the uncertainty of the effectiveness of hatchery fish to reproduce in the wild were initiated or ongoing in 2002.

Regional Coordination and Integration

The RM&E and data requirements of the BiOp need to be coordinated across the different categories of RM&E and the various federal and state programs. This coordination is essential to maximize the amount and quality of RM&E within limited budgets, and to avoid confounding effects of multiple or overlapping treatment and control sites.

Currently RM&E efforts focus on monitoring the requirements of listed species specified in the NMFS BiOp. The need to monitor a broad range of environmental variables in geographic areas beyond those demarcated by the ESUs is present among many different regional organizations. The Action Agencies and NMFS recognize the broader regional needs for monitoring unlisted natural stocks, hatchery populations, and resident fish species. The RM&E Program overlaps with other regional programs having their own needs and geographic coverage. Where there are opportunities to coordinate with other programs or use their monitoring data, NOAA Fisheries and the Action Agencies plan to do so. Both the Action Agencies and NOAA Fisheries recognize that the various programs have different goals and that this may

preclude region-wide reliance on any single monitoring program.

In 2002, important advancements were made in the area of regional RM&E coordination and implementation. Under the auspices of the Federal Caucus, a federal regional coordination team was formed. This team, whose participants include all the federal agencies of the Federal Caucus, has begun to define methods and requirements to integrate each agency's monitoring efforts. The coordination and integration of the individual federal agency's monitoring activities will result in a reduction of uncertainties in RM&E planning and metrics, increase effectiveness in achieving each agency's monitoring goals, help the federal members to meet broader, overarching regional goals, and increase the efficiency and effectiveness of meeting the objectives of a comprehensive RM&E plan called for in the BiOp.

Reclamation co-funded a major conference in May 2002 to identify the barriers and propose solutions to implementing an ecosystem-based monitoring program. In addition, advance developments were made in discussions with federal, state, and tribal partners in determining the structure, funding and feasibility of creating a regional forum to address RM&E needs at the policy, programmatic and technical levels.



Planning and Coordination

Implementation Planning and Progress Reporting

The Action Agencies coordinated and prepared a number of BiOp related planning and reporting documents in fiscal year (FY) 2002. The first annual implementation plan (*Endangered Species Act 2002 Annual Implementation Plan for the FCRPS*) was finalized and released in November 2001. This plan provided details about the Action Agencies' measures planned for implementation in FY 2002 and summarized expected modifications from the BiOp.

In May 2002, after extensive coordination with NOAA Fisheries, the Action Agencies issued the 2001 Progress Report. The 2001 Progress Report documented the Columbia River Basin fish recovery measures implemented by the Action Agencies in FY 2001. After release of the 2001 Progress Report, the Action Agencies continued to provide information to NOAA Fisheries needed for its Findings Letter. The Findings Letter found that the Action Agencies were making sufficient progress implementing hydrosystem improvements and offsite mitigation measures. The Findings Letter also emphasized areas where future efforts should be focused and identified issues needing resolution.

The Action Agencies also prepared a draft and final 2003/2003–2007 Implementation Plan for the FCRPS in FY 2002.

The Action Agencies met with various state, tribal, and other entities from August through October of 2002 to discuss and take comment on the draft 2003/2003–2007 Implementation Plan. Comments received were summarized and responded to in the final 2003/2003–2007 Implementation Plan.

NOAA Fisheries Regional Forum

The Action Agencies continued to develop and implement hydrosystem activities in coordination with the various teams of the NOAA Fisheries Regional Forum: The Implementation Team, the Technical Management Team, the Water Quality Team, and the System Configuration Team. The Action Agencies also coordinated with the Fish Passage Operation and Maintenance Team (FPOM), the Studies Review Work Group and the Corps' Walla Walla and Portland Districts' Fish Facilities Design Review Work Groups. These groups provided an opportunity for the region to share information and coordinate at the technical and policy levels.

The Council's Fish and Wildlife Program

In 2002, BPA, NOAA Fisheries and the Council worked together to further align NMFS and USFWS BiOp needs with the Council's Fish and Wildlife Program. Significant effort was put into identifying projects that were responsive to BiOp requirements and any subsequent gaps. The Action Agencies also participated in the Council's mainstem rulemaking process to share information and coordinate BiOp implementation with the hydrosystem measures in the Council's Fish and Wildlife Program.

BPA worked with the Council to assure development of subbasin assessments and planning and used the Council's Provincial Review process to solicit project proposals responsive to BiOp actions. BPA and the Council continued to develop contracts for subbasin plans, schedules for plan completions, and guidelines for the contents of plans.

Lower Columbia River Estuary Partnership

BPA and the Corps continued to coordinate BiOp implementation through Lower Columbia River Estuary Partnership and used the Lower Columbia River Comprehensive Conservation and Management Plan as the basis for an estuary recovery initiative that addresses the needs of ESA-listed populations.

Federal Caucus and the Basinwide Salmon Recovery Strategy

The Action Agencies use the Federal Caucus to coordinate salmon recovery efforts with their federal partners. Coordination also occurred with Federal Caucus subgroups such as the Federal Habitat Team, the RM&E Work Groups and the Hydrosystem Work Group.

IV. Summary of Actions

Table 7 summarizes the Action Agencies' progress in 2002 for each RPA Action listed in the NMFS BiOp.

Table 7 Action Agency Summary of Progress by RPA Action

Action #	Action Description	Progress Summary
1	The Action Agencies, coordinating with NMFS and USFWS, shall annually develop 1- and 5-year plans to implement specific measures in hydro, habitat, hatcheries, harvest, research, monitoring, and evaluation needed to meet and evaluate the performance standards contained in this biological opinion.	Annual and 5-year implementation plans were provided for 2002, 2002-2006, and 2003/2003-2007. The implementation plans included detailed and summarized information for the 1- and 5-year planning periods. The plans will continue to be coordinated with state, tribal and other regional entities.
2	The Action Agencies shall coordinate development and implementation of the hydro portion of the 1- and 5-year implementation plans through the Regional Forum, chaired by NMFS.	The hydrosystem portion of the 2003/2003-07 Implementation Plan was coordinated through the NMFS Regional Forum.
3	The Action Agencies, coordinating through the Technical Management Team, shall develop and implement a 1- and 5-year water management plan and in-season action plans for the operation of the FCRPS.	The Action Agencies proposed that referencing the Water Management Plans in the 5-year implementation plans would serve the purpose of the 5-Year WMP.
4	The Action Agencies, coordinating through the System Configuration Team, shall annually develop and implement a 1- and 5-year capital investment plan for the configuration of the FCRPS projects.	The Action Agencies continued to use the SCT to identify the system configuration priorities, capital investments, hydrosystem research and reliability improvements and included them in the 2003/2003-07 Implementation Plans.
5	The Action Agencies, coordinating through the Water Quality Team, shall annually develop a 1- and 5-year water quality plan for operation and configuration measures at FCRPS projects.	The Action Agencies developed the 1- and 5- year work plans as part of the implementation process. The Corps developed a Water Quality Plan that described planned operations to meet water quality TMDLs. This plan was issued in conjunction with the Fish Passage Plan in February. A summary of water quality measurements taken throughout the year and their compliance with, for example, the dissolved gas TMDLs was issued.
6	The Corps and BPA, through the annual planning process, shall develop and implement 1- and 5-year operations and maintenance (O&M) plans and budgets that enhance the	The Corps developed 5-year O&M plans that describe routine and non-routine O&M projects planned at each of the dams. These plans were coordinated with the Fish Passage O&M Coordination Group.

Action #	Action Description	Progress Summary
	capability to operate and maintain fish facilities at FCRPS projects for listed salmonid stocks.	
7	The Action Agencies, with assistance from NMFS and USFWS, shall annually develop 1- and 5-year plans for habitat measures that provide offsite mitigation.	The Action Agencies developed 1- and 5-year implementation plans in coordination with NOAA and the USFWS that included habitat measures that provide offsite mitigation.
8	The Action Agencies, with assistance from NMFS and USFWS, shall annually develop 1- and 5-year plans for hatchery and harvest measures that provide offsite mitigation.	The Action Agencies included 1- and 5-Year work plans for hatchery and harvest measures in the 2003/2003-07 IP, the 2002 Annual IP, and the 2002-2006 5-Year IP.
9	The Action Agencies, with assistance from NMFS and USFWS, shall annually develop 1- and 5- year plans for research, monitoring, and evaluation to further develop and to determine the effectiveness of the suite of actions in this RPA.	The Action Agencies included 1- and 5-Year work plans for research, monitoring, and evaluation in the 2003/2003-07 IP, the 2002 Annual IP, and the 2002-2006 5-Year IP.
10	The Action Agencies shall work with NMFS and others to promptly incorporate the results of recovery planning into annual Fish and Wildlife Program implementation funding, including support for incorporation of the results into the NWPPC's Fish and Wildlife Program.	BPA initiated funding for project 2002-075-00 to support Technical Recovery Teams. No results were available in 2002 to incorporate into the Councils Fish & Wildlife Program.
11	By September 30, 2001, the Action Agencies shall develop procedures for carrying out actions that could not be anticipated in the planning process, but that are necessary or prudent to achieve the performance standards.	The Action Agencies, USFWS, and NOAA established an expedited process for considering the implementation of activities that are new or were unanticipated during development of annual implementation plans or which do not fit into established funding processes. The expedited process supplements the framework process established by the Corps and NOAA.
12	The Action Agencies shall coordinate with NMFS and USFWS in the review of the 1- and 5-year plans to facilitate timely review and approval as part of the annual decision process.	The Action Agencies continued to coordinate preparation and finalization of the implementation plans with NOAA, USFWS, and others.
13	The Action Agencies shall issue annual reports to NMFS and USFWS on progress toward achieving the performance standards set out in this biological opinion, including comprehensive	The Action Agencies released the 2001 Progress Report in May 2002 and the 2002 Progress Report in May 2003.

Action #	Action Description	Progress Summary
	cumulative reviews in years 3, 5, and 8.	
14	The Action Agencies shall operate FCRPS dams and reservoirs with the intent of meeting the flow objectives (Table 9.6-1) on both a seasonal and weekly average basis for the benefit of migrating juvenile salmon.	<p>The Action Agencies operated the FCRPS projects to meet the flow objectives. Dworshak was refilled.</p> <p>Lower Granite: Based on an April final April-July runoff forecast of 19.2 MAF, the spring flow objective was 97 kcfs. Actual average outflows from 4/3 –6/20/2002 were 83.4 kcfs. The summer flow objective was 50.9 kcfs based on a June final April-July runoff forecast of 18.1 MAF. From 6/21-8/31/02 the average outflow was 41 kcfs.</p> <p>McNary: Based on an April final April-August runoff forecast of 87.8 MAF, the spring flow objective was 246 kcfs. Actual average outflows from 4/10 –6/30/2002 were 269.3 kcfs. Summer flow objective was 200 kcfs. From 7/01 -8/31/02 the average outflow was 189.1 kcfs.</p> <p>Libby: refill was completed July 15, 2002. A Libby/Duncan swap was agreed to for 70 kcf.</p> <p>Priest Rapids: From 4/10-6/30/2003, the average outflow was 180.6 kcfs.</p>
15	The Action Agencies shall operate the FCRPS to provide flows to support chum salmon spawning in the Ives Island area below Bonneville Dam.	The Action Agencies operated the FCRPS projects to provide flows to support chum salmon spawning in the Ives Island area.
16	The Action Agencies shall operate the FCRPS to provide access for chum salmon spawning in Hamilton and Hardy creeks.	The Action Agencies operated the FCRPS projects to provide access for chum spawning in Hamilton and Hardy creeks. The annual Water Management Plan described the chum operation that is planned and seasonal updates based upon water volume forecasts and chum spawning needs were developed and operations implemented in conjunction with the Technical Management Team (TMT).
17	The Action Agencies shall coordinate with NMFS, USFWS, and the states and Tribes in preseason planning and in-season management of flow and spill operations. This coordination shall occur in the Technical Management Team process (see Section 9.4.2.2).	TMT coordination continued. Seasonal updates to the spill and flow elements of the Water Management Plan were coordinated with the TMT and based upon research objectives, the water volume forecast, and fish passage needs. 46 TMT meetings and/or conference calls occurred.
18	The Action Agencies shall operate the FCRPS during the fall and winter months in a manner that achieves refill to April 10 flood control elevations, while meeting project and system minimum flow and flood control constraints before April 10. During the spring, the Action Agencies shall operate the FCRPS to meet the	<p>April 10 flood control: Grand Coulee, Dworshak, and Libby were operated in 2002 to meet both the April 10 flood control constraint and refill by June 30. Hungry Horse was below the April 10 flood control due to minimum flow requirements, but refilled shortly after June 30, 2002.</p> <p>The Albeni Falls flood control rule curve has an upper rule curve elevation of 2056 ft. and a lower elevation of 2052 ft. on April 10th. On April 10th the Hope gage reading was 2052.8 ft.</p>

Action #	Action Description	Progress Summary
	flow objectives and refill the storage reservoirs (Albeni Falls, Dworshak, Grand Coulee, Hungry Horse, and Libby) by approximately June 30.	2052.8 ft. June 30 refill: Dworshak was refilled by June 30. Libby was refilled by July 15. Albeni Falls was refilled by June 30th. Hungry Horse refilled by July 13. Grand Coulee refilled by July 8.
19	The Action Agencies shall operate specific FCRPS projects as follows:	The Action Agencies operated the FCRPS projects as indicated in the RPA action. In coordination with TMT, in-season fish needs and runoff forecasts were used to make operational adjustments.
20	The Corps shall operate the lower Snake River reservoirs within 1 foot of MOP from approximately April 3 until small numbers of juvenile migrants are present and shall operate the John Day pool within a 1½-foot range of the minimum level that provides irrigation pumping from April 10 to September 30.	Ice Harbor and Little Goose were operated part of the year at MOP plus 1 due to navigation concerns. Lower Monumental was operated at MOP. Lower Granite exceeded MOP for a total 8 days because of load reductions, unit outage, and ISO bus work. John Day was operated per the RPA Action.
21	The Corps shall routinely identify opportunities to shift system flood control evacuation volumes from Brownlee and Dworshak reservoirs to Lake Roosevelt and identify such opportunities for the Technical Management Team. The Corps shall implement flood control shifts as necessary to best protect listed fish, as called for by NMFS in coordination with the Technical Management Team, taking into account water quality issues and the concerns of all interested parties.	A flood control shift of 115 kaf occurred between Dworshak and Grand Coulee.
22	The Corps and BOR shall implement VARQ flood control operations, as defined by the Corps (1999d), at Libby by October 1, 2001, and at Hungry Horse by January 1, 2001. By February 1, 2001, the Corps shall develop a schedule to complete all disclosures, NEPA compliance, and Canadian coordination necessary to implement VARQ flood control at Libby.	Reclamation implemented VARQ on an interim basis at Hungry Horse in 2002. Due to minimum flow requirements, Hungry Horse was below VARQ flood control elevations until early May when inflows refilled the project to VARQ flood control. The Corps completed an Environmental Assessment in December 2002 to allow interim VARQ operation at Libby beginning in 2003.
23	BOR shall operate Banks Lake at an elevation 5 feet from full during August by reducing the	Banks Lake operated such that pumping was reduced by about 130 kaf in August, allowing the lake elevation to draft to 1565 feet.

Action #	Action Description	Progress Summary
	volume of water pumped from Lake Roosevelt into Banks Lake by about 130 kaf during this time.	
24	BPA and the Corps shall continue to request and negotiate agreements to annually provide 1 Maf of Treaty storage from January through April 15, release the water during the migration season, and seek additional storage amounts.	BPA and the Corps negotiated an agreement with the Canadian Section of the Operating Committee for operation of Treaty storage to allow storage of up to 1 MAF of water above Treaty Storage Regulation (TSR) levels to support U.S. flow augmentation. Based on the early May TSR, after-the-fact accounting showed that flow augmentation storage was approximately 0.9 MAF. This water was all released by the end of July 2002.
25	BPA and the Corps shall continue to request, and negotiate with BC Hydro for storage of water in non-Treaty storage space during the spring for subsequent release in July and August for flow enhancement, as long as operations forecasts indicate that water stored in the spring can be released in July and August.	A letter agreement was negotiated between BPA and BC Hydro for spring storage of water under the non-Treaty Storage Agreement for release in July and August. Under terms of the agreement, BPA received release rights for all water stored in the spring storage period (1 May through 7 July 2002) and BC Hydro was required to release one-half of their spring storage during the summer release period (8 July through 31 August 2002). BPA and BC Hydro each stored 340 thousand second-foot days (ksfd) during the spring period. BPA released all 340 ksfd of spring storage during July and August while BC Hydro released their required 170 ksfd.
26	BPA and the Corps shall continue to evaluate, request, and negotiate with BC Hydro the shaping and release of water behind Canadian Treaty storage projects in addition to the non-Treaty storage water previously discussed during July and August.	<p>The Columbia River Treaty Operating Committee (BPA, the Corps, and BC Hydro) prepared a preliminary report on feasibility on increasing discharges from Canadian storage in July and August. The Operating Committee submitted the report in March of 2002 for the consideration of the Entities.</p> <p>The primary focus of the study was on capital improvement options that would enable significant increases in summer flows. BPA recently checked with Canada regarding their desire to implement the recommendations in the report. They indicated that there are currently no firm plans to install additional units at Mica or Revelstoke, but that additional units at both projects remain as viable options for their long-range needs. It was agreed that both entities would like to leave the door open for consideration of these measures in the future. The Operating Committee will reconsider the feasibility of these measures periodically and will submit recommendations for consideration of the Entities when economic conditions are more favorable.</p> <p>The report also concluded that there are operational approaches that might provide slight increases in summer flows. These operations require additional evaluation of their environmental effects both in Canada and in the US as well as their economic effects. The Treaty Operating Committee will continue to evaluate operating alternatives that would increase Canadian storage discharges to increase summer flows, while providing a</p>

Action #	Action Description	Progress Summary
		better overall operation for Canadian non-power objectives.
27	Before entering into any agreement to commit currently uncontracted water or storage space in any of its reservoirs covered by this biological opinion to any other use than salmon flow augmentation, BOR shall consult with NMFS under ESA Section 7(a)(2). Such consultations shall identify the amount of discretionary storage or water being sought, the current probability of such storage or water being available for salmon flow augmentation, and any plan to replace the storage volume currently available to salmon flow augmentation that would be lost as a result of the proposed commitment. Also, BOR shall consult with NMFS before entering into any new contract or contract amendment to increase the authorized acreage served by any irrigation district receiving BOR-supplied water. NMFS' criterion in conducting such reviews is to ensure that there be zero net impact from any such BOR commitment on the ability to meet the seasonal flow objectives established in this biological opinion. Replacement supplies should have at least an equal probability of being available for salmon flow augmentation as the storage space or water that is being committed.	Reclamation had no change in uncontracted space during 2002, but will continue to consult with NOAA and USFWS on an as needed basis.
28	BOR shall pursue water conservation improvements at its projects and shall use all mechanisms available to it under state and Federal law to ensure that a reasonable portion of any water conserved will benefit listed species.	Numerous small projects were completed that have the potential to either improve instream flows, improve fish passage, increase minimum pools for bull trout, or increase water available for flow augmentation.
29	Within 2 years from the date this opinion is signed, BOR shall provide NMFS with a detailed progress report addressing possible instances where BOR-supplied water within the Columbia	Work continued on the report of unauthorized use.

Action #	Action Description	Progress Summary
	River basin is being used without apparent BOR authorization to irrigate lands. In the report, BOR shall indicate how it shall proceed to identify and address instances of unauthorized use.	
30	For those BOR projects located in the Columbia River and its tributaries downstream from Chief Joseph Dam (Table 9.6-2), BOR shall, as appropriate, work with NMFS in a timely manner to complete supplemental, project-specific consultations. These supplemental consultations shall address effects on tributary habitat and tributary water quality, as well as direct effects on salmon survival (e.g., impingement, entrainment in diversions, false attraction to return flows, and others). These supplemental consultations shall address effects on mainstem flows only to the extent to which they reveal additional effects on the in-stream flow regime not considered in this biological opinion (e.g., flood control).	Reclamation and NOAA have agreed to the following consultation schedules: Okanogan Feasibility study – BPA-funded EIS in progress, schedule uncertain Yakima BA to NOAA/FWS – August 2000 Umatilla BA to NOAA/FWS – August 2001 Draft BiOp – April 2002 Ongoing consultation during 2002 on a Supplemental BA Crescent Lake is a non-Reclamation Project Crooked River, Deschutes, Wapinitia Ongoing consultation during 2002 The Dalles Completed in 1992 Tualatin Received NOAA species listing – Jan 2001 (no FCRPS-impacted species present) Ongoing consultation during 2002
31	BOR shall assess the likely environmental effects of operating Banks Lake up to 10 feet down from full pool during August. The assessment and NEPA compliance work shall be completed by June 2002 to determine future operations at this project by the summer of 2002.	Work continued on the Banks Lake EIS during 2002
32	The Action Agencies shall acquire water for instream use from BOR's Upper Snake River basin projects and Idaho Power Company's Hells Canyon Complex during the spring and summer flow augmentation periods to improve the likelihood of achieving spring and summer flow objectives at Lower Granite Dam.	Reclamation provided up to 286.5 kaf for flow augmentation in 2002.

Action #	Action Description	Progress Summary
33	The Corps, in coordination with USFWS, shall design and implement appropriate repairs and modifications to provide water supply temperatures for the Dworshak National Fish Hatchery that are conducive to fish health and growth, while allowing variable discharges of cold water from Dworshak Reservoir to mitigate adverse temperature effects on salmon downstream in the lower Snake River.	Hatchery modifications were designed in FY01 and 02 with contracts awarded in FY02. Construction work (boiler replacement, waterline extension, and reuse system 1) was completed in December 2002.
34	The Action Agencies shall evaluate potential benefits to adult Snake River steelhead and fall chinook salmon passage by drafting Dworshak Reservoir to elevation 1,500 feet in September. An evaluation of the temperature effects and adult migration behavior should accompany a draft of Dworshak Reservoir substantially below elevation 1,520 feet.	The field evaluations continued using temperature and depth-sensitive radio tags to evaluate adult salmon use of cooler waters during their migration upstream of Lower Granite. The Corps also continued temperature monitoring in Lower Granite Reservoir and the Clearwater River and developed the Computational Fluid Dynamics model of the lower Snake and Clearwater rivers.
35	The Corps shall develop and conduct a detailed feasibility analysis of modifying current system flood control operations to benefit the Columbia River ecosystem, including salmon. The Corps shall consult with all interested state, Federal, Tribal, and Canadian agencies in developing its analysis. Within 6 months after receiving funding, the Corps shall provide a feasibility analysis study plan for review to NMFS and all interested agencies, including a peer-review panel (at least three independent reviewers, acceptable to NMFS, with expertise in water management, flood control, or Columbia River basin anadromous salmonids). A final study plan shall be provided to NMFS and all interested agencies 4 months after submitting the draft plan for review. The Corps shall provide a draft feasibility analysis to all interested agencies,	Congressional funds were sought for a reconnaissance level study.

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	NMFS, and the peer-review panel by September 2005.	
36	By October 1, 2002, the Corps shall develop and, if feasible, implement a revised storage reservation diagram for Libby Reservoir that replaces the existing fall draft to a fixed end-of-December elevation. One option is to evaluate variable drafts based on the El Niño Southern Oscillation Index (SOI) predictions or other forecast methodologies of runoff volume. To implement this change, the Corps shall complete successful coordination with Canada under the Columbia River Treaty.	Coordination for Libby occurred at TMT meetings. Revised forecast procedure to evaluate El Nino Southern Oscillation Index (SOI) predictions or other forecast methodologies of runoff volume. .
37	BOR shall investigate the attraction of listed salmon and steelhead into wasteways and natural streams receiving waste water from the Columbia Basin Project. If listed fish are found to be attracted into these channels, BOR shall work with NMFS to identify and implement structural or operational measures to avoid or minimize such use, as warranted.	Investigations continued in 2002 on wasteways and natural streams receiving water from the Columbia Basin Project.
38	By March 1, 2002, BOR shall install screens meeting NMFS' screen criteria at the canal intakes to the Burbank No. 2 and Burbank No. 3 pump plants. BOR shall connect the Burbank No. 3 intake canal to Burbank Slough to provide juvenile fish egress. BOR shall coordinate with NMFS on each of the actions identified above.	This was completed and operational in 2002.
39	BOR shall evaluate the water quality characteristics of each point of surface return flows from the Columbia Basin Project to the Columbia River and estimate the effects these return flows may have on listed fish in the Columbia River and in the wasteways accessible to listed fish. By June 1, 2001, BOR shall	Reclamation continued to monitor return flows through 2002. Results were not available at the time of this report.

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	provide NMFS with a detailed water quality monitoring plan, including a list of water quality parameters to be evaluated. If the water quality sampling reveals enough water quality degradation to adversely affect listed fish, BOR shall develop and initiate implementation of a wasteway water quality remediation plan within 12 months of the completion of the monitoring program.	
40	The Corps shall continue to transport all non-research juvenile salmonids collected at the Snake River collector projects. The Corps and BPA shall continue to implement voluntary spill at all three Snake River collector projects when seasonal average flows are projected to meet or exceed 85 kcfs.	The transport program was implemented according to the operating criteria. Barging of fish collected during the summer was extended through August 16 for Snake River projects and August 17 at McNary Dam. The voluntary spill program was implemented at Lower Granite and Little Goose. No spill occurred at Lower Monumental due to work in the tailrace.
41	The Corps and BPA shall continue (pending results of the McNary Transport Evaluation) to bypass juvenile spring migrants collected at McNary Dam and shall provide the spring spill levels described for that project.	The Corps bypassed spring migrants at McNary Dam. Spill was provided at BiOp levels.
42	The Corps and BPA shall operate the collector projects to maximize collection and transportation during the summer migration (i.e., no voluntary spill except as NMFS deems necessary for approved research).	The Corps operated the collector projects to maximize collection and transportation during the summer migration.
43	The Corps shall not initiate collection of subyearling fall chinook for transportation at McNary Dam until inriver migratory conditions are deteriorating (i.e., no longer spring-like).	Collection began at McNary on July 11, 2002. Barging was extended through August 17, 2002 at McNary.
44	The Corps shall extend the period of barge transportation from the lower Snake River dams and McNary to further reduce reliance on trucking.	In FY02 the Corps extended barge transport from Snake River projects through August 16 and at McNary Dam through August 17.
45	By the end of 2001, the Corps shall develop, in	A research plan was developed and research was started in 2002 to evaluate transport at

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	coordination with NMFS and the other Federal, state, and Tribal salmon managers, a McNary Dam transportation evaluation study plan specifically focusing on the response of UCR spring chinook and steelhead to transportation. Approved research should begin by 2002, if feasible.	McNary. This work will continue through 2005 with adult return through 2008. The final report will be available in 2009.
46	The Corps and BPA, in coordination with NMFS through the annual planning process, shall evaluate transport to inriver return ratios for wild SR yearling chinook salmon and steelhead. In addition, the Corps and BPA shall also evaluate the effects of transportation on summer-migrating subyearling SR chinook salmon.	The transportation evaluation from Lower Granite continued. The baseline study to compare in river survival to transportation from Lower Granite will be complete in 2003. Adults will be monitored through 2006 and a final report will be available in 2007.
47	During all transport evaluations, the Corps and BPA, in coordination with NMFS through the annual planning process, shall include an evaluation of delayed mortality (D) of transported versus inriver migrating juvenile anadromous salmonids.	Baseline estimates for delayed mortality (D) were incorporated into the study design for the Lower Granite and McNary transport evaluations by maintaining an inriver release group. The D estimates will be provided in the annual status reports and in the final reports (Lower Granite in 2007 and McNary in 2009).
48	The Corps and BPA shall evaluate the effects of prior transport as smolts on the homing of adults.	Adult telemetry fieldwork and data analysis continued in 2002.
49	The Corps shall evaluate strategies to enhance post-release survival of transported fish; examples of such strategies include timing releases so that fish arrival at the estuary corresponds to minimal interactions with predators and maximum availability of forage and locating releases so as to decrease passage time through areas of high predation.	The Corps began late season evaluations of transported fish in 2002.
50	BPA and the Corps shall install necessary adult PIT-tag detectors at appropriate FCRPS projects before the expected return of adult salmon from	Adult Pit-tag detectors were installed at Bonneville and McNary in 2002 and are scheduled for installation at Ice Harbor and Lower Granite in 2003.

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	the 2001 juvenile outmigration.	
51	If results of Snake River studies indicate that survival of juvenile salmon and steelhead collected and transported during any segment of the juvenile migration (i.e., before May 1) is no better than the survival of juvenile salmon that migrate inriver, the Corps and BPA, in coordination with NMFS through the annual planning process, shall identify and implement appropriate measures to optimize inriver passage at the collector dams during those periods.	Analysis of the data collected to date comparing the smolt to adult returns (SARs) of Snake River spring/summer chinook which were transported versus those which migrated in-river and were not detected at any downstream transportation project suggests little benefit from transportation early in the season (April). Data for steelhead is more limited, but suggests a benefit from April transport. The conclusion drawn from the data to date is there is a benefit to providing good in-river conditions during this migration period. Transportation studies were conducted during 2002 to provide information on this issue. A more thorough analysis of the data is necessary before drawing any further conclusions."
52	The Corps shall identify and implement improvements to the transportation program.	The Corps implemented facility improvements and operational changes for the transport program as identified and coordinated through FPOM and the Fish Passage Plan.
53	The Corps shall evaluate and implement structural and operational alternatives to improve juvenile transportation at the collector dams.	Specific improvements to the fish facilities for research included the juvenile fish PIT tag detector/deflector sort by code systems at Lower Granite (2001), Little Goose (2002), and McNary (2002 – 2003). Modification of the Lower Monumental juvenile fish facility to improve raceway releases and barge loading flumes began in 2002 and was completed in 2003. New fish release pipes were installed at McNary in 2002. The Corps will continue to implement other facility improvements and operational changes for the transport program as they are identified and coordinated through FPOM and the Fish Passage Plan.
54	The Corps and BPA shall implement an annual spill program, consistent with the spill volumes and TDG limits identified in Table 9.6-3, at all mainstem Snake and Columbia River FCRPS projects as part of the annual planning effort to achieve the juvenile salmon and steelhead performance standards.	The Corps and BPA implemented an annual spill program coordinated through the TMT. Details were provided in the 2002 Water Management Plan.
55	To improve the future flexibility of the transmission system, BPA's Transmission Business Line shall initiate planning and design necessary to construct a Schultz-Hanford 500-kV line or an equivalent project, with a planned schedule for implementation by 2004 or 2005.	BPA continued to work on the EIS for the Schultz-Wautoma 500-kV line in 2002.
56	BPA's Transmission Business Line shall continue efforts to evaluate, plan, design, and	BPA completed a Final EIS for a new Grand Coulee – Bell 500-kV transmission line in 2002 and in January 2003 issued a Record of Decision to proceed with construction of the

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	construct a joint transmission project to upgrade the west-of-Hatwai cutplane and improve the transfer limitations from Montana.	project. Construction of the line will begin this February with completion expected in November 2004. Thus, BPA has taken actions that will enable RPA Action 56 to be implemented by 2004 as requested in the BiOp and provide additional flexibility for fish operations.
57	BPA's Transmission Business Line shall continue to evaluate strategically located generation additions and other transmission system improvements and report progress to NMFS annually. BPA's Transmission Business Line shall also limit future reservations for transmission capacity, as needed, to enable additional spill to meet performance standards, while minimizing effects on transmission rights holders.	BPA's Transmission Business Line evaluated the integration of new generating facilities, including Hungry Horse Transmission Stability Study -and the Libby Transmission Stability Study. Several new transmission line additions were proposed to integrate the output from a number of proposed combustion turbines. New 500-kV transmission lines from Lower Monumental to McNary and from McNary to John Day have been evaluated in EIS's. Their scheduled completion was delayed when the generation projects were placed on hold.
58	The Corps and BPA, in coordination with the Fish Passage Operations and Maintenance Coordination Team (FPOM), shall operate all turbine units at FCRPS dams for optimum fish passage survival. Methods to achieve this objective shall include, but are not limited to, activities outlined in the following paragraphs. (See RPA)	Units were operated at the 1% efficiency except at Lower Granite, Little Goose, and Lower Monumental, which were authorized to operate outside of 1% peak efficiency from 10/01/02 until 10/23/02 due to low flows if needed. McNary was operated outside of 1% peak efficiency for part of the time during the turbine survival test 4/03- 4/22/2002 and 5/6 - 6/14/2002. An annual report was provided to NOAA-Fisheries.
59	The Action Agencies, in coordination with the Regional Forum, shall determine the appropriate operating range of turbines equipped with minimum gap runners (MGRs) to increase survival of juvenile migrants passing through these new turbine designs.	Conducted McNary turbine survival test. Draft phase 1 report underway and scheduled for completion early FY 2003. Hydraulic modeling work is planned for 2003. Schedules for additional efforts, including field tests, will be determined through development of the Turbine Survival Program Phase II study plan in 2003 and implemented according to future funding priorities for the program
60	The Corps and BPA shall evaluate adult fallback and juvenile fish passage under daytime spill to the gas cap at Bonneville Dam in 2002 and 2003, after deflector optimization improvements allow for increased spill above current levels. Research results will be considered, in consultation with NMFS through the annual planning process, to	Conducted adult fallback telemetry evaluations and will continue through 2003. This data will be used to assess operational and configuration alternatives (See also RPA action 113).

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	determine implementation of additional changes in spill to further improve fish survival.	
61	The Corps shall complete the ongoing prototype powerhouse system surface collection evaluations at Bonneville First Powerhouse in 2000. The Corps shall compare the prototype with screened bypass systems and, if warranted, design and construct permanent facilities after full consideration and resolution of biological and engineering uncertainties, especially high-flow outfall investigations.	The prototype tests were completed. Test program to evaluate potential alternatives was developed. The configuration decision process will continue with these additional tests. (See also RPA action 97)
62	The Corps shall complete Bonneville First Powerhouse prototype evaluations of extended submerged intake and gateway vertical barrier screens, including an assessment of fry passage.	Completed designs for new porosity plate for additional testing.
63	The Corps shall complete the design of debris removal facilities for the Bonneville First Powerhouse forebay.	Debris removal (log boom) was designed in conjunction with the JBS outfall relocation improvements.
64	The Corps shall continue the investigation of minimum gap runners at the Bonneville First Powerhouse.	The Corps conducted second-year evaluation of MGRs at Bonneville first powerhouse.
65	The Corps shall complete Bonneville Second Powerhouse post-construction evaluation of the new juvenile fish bypass outfall and address design and operational refinements as warranted.	Completed 2002 post-construction biological evaluations.
66	The Corps shall continue design development and construction of a Bonneville Second Powerhouse permanent corner collector at the existing sluice chute, pending results of high-flow outfall investigations. The Corps shall construct new facilities if, and as soon as, evaluations confirm the optimum design configuration and survival benefits.	Began corner collector construction.
67	The Corps shall continue Bonneville Second Powerhouse investigations of measures to	Completed prototype testing. Based on identified problems with VBS, redesign and retesting is needed. Implementation decision will be made following tests.

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	improve intake screen fish guidance efficiency and safe passage through the gateway environment. This work shall include an assessment of fry passage.	
68	The Corps and BPA shall continue spill and passage survival studies at The Dalles Dam in 2001. Research results shall be considered, in consultation with NMFS through the annual planning process, to assess the need for additional changes in spill to further improve fish survival by 2002, if possible, but no later than 2005.	Continued field studies, alternative analysis, and initiated plans and specifications for spill walls. Also see RPA actions 134 and 135.
69	The Corps shall continue design development and 2001 prototype testing of upper turbine intake occlusion devices at The Dalles, with a goal of increased non-turbine passage rates through either the sluiceway or the spillway. The Corps shall install occlusion devices across the entire powerhouse, as warranted.	Prototype test conducted and design report completed. Preliminary analysis indicated that prototype blocks did not reduce turbine entrainment significantly.
70	The Corps shall continue biological and engineering investigations and design of a composite ice and trash sluiceway outfall relocation and adult ladder auxiliary water system at The Dalles Dam and shall construct such devices as warranted.	Deferred alternative site analyses due to funding priorities and to await results of spillway improvement study. (See RPA action 69)
71	The Corps and BPA shall continue investigation of 24-hour spill at John Day Dam in 2001. Research results will be considered, in consultation with NMFS through the annual planning process, to determine implementation of daytime spill to further improve juvenile fish survival as needed for its contribution to the performance standard.	Studies will continue in 2003 to be completed in 2004. Spillway operations will be established in conjunction with configuration decisions for John Day project. (See RPA action 98)
72	The Corps shall continue design development of a prototype RSW and extended deflector for	The NOAA Findings Letter (July 2002) acknowledges that the prototype RSW test at John Day will be delayed from 2002 pending results of tests at Lower Granite and Ice Harbor.

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	testing at John Day in 2002. The Corps should synthesize evaluation results, determine the fish survival benefits of one or more RSWs or a skeleton bay surface bypass, and install the units as warranted.	A schedule for future development, if warranted, will be established when additional information becomes available.
73	The Corps shall continue John Day prototype development and investigations of extended submerged intake screens, gateway vertical barrier screens, and, if necessary, orifices to optimize guidance and safe passage through the system, including a gateway debris cleaning plan. This work shall include an assessment of fry passage. The Corps shall design and construct new screen systems for safe passage of juvenile salmonids, as warranted. Juvenile bypass outfall survival investigations shall also be conducted.	Completed summer tests and did not observe gateway mortality. However, encountered structural problem with VBS that will need repaired prior to additional testing. (See RPA action 98)
74	The Corps shall continue evaluations to assess the need for improvements of the existing intake screens, gateway vertical barrier screen cleaning system, and bypass facilities (including debris containment and removal systems, separation, sampling, loading, and outfall facilities) at McNary to determine where improvements are necessary to reduce problems experienced during the 1996 flood, increase fish survival, and resolve holding and loading facility problems, including raceway jumping by juvenile salmon and steelhead and debris plugging of bypass lines. Additionally, the Corps shall evaluate whether the existing juvenile bypass system outfall should be relocated.	Second year of debris and biological tests on cylindrical dewatering screen were conducted. Decision on future use pending.
75	The Corps shall investigate a surface bypass RSW at McNary Dam, based on prototype results at other locations, and shall install the unit in multiple spillway bays, as warranted.	The Corps will complete a draft decision analysis for the Lower Snake River Projects and McNary in the spring 2003. This analysis will identify project priorities for application of RSW technology. The analysis will also include other juvenile bypass features.

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76	The Corps shall investigate, design, and construct, as warranted, a new juvenile bypass outfall at Lower Monumental Dam. Investigations shall be conducted in conjunction with spillway deflector and spill pattern optimization studies.	The Corps plans to use a decision analysis for McNary and Lower Snake projects similar to that used for Bonneville 1 Powerhouse that would include the RPA actions related to Lower Monumental (76, 77, 78, and 99). ESBS design and testing has not started due to other high priority work and recent discussions regarding poor performance related to the juvenile facility support. The Corps is delaying any significant improvements to the powerhouse collection system until spill survival results are available. The spill studies are scheduled to start in 2003 pending funding and regional prioritization. The studies will include consideration of spill survival, RSW benefits, transport vs in-river, etc. and call for a decision analysis to be completed by 2005. Corps and NOAA technical staff will work with the region to develop a comprehensive plan. Work in FY03 will also include hydraulic model studies to evaluate alternative outfall locations for analysis in the decision document.
77	The Corps shall investigate surface bypass (e.g., RSW) at Lower Monumental Dam, based on prototype results at other locations, and install in multiple spillway bays, as warranted.	Same as 76
78	The Corps shall initiate design development and testing of extended submerged intake screens and vertical barrier screens at Lower Monumental Dam and construct units as warranted.	Same as 76
79	The Corps shall conduct a post-construction evaluation of the new debris containment boom at Little Goose to monitor populations and behavior of aquatic predators when debris accumulates at the log boom.	The post-construction predator monitoring evaluation was completed.
80	The Corps shall continue the design development, fabrication/deployment, and testing of a prototype RSW at Lower Granite, in conjunction with the existing prototype powerhouse occlusion devices, including the forebay behavioral guidance structure (BGS) and upper turbine intake occlusion devices. As warranted by prototype test results, the Corps shall install one or more permanent RSWs and occlusion devices at appropriate lower Snake	Conducted 1 st year biological test of the RSW in 2002. RSW performance exceeded expectations. A second year of testing is scheduled for spring 2003. The existing SBC and BGS will be removed to provide stand-alone test conditions. See RPA action 75 for discussion of installing RSWs at other projects.

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	hydro projects, in coordination with the annual planning process.	
81	The Corps shall complete design for new juvenile bypass facilities at Lower Granite Dam, including enlarged orifices and bypass gallery, open-channel flow bypass, improved separator for juvenile separation by size, and improved fish distribution flumes and barge-loading facilities and shall proceed to construction, as warranted.	The Corps will resume design in 2004. It will take two construction work windows and completion of new facility will be in 2007.
82	The Action Agencies, in coordination with NMFS through the annual planning process, shall investigate the spillway passage survival of juvenile salmonids at appropriate FCRPS dams. These investigations shall assess the effect of spill patterns and per-bay spill volumes on fish survival, across a range of flow conditions. The Action Agencies shall develop a phased approach (including costs and schedules) and set priorities, in consultation with NMFS in the annual planning process, to continue spillway passage survival studies in 2001 and future years.	<p>Bonneville: Completed 2001 Research Report and conducted 2002 passage and survival studies.</p> <p>The Dalles: Continued spill and project survival studies.</p> <p>John Day: Completed 12 vs 24 spill evaluations. (See also RPA action 98)</p> <p>McNary Dam: Started spill survival studies.</p>
83	The Action Agencies, in coordination with NMFS through the annual planning process, shall evaluate the effect of spill duration and volume on spillway effectiveness (percent of total project passage via spill), spill efficiency (fish per unit flow), forebay residence time, and total project and system survival of juvenile steelhead and salmon passing FCRPS dams. Studies shall include both collector and non-collector projects. Adult passage considerations and potential adult fallback shall also be considered in study designs. Little Goose and Lower Granite dams shall be specifically considered for daytime spill studies. An overall	See RPA action 82

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	phased study approach for spill evaluations will be determined in the 1- and 5-year implementation plans.	
84	The Corps shall continue high-flow outfall investigations to determine whether it is appropriate to modify bypass outfall criteria in the context of high-discharge bypass discharges.	Evaluations were completed and the results were incorporated into the outfall design for the B2 corner collector. Post-construction testing of the corner collector is scheduled for 2004 and 2005 at which time outfall performance will be monitored.
85	The Corps shall continue to develop and evaluate improved fish-tracking technologies and computational fluid dynamics (numerical modeling). The ability to integrate these technologies and fluid dynamics shall be assessed as a potentially improved means of determining fish responses to forebay hydraulic conditions.	Continued development of improved tracking technologies and CFD modeling, funded and employed as an ongoing component of several surface bypass/project configuration evaluations underway at various dams and estuary studies. Implementation of this RPA is not envisioned to be a stand-alone activity, and has not been prioritized or funded as such in SCT.
86	The Corps shall continue to investigate a way to increase entry rates of fish approaching surface bypass/collector entrances.	This is an ongoing effort to test fish entry with various entrance geometry and flow conditions at projects where surface bypass is being tested (see specific RPA actions at various projects).
87	The Corps and BPA shall assess less-intrusive, PIT-tag interrogation methods at FCRPS juvenile bypass systems with interrogation sites, including McNary, John Day, and Bonneville dams. The Corps and BPA shall also assess providing a similar detection capability for the Ice Harbor juvenile bypass system.	Installation completed at McNary Dam in 2002. Other projects to follow in future years.
88	The Corps and BPA, in coordination with the Fish Facility Design Review Work Group and the Fish Passage Improvement Through Turbines Technical Work Group, shall continue the program to improve turbine survival of juvenile and adult salmonids.	Conducted McNary test and draft Phase 1 report underway for completion in 2003. (See RPA action 89)
89	The Action Agencies shall investigate hydraulic and behavioral aspects of turbine passage by juvenile steelhead and salmon through turbines to develop biologically based turbine design and operating criteria. The Corps shall submit a	A study was conducted at McNary in 2002 to evaluate different operating points. The Phase 1 report was delayed and will be completed in 2003 with a plan of study for Phase II.

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	report to NMFS stating the findings of the first phase of the Turbine Passage Survival Program by October 2001. Annual progress reports will be provided after this date.	
90	The Action Agencies shall examine the effects of draft tubes and powerhouse tailraces on the survival of fish passing through turbines.	Initiated evaluation of draft tubes at McNary as part of the turbine survival program. Additional evaluation needs will be identified in the turbine survival program Phase II. Radio telemetry study to partition tailrace (roller) impacts from turbine mortality also started in 2002. Future work will depend on regional discussions.
91	The Action Agencies shall remove all unnecessary obstructions in the higher velocity areas of the intake-to-draft tube sections of the turbine units.	All Corps NWW Columbia River turbine-to-draft tube sections are being inspected during scheduled turbine dewaterings. All obstructions are being identified with any unnecessary items being removed during each turbine units' dewaterings. A status report is being produced and will be submitted to FPOM in 2003.
92	The Action Agencies shall consider all state-of-the-art turbine design technology to decrease fish injury and mortality before the implementation of any future turbine rehabilitation program (including any major repair programs, the ongoing rehabilitation program at The Dalles Dam, and any future program at Ice Harbor Dam). The Action Agencies shall coordinate within the annual planning process before making decisions that would preclude the use of fish-friendly technologies and to minimize any adverse effects of project downtime.	No activity for this action.
93	The Action Agencies shall determine the number of adults passed through turbines, then, if warranted, investigate the survival of adult salmonid passage through turbines (including steelhead kelts).	Began evaluation of adult passage through turbines as part of the adult studies program for completion in 2004. Future work will depend on regional discussion.
94	The Corps shall continue to evaluate the need for improvements of the existing intake screens, gateway vertical barrier screens' cleaning system, and bypass facilities (including debris containment and removal systems, separation,	No activity for this action.

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	sampling, loading, and outfall facilities) at the four lower Snake River hydropower projects.	
95	The Corps shall complete investigations of improved wet separator designs in 2002. The Corps shall design and construct a new wet separator at McNary, Lower Monumental, and Little Goose dams, as warranted.	Completed the final report with conceptual designs to be complete in 2003. However, based on regional review of the separator study findings, additional work has been recommended to evaluate impacts of fish densities on separation efficiency before considering installation at Lower Granite. The new study will be conducted in 2003 with a final report due in 2004.
96	The Corps shall complete the extended submerged intake screen systemwide letter report and implement recommended improvements.	Completed the report and identified improvements to be completed at various projects by 2003.
97	By January 2002, the Action Agencies shall develop an analysis that compares the relative passage survival benefits of an extended-length, intake screen bypass system, a surface-collection bypass system, and hybrid alternatives at Bonneville First Powerhouse. Through the annual planning process, the Corps shall determine which of these configurations to implement.	<p>The NOAA Findings Letter (July 2002) acknowledged that the comparative analysis should be delayed. The delay is consistent with the SCT's determination that additional information is needed before a prudent final decision can be made regarding juvenile passage alternatives for the first Powerhouse. The analysis will be indefinitely delayed depending on corner collector information needs and ISRP review.</p> <p>The overall decision document for Bonneville project was completed in 2002 establishing B2 priority for operations among other recommendations. With B2 priority and recognition that additional information is needed before a B1 configuration can be determined, the decision will be deferred until at least 2005.</p>
98	By January 2003, the Action Agencies shall develop an analysis that compares the relative passage survival benefits of replacing existing standard-length intake screens with extended-length screens at the John Day Dam powerhouse to surface collection at one or more skeleton or spillway bays. Through the annual planning process, the Action Agencies shall then determine the need for, and the implementation priority of, these configuration alternatives.	Completed summer tests. Configuration decisions at John Day were indefinitely delayed pending a decision to test RSW at this project and funding priorities.
99	By January, 2003, the Action Agencies shall develop an analysis that compares the relative passage survival benefits of replacing existing standard-length intake screens with extended-length screens at the Lower Monumental Dam	See RPA action 76

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	powerhouse turbines to a removable RSW surface bypass system.	
100	The Action Agencies shall continue to implement and study methods to reduce the loss of juvenile salmonids to predacious fishes in the lower Columbia and lower Snake rivers. This effort will include continuation and improvement of the ongoing Northern Pikeminnow Management Program and evaluation of methods to control predation by non-indigenous predacious fishes, including smallmouth bass, walleye, and channel catfish.	BPA continued to annually monitor catch and harvest rates of Northern Pikeminnow. In 2002, approximately 200,000 (199,380) northern pikeminnow were removed, which equates to approximately 12.3% exploitation rate. Multi-year system-wide exploitation rate was approximately 12.2%, for an average annual reduction in predation of ~25%.
101	The Corps, in coordination with the NMFS Regional Forum process, shall implement and maintain effective means of discouraging avian predation (e.g., water spray, avian predator lines) at all forebay, tailrace, and bypass outfall locations where avian predator activity has been observed at FCRPS dams. These controls shall remain in effect from April through August, unless otherwise coordinated through the Regional Forum process. This effort shall also include removal of the old net frames attached to the two submerged outfall bypasses at Bonneville Dam. The Corps shall work with NMFS, FPOM, USDA Wildlife Services, and USFWS on recommendations for any additional measures and implementation schedules and report progress in the annual facility operating reports to NMFS. Following consultation with NMFS, corrective measures shall be implemented as soon as possible.	Avian deterrent actions were implemented as coordinated with FPOM. Draft Environmental Assessment prepared by USDA Wildlife Services.
102	The Action Agencies, in coordination with the Caspian Tern Working Group, shall continue to conduct studies (including migrational behavior)	Avian predation monitoring continued under the estuary monitoring program. Started monitoring at Crescent Island (McNary) and will continue through the project survival studies.

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	to evaluate avian predation of juvenile salmonids in the FCRPS reservoirs above Bonneville Dam. If warranted and after consultation with NMFS and USFWS, the Action Agencies shall develop and implement methods of control that may include reducing the populations of these predators.	The project titled "Avian Predation on Juvenile Salmonids" will (1) identify those piscivorous water bird populations (i.e., terns, cormorants, and gulls) that pose the greatest risk to smolt survival, (2) test the feasibility of different management initiatives to reduce avian predation on smolts, (3) monitor and evaluate the effectiveness of those initiatives once fully implemented, and (4) recommend changes to existing management plans to maximize benefits to juvenile salmonids, while maintaining or enhancing the status of managed bird populations.
103	The Action Agencies shall quantify the extent of predation by white pelicans on juvenile salmon in the McNary pool and tailrace. A study plan shall be submitted to NMFS by September 30, 2001, detailing the study objectives, methods, and schedule. Based on study findings, and in consultation with USFWS and NMFS, the Action Agencies shall develop recommendations and, if appropriate, an implementation plan.	Evaluation started in 2002 and will continue in 2003. A final report will be available in 2004. The project titled "Avian Predation on Juvenile Salmonids" will (1) identify those piscivorous water bird populations (i.e., terns, cormorants, and gulls) that pose the greatest risk to smolt survival, (2) test the feasibility of different management initiatives to reduce avian predation on smolts, (3) monitor and evaluate the effectiveness of those initiatives once fully implemented, and (4) recommend changes to existing management plans to maximize benefits to juvenile salmonids, while maintaining or enhancing the status of managed bird populations.
104	The Action Agencies shall recover PIT-tag information from predacious bird colonies and evaluate trends, including hatchery-to-hatchery and hatchery-to-wild depredation ratios.	Evaluation of avian predation continued as part of the estuary monitoring efforts. (See RPA action 102)
105	The Action Agencies shall develop a pilot study to assess the feasibility of enhancing the function of ecological communities to reduce predation losses and increase survival in reservoirs and the estuary.	BPA funded the Council project 1997-026, and additional work continues to be funded as part of project 1998-014. The project assesses feeding habits of predatory fishes during the spring salmonid smolt migration period. Also assessed are the indirect effects on the changing pelagic fish community associated with different oceanographic regimes on juvenile salmonids.
106	The Action Agencies, in coordination with NMFS, shall investigate marine mammal predation in the tailrace of Bonneville Dam. A study plan shall be submitted to NMFS by June 30, 2001, detailing the study objectives, methods, and schedule.	Marine mammal studies were initiated in 2001 and will continue through 2003. The information will be provided to NOAA for further action.
107	The Action Agencies shall conduct a comprehensive evaluation to assess survival of adult salmonids migrating upstream and factors	This action was evaluated in 2002 in the adult studies program. Radio telemetry monitoring to assess unaccounted loss will continue through April 2004. Data analysis will be conducted through 2005 and a final report will be available in 2006. As a result of

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	contributing to unaccounted losses.	adult PIT tag detector installation in 2003 additional information will be available for PIT tag database and for further monitoring and analysis. Adult PIT detection systems were installed at McNary and are scheduled for installation at Priest Rapids, Ice Harbor and Lower Granite this winter. Further installation needs will be considered for subsequent years.
108	The Corps and BPA shall conduct a comprehensive evaluation to investigate the causes of headburn in adult salmonids and shall implement corrective measures, as warranted.	Conducted first of 2-year head burn evaluations. Additional studies may continue through 2004 with a final report in 2005. Corrective measures will be determined based on results and regional discussions.
109	The Corps shall initiate an adult steelhead downstream migrant (kelt) assessment program to determine the magnitude of passage, the contribution to population diversity and growth, and potential actions to provide safe passage.	Completed second year of the kelt study for the Snake and lower Columbia rivers. Evaluation of kelt abundance and survival through various routes of passage (including transportation) shall continue in 2003 and 2004. Monitoring of return spawning shall continue through 2007 and the final report is due in 2008.
110	The Corps shall use information from previous and ongoing investigations regarding the problem of adult steelhead holding and jumping in the fish ladders at John Day Dam, develop a proposed course of action, and implement it, as warranted.	Ladder weir modifications were initiated in 2002 to be completed for 2003 adult migration season. An evaluation is scheduled to be completed in 2003.
111	The Corps shall investigate and enumerate fallback of upstream migrant salmonids through turbine intakes at all lower Snake and lower Columbia River dams. The Corps shall implement corrective measures to reduce turbine mortality, as warranted.	Radio telemetry monitoring of fallback was ongoing in 2002 and will continue through April 2004. Data analysis will be conducted through 2005 and a final report will be available in 2006. Actions for remediation will be assessed at that time.
112	The Corps shall investigate ways to provide egress to adult fish that have fallen back into juvenile collection galleries and primary dewatering facilities at Ice Harbor and McNary dams. The Corps shall either install structural, or implement operational, remedies to minimize delay and injury of fish that fall back, as warranted.	Completed the field evaluation and a final report is due in 2003. Although a final decision to modify the collection channel depends on the results in the final report, preliminary results do not appear to support collection channel modifications. Results and recommendations will be coordinated through the FFDRWG.

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113	The Corps shall investigate measures to reduce adult steelhead and salmon fallback and mortality through the Bonneville Dam spillway. A final report shall be submitted to NMFS stating the findings of these investigations and recommending corrective measures. Potential remedies shall be included in the annual planning process.	Continued fallback studies (see RPA action 60).
114	The Corps shall examine existing fish-ladder water temperature and adult radio-telemetry data to determine whether observed temperature differences in fishways adversely affect fish passage time and holding behavior. If non-uniform temperatures are found to cause delay, means for supplying cooler water to identified areas of warmer temperatures should be developed and implemented in coordination with the annual planning process.	The Corps monitored ladder water temperatures for four years at Bonneville, The Dalles and John Day dams. The John Day ladder systems were the only ones where non-uniform temperatures large enough to be detected by fish were noted. No passage delays (radio tracking data) were apparent that could be associated with those temperature differences. Report due in 2003.
115	The Corps and BPA shall conduct a comprehensive depth and temperature investigation to characterize direct mortality sources at an FCRPS project considered to have high unaccountable adult losses (either from counts and/or previous adult evaluations).	Continued evaluation of temperature impacts on adult delays, homing, straying, and survival using radio telemetry through April 2004. Data analysis will be conducted through 2005 and a final report will be available in 2006.
116	The Corps shall investigate adult fish delay and fallback at ladder junction pools and implement remedies to reduce this problem, as warranted.	Completed field evaluation of fish passage improvements in December 2002 and the final report will be available in 2003. Design for changes will occur in 2004 for implementation in 2005 at Lower Granite. A schedule for implementation at additional projects (2003-2004) will be developed and prioritized through FFDRWG.
117	The Corps shall evaluate adult count station facilities and rehabilitate where necessary at all projects to either minimize delay of adults or minimize counting difficulties that reduce count accuracy.	The Corps evaluated all count stations and reports for submission to FPOM in 2003. Funding for corrective actions will be prioritized by FPOM in the O&M budget process for future implementation. Telemetry evaluation of impacts of count windows will continue through spring 2004.
118	The Corps shall develop and implement a program to better assess and enumerate indirect	Continued adult telemetry evaluation to help identify factors that contribute to successful spawning or unaccounted loss through spring 2004. Data analysis is scheduled through

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	prespawning mortality of adult upstream-migrating fish. Such mortality may be due to, or exacerbated by, passage through the FCRPS hydro projects. If measures are identified which will reduce the unaccountable adult loss rate and/or the prespawning mortality rate, the Corps shall implement these measures as warranted. The program should also enhance efforts to enumerate unaccountable losses associated with tributary turnoff, harvest, or other factors in FCRPS mainstem reservoirs and upstream of FCRPS projects.	2005 and the final report will be available in 2006.
119	The Corps shall ensure that alterations to fish ladders and adult passage facilities to accommodate Pacific lamprey passage do not adversely affect salmonid passage timing and success.	Continued adult lamprey prototype studies with scheduled completion in 2003. A design report could be initiated in late-2003. Implementation of ladder modifications could be initiated by 2005 at one or more projects subject to regional funding priorities.
120	The Corps shall develop improved operations for adult fishway main entrances at FCRPS dams so that the best possible attraction conditions are provided for adult migrants, both at the four Columbia River hydro projects and the four lower Snake hydro projects (where reservoir elevations are held near MOP). The Corps shall report the findings of fishway entrance flow-balancing investigations in a report to NMFS by the end of 2001 and shall continue to work through FPOM to evaluate and implement, as warranted, structural changes to satisfy fish passage plan fishway entrance criteria.	Hydraulic evaluation reports for various projects were prepared and submitted to FPOM prior to 2000. An in-depth analysis of some of the reports showed the consultant did not evaluate the systems as they were being operated. More thorough and accurate hydraulic evaluations are being conducted by the Corps and will be completed and submitted in 2003 and 2004 to FPOM. By the end of calendar year 2003, the Corps will report to NOAA the findings of fishway entrance flow-balancing investigations. This delay is needed to allow the Corps to complete the work informing the report. Corrective actions will be implemented as warranted and when funding becomes available (if additional funding is necessary).
121	The Corps shall develop and maintain an auxiliary water-supply, emergency-parts inventory for all adult fishways where determined necessary, in coordination with NMFS.	The Corps determined which spare parts need to be available on project. Funding was made available to the respective projects for procurement of the identified spare parts. A report will be submitted to FPOM by the end of 2003. Funding for additional spare parts or high cost items will be prioritized by FPOM in the O&M budget process for future implementation.

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122	The Corps shall continue design development and, subsequently, construct an emergency auxiliary water supply system at The Dalles Dam's east ladder.	Work was been deferred due to funding priorities. See RPA action 70.
123	The Corps shall continue to investigate alternatives to dewater adult auxiliary water system floor diffusers for inspection at The Dalles adult fishway powerhouse collection channel. The Corps shall implement design and construction of needed changes, as warranted.	Construction was initiated in 2002 and the system will be operational in late 2003 or early 2004.
124	The Corps shall investigate methods to provide additional emergency auxiliary water to The Dalles Dam north fishway when the normal auxiliary water supply is interrupted.	This activity was deferred due to funding priorities. The Corps will initiate in 2004 if funding is available.
125	The Corps shall develop and implement an automated monitoring and alarm system at appropriate FCRPS projects, as determined in the NMFS Regional Forum, to monitor changes in head differential remotely between the primary auxiliary water supply conduits/channels and the adult collection channels and to minimize diffuser damage due to excessive differentials. The Corps shall ensure that diffuser gratings for all auxiliary water supply systems are securely fastened. The Corps shall work through FPOM to develop a monitoring program for inspecting diffuser gratings and grating fasteners.	The Corps projects ensured all diffusion water gratings are secured in place. Methods were demonstrated to FPOM. The Corps conducted an engineering study to determine the feasibility of successfully and economically constructing an automated monitoring and alarm system on an AWS system the size of those on mainstem projects. A report will be provided to FPOM in 2003.
126	The Corps shall initiate an investigation and prepare a report on the Bonneville First Powerhouse Bradford Island and Cascade Island adult fishway auxiliary water system by the end of 2001. In the report, the Corps shall identify measures that will improve or replace aging components, thereby enhancing current and	The Bonneville Project replaced and repaired major aging components of the subject fishways in the last three years.

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	long-term performance and reliability.	
127	The Corps shall continue its investigation of the Bonneville Second Powerhouse adult fishway auxiliary water system and shall identify measures to satisfactorily address emergency backup auxiliary water needs.	Completed plans and specifications. Contract for modifications awarded in September 2002 and scheduled for completion in 2003.
128	The Corps shall initiate an engineering study to evaluate existing limitations relating to its inability to satisfy fish passage plan operating criteria at the John Day Dam north shore ladder.	Problem evaluations completed and alternative solutions for further study identified.
129	The Corps shall complete adult fishway auxiliary water supply evaluations at each lower Snake River hydro project and implement corrective measures as warranted.	Continued construction related to auxiliary water supply systems at Lower Granite and Ice Harbor for completion in 2003. Initiated design and EDC at Little Goose. Completed final report of designs of proposed operational/structural modifications at Lower Monumental.
130	The Corps shall complete its DGAS by April 2001. The results of this study will be used to guide future studies and decisions about implementation of some long-term structural measures to reduce TDG.	The DGAS study was completed in 2002 and the TDG production equations have been used to develop the SYSTDG spreadsheet model. SYSTDG model results have been used to evaluate operational alternatives related to annual spill cap management.
131	The Action Agencies shall monitor the effects of TDG. This annual program shall include physical and biological monitoring and shall be developed and implemented in consultation with the Water Quality Team and the Mid-Columbia PUDs' monitoring programs.	The Corps conducted the TDG monitoring program and prepared a report that was provided to the Oregon DEQ and Washington DOE.
132	The Action Agencies shall develop a plan to conduct a systematic review and evaluation of the TDG fixed monitoring stations in the forebays of all the mainstem Columbia and Snake river dams (including the Camas/Washougal monitor). The evaluation plan shall be developed by February 2001 and included as part of the first annual water quality improvement plan. The Action Agencies shall conduct the evaluation and make changes in the	The Action Agencies have worked with a Water Quality Team subcommittee in 2001 and 2002 on a systematic review of the forebay fixed monitoring sites. The 2001 efforts focused on the lower Columbia River. In 2002, lower Columbia River and lower Snake River sites were evaluated. Changes at some sites have been implemented and studies are ongoing for 2003 at other sites.

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	location of fixed monitoring sites, as warranted, and in coordination with the Water Quality Team. It should be possible to make some modifications by the start of the 2001 spill season.	
133	As part of DGAS, the Corps shall complete development of a TDG model to be used as a river operations management tool by spring 2001. Once a model is developed, the applications and results shall be coordinated through the Water Quality Team. The Corps shall coordinate the systemwide management applications of gas abatement model studies with the annual planning process, the Transboundary Gas Group, the Mid-Columbia Public Utilities, and other interested parties.	The Corps advanced the development of the SYSTDG spreadsheet model and two MASS numerical models for use as river operations models. The SYSTDG model was used for guidance in 2000 and the MASS 1 model was used for water temperature guidance during the 2001 drought year spill season. The SYSTDG model was shared with the region in 2001 by providing regional training sessions.
134	The Corps shall continue the spillway deflector optimization program at each FCRPS project and implement it, as warranted. The Corps and BPA shall conduct physical and biological evaluations to ensure optimum gas abatement and fish passage conditions. Implementation decisions will be based on the effect of spill duration and volume on TDG, spillway effectiveness, spill efficiency, forebay residence time, and total project and system survival of juvenile salmon and steelhead passing FCRPS dams.	Additional deflectors were installed at Bonneville in 2002. A report will be available in 2003 on whether existing deflectors should be modified.
135	The Corps shall include evaluations of divider walls at each FCRPS project in the spillway deflector optimization program. Design development and construction of divider walls would begin only after coordination within the annual planning process, and only if warranted.	Hydraulic model studies were conducted for a prototype spill wall at The Dalles. Construction will be initiated in 2003, with completion and initial testing anticipated for the 2004 passage season.
136	The Corps shall continue to develop and	Pending receipt of appropriations, the Corps, NMFS, and Reclamation continued efforts

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	construct spillway deflectors at Chief Joseph Dam by 2004 to minimize TDG levels associated with system spill.	to investigate alternative means to reduce total dissolved gas saturation in the Columbia River below Chief Joseph and Grand Coulee Dams by shifting additional power generation to Grand Coulee Dam. The Task Force prepared a draft report. The Corps continued to seek appropriations to develop and construct the spillway deflectors.
137	The Corps shall investigate TDG abatement options at Libby Dam, including the installation of spillway deflectors and/or additional turbine units. The Corps shall construct gas abatement improvements at Libby on the Kootenai River, as warranted, to reduce TDG levels below the project.	The Corps conducted spill test and is discussing the results with the State of Montana for potential future spill options, including a potential TDG variance. The Corps will investigate in FY 03 the feasibility of installing flow deflectors in the spillway. The Corps has already investigated installation of additional turbines (in FY 02) and found that the installation of generating units at Libby is technically feasible using a generating unit major rehab construction protocol. Most of the major parts for two units are present and in relatively good condition. But there is insufficient, reliable load in the spring when the sturgeon flows through the added units would be called for and no available transmission capacity to move any additional generation from Libby Dam. BPA/TBL estimated approximately \$250 million of transmission improvements would be needed to provide the capacity to move power to reliable load assuming a reliable load can be found. There are no current funded plans to provide the required transmission capacity. If the projects were funded, environmental coordination, planning, and other requirements would take several years to complete before construction of a new transmission line could be undertaken. Under an optimistic schedule, the soonest that new turbines could be in place would be 2007 or 2008.
138	The Corps shall continue to investigate RSWs, in conjunction with extended spillway deflectors, as a means of optimizing safe spillway passage of adult steelhead kelts and juvenile migrants.	Conducted 1 st year biological test at Lower Granite. Work will continue at Lower Granite in 2003 and begin preparatory work for evaluation at Ice Harbor.
139	The Corps shall investigate TDG abatement options at Dworshak Dam and implement options, as warranted, in coordination with the annual planning process.	No activity for this action.
140	The Corps shall design the spillway Number 1 (end bay) deflector at John Day Dam, and implement as warranted, in coordination with the annual planning process.	Deferred spill bay 1 deflector construction for construction efficiency reasons pending decisions on spillbay 20 construction plans relative to RSW testing at this project and for determination of regional funding priorities
141	The Action Agencies shall evaluate juvenile fish condition due to disease in relation to high temperature impacts during critical migration	Continued temperature monitoring and physiological monitoring at McNary; final report scheduled for 2004. The SRWG sub-group on juvenile fish temperature impacts will develop an action plan and schedule by 2004.

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	<p>periods. This evaluation should include monitoring summer migrants at lower Columbia and lower Snake river dams to clarify the possible link between temperature and fish disease and mortality. This information will be used to assess the long-term impacts of water temperature on juvenile fish survival.</p>	
142	<p>The Corps shall work through the regional forum process to identify and implement measures to address juvenile fish mortality associated with high summer temperatures at McNary Dam. As a starting point, the Corps shall assemble and analyze the temperature data that have been recorded in the McNary forebay, collection channel, and juvenile facilities. The Corps shall examine relationships among juvenile mortality, temperatures, river flow rates, and unit operations in detail. The Corps shall investigate the feasibility of developing a hydrothermal computational fluid dynamics model of the McNary forebay to evaluate the potential to determine optimal powerhouse operations or structural modifications for minimizing thermal stress of juvenile salmon collected in the summer and to conduct a modeling program, if warranted.</p>	<p>Conducted temperature monitoring at McNary. A temperature model of the McNary forebay is scheduled to be complete by 2004. Physiological monitoring will continue in 2003 at McNary and a final report is due in 2004.</p>
143	<p>By June 30, 2001, the Action Agencies shall develop and coordinate with NMFS and EPA on a plan to model the water temperature effects of alternative Snake River operations. The modeling plan shall include a temperature data collection strategy developed in consultation with EPA, NMFS, and state and Tribal water quality agencies. The data collection strategy shall be sufficient to develop and operate the</p>	<p>The Action Agencies have been working with an ongoing Water Quality Team subcommittee since 2001 to develop a plan to model water temperature effects of alternative Snake River operations. The 2001 and 2002 subcommittee work efforts have determined the goals of water temperature modeling, have investigated and evaluated multi-agency existing data, determined what questions can be answered without modeling, recommended and started additional data collection, recommended numerical models to be considered, and are currently in the process of identifying a recommended numerical model to be used.</p>

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	model and to document the effects of project operations.	
144	The Corps, in coordination with the Regional Forum, shall maintain juvenile and adult fish facilities within identified criteria and operate FCRPS projects within operational guidelines contained in the Corps' Fish Passage Plan. The Corps shall coordinate with NMFS on the development of these criteria and operational guidelines before the start of each fish passage season (generally February 1).	<p>The Corps updated and implemented the Fish Passage Plan in coordination with NOAA Fisheries and the Region.</p> <p>Rehabilitation of pumps for the Lower Monumental AWS began in FY 02 and will continue through FY 04.</p>
145	The Corps shall develop and implement preventative maintenance programs for fish passage facilities that ensure long-term reliability, thereby minimizing repair costs.	The Corps developed, budgeted for, and implemented preventative maintenance programs for their fishways. The plans were coordinated with FPOM.
146	The Corps shall address debris-handling needs and continue to assess more efficient and effective debris-handling techniques to ensure that the performance of both new and old fish passage facilities will not be compromised.	<p>General: As a normal course of O&M of the projects, debris is constantly monitored throughout the facilities and appropriate removal action initiated as required. This has been and will continue to be addressed in the Fish Passage Plan. Specific problem areas that come up are presented and discussed at FPOM, where courses of action are developed and then followed-up on by the Corps. The Corps believes fish passage effects are adequately addressed and are the critical concern in establishing protocols and correcting problem areas. A system-wide assessment was not called for in the subject RPA, nor is one necessary at this time. At the end of this summary is a chronology of evaluations and actions completed for the Snake River and McNary projects that the Corps believes have fully addressed the issue at those projects and in conjunction with ongoing efforts as will be described below meet the intent of this RPA.</p> <p>The Corps also questions the value for a reconnaissance-level analysis for debris booms at the dams and believes they are beyond that at the projects. Again, see the specific actions and the chronology below. Immediately following is a listing of the status and plans for specific debris-related issues for FY 03 and beyond at the projects. In these the Corps references the other RPA actions items associated with these activities. Several of these actions are only a part of other larger measures and as such may not have been highlighted in the RPA implementation summaries. Much of this information should be available in the FY03 work plans provided to the SCT, and used as the basis for implementation plan</p>

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		<p>summaries.</p> <p>Bonneville: Also, reference RPA Action 63. At 1st PH, analysis of debris handling has been addressed in association with the JBS improvement/outfall relocation project. A debris boom is recommended and has been designed for installation when and if that project is implemented. No action is planned until that decision is made.</p> <p>At B2 (no specific RPA reference) an ongoing prototype study of a gateway debris removal system is underway, but has not been funded recently, nor in 2003, due to funding priorities. Also, action is being deferred pending completion of the corner collector and evaluation of the effect of its operation on B2 debris issues.</p> <p>Under the B2 FGE improvement study (RPA 67), evaluation of problems with failure of VBS screens due to increased slot flows, tighter mesh criteria, and debris will continue. New VBS screen frame designs will be tested in 2003 and a new screen cleaner prototype is under design and is planned for testing in 2004.</p> <p>Also at B2, under the follow-on work for bypass improvements (RPA 65) a new air burst cleaning system is under development due to problems with the mechanical cleaning system for the DSM dewatering screens. We are also planning for an automated trash rake for the fish units in 2004.</p> <p>The Dalles: No specific actions are anticipated at this time</p> <p>John Day: Reference RPA Action 73. Debris issues will continue to be addressed in association with the extended screen evaluations. No specific debris-related work is planned for 2003, but would be continued as the screen program moves forward. The schedule will depend on future funding priorities and decisions on future configuration of this project.</p> <p>McNary: Reference RPA Action 74. Ongoing efforts continue as required. Annual contracts for debris removal continue and the new debris removal craft is scheduled to be purchased in 2004, subject to funding priorities. Corrections to the debris plugging problems in the 10-inch fish transport lines were completed in 2002 and no further action is anticipated. Testing of the cylindrical dewatering prototype was concluded in 2002, final reports will be completed in 2003 and the test facility is scheduled to be removed in 2004.</p> <p>We are continuing a major modeling effort at WES to try to identify and resolve gateway</p>

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		<p>debris issues, particularly at McNary. That effort continues, under the McNary Modernization Project to look at options to resolve periodic VBS and gateway debris issues at McNary.</p> <p>Snake River projects (system evaluation): Reference RPA 94. The Lower Snake and Columbia Rivers Extended-Length Submerged Bar Screen System-Wide Letter Report was completed in 2002 to assess JBS system performance at each of the Lower Snake projects to include debris control and cleaning systems.</p> <p>Ice Harbor: No specific actions for debris planned as a result of the system evaluation.</p> <p>Lower Monumental: No specific actions for debris planned as a result of the system evaluation. New debris issues may need to be evaluated in conjunction with ongoing ESBS development initiated in 2002 for this project (RPA 78).</p> <p>Little Goose: Reference RPA 79. Completed post-construction predator studies of the new containment boom to verify or modify debris removal criteria in 2002. No further action required.</p> <p>Lower Granite: No specific actions for debris are planned based on above evaluations and until re-initiation of the Lower Granite juvenile bypass facility improvement measure (RPA action 81).</p> <p style="text-align: right;"><i>(a) Lower Snake and McNary debris issues chronology</i></p> <p>November 1996 - The Lower Snake and Columbia Rivers Debris Control Study Phase I Report was completed. That report identified various short-term actions that could be implemented to mitigate the effects of debris at the projects. The report also looked at potential long-term solutions.</p> <p>1997 - Lower Snake and Columbia River Debris Control Phase II was completed. Short-term actions identified in the Phase I report were implemented.</p> <p>July 1998 - The Lower Snake and Columbia Rivers Debris Control Study Phase III Report was completed. This report recommended long-term actions and measures to be installed as permanent systems. This report recommended installation of a debris boom at Little Goose, which was subsequently installed in 2000 and recommended not to install a debris boom at McNary. The report also made other recommendations specific to the Collection Systems at McNary and Lower Granite.</p> <p>March 2000 - The McNary Dam Debris Boom Analysis & Alternatives report was completed. This report reinforced the conclusions of the Phase III report that a debris boom was not a feasible alternative and that the recommended course of action was to</p>

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		<p>procure a Debris Removal Craft. Purchase of that craft is scheduled for FY04, subject to regional coordination and SCT prioritization.</p> <p>August 2002 – The Lower Snake and Columbia Rivers Extended Length Submerged Bar Screen System-Wide Letter Report was completed. Section 4 of that report dealt extensively with Forebay Debris, Collection System Debris and Holding & Loading Debris as applicable at all projects.</p> <p>Current Status: Forebay Debris Booms exist at Lower Granite and Little Goose Projects. Similar booms are not needed at Lower Monumental or Ice Harbor due to minimal debris accumulation and 24 hr spill.</p>
147	<p>As a contingency plan, the Corps (in cooperation with other Federal agencies) shall develop a project management plan to reevaluate more intensive dams. The project management plan will identify the scope, schedule, costs, tasks, products, and responsibilities for the reevaluation study. The study should assess all significant changed conditions to the Lower Snake River Feasibility Report and Environmental Impact Statement (Corps 1999c). The project management plan should be consistent with direction from Congress, Corps authorities, and other legal requirements. The completed project management plan should be coordinated with the appropriate regional interests. The project management plan should include, but not be limited to, plans to mitigate disproportionate impacts to communities, industries, and Tribes, detailed water and air quality effects, implementation plans, and a complete public involvement program. The decision to start the reevaluation study should result from the NMFS check-in process in Section 9.5. The Corps will request funding or reprogramming to complete the project management plan within 1 year after NMFS'</p>	<p>Further action on this item will follow the 2005 check-in.</p>

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	issuance of a check-in report indicating the need to seek additional authority. The study should result in a general reevaluation report and supplemental environmental impact statement, which would be used to seek authorization and/or appropriations to implement, recommended action(s), if needed. The general reevaluation report/ supplemental environmental impact statement will require approximately 2 years to complete.	
148	The Corps shall conduct detailed engineering and design work for improvements recommended in the general reevaluation report and supplemental environmental impact statement described in the preceding action. The Corps shall seek funding to allow initiation of the engineering and design work to occur immediately upon completion of the final general reevaluation report. The engineering and design work shall include only those activities on (or near) the implementation schedule critical path for the recommended actions, up to the award of the first construction contract. For a dam breach recommendation, the critical path activities shall include turbine physical modeling (for use as low level outlets), rock source explorations for embankment erosion protection (riprap), and hydraulic (physical) modeling for the embankment removal and channelization. Tentative milestones for the general reevaluation report/EIS and engineering and design work are as follows, based on the check-in process identified in Section 9.5. (see RPA for list)	Further action on this item will follow the 2005 check-in.
149	BOR shall initiate programs in three priority subbasins (identified in the Conceptual Recovery	During FY 2002, Reclamation initiated programs in three additional subbasins and continued work in the four subbasin programs initiated in FY 2001. The seven subbasins

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	<p>Plan) per year over 5 years, in coordination with NMFS, FWS, the states and others, to address all flow, passage, and screening problems in each subbasin over 10 years. The Corps shall implement demonstration projects to improve habitat in subbasins where water-diversion-related problems could cause take of listed species. Under the NWPPC program, BPA addresses passage, screening, and flow problems, where they are not the responsibility of others. BPA expects to expand on these measures in coordination with the NWPPC process to complement BOR actions described in the action above.</p>	<p>with active programs are the Upper Salmon and Lemhi in Idaho; the Middle Fork John and Upper John Day subbasins in Oregon; and the Methow, Wenatchee, and Entiat subbasins in Washington. (Specific projects in the subbasins initiated or completed by Reclamation in the seven priority subbasins are identified below.) Reclamation continued programmatic NEPA compliance studies for the Idaho subbasins and the John Day subbasins which were initiated in FY 2001. In addition, fish flow studies were initiated in several subbasins to ascertain fish flow needs in preparation for water acquisition projects in the subbasins. To acquire the needed authority to fund the construction of screen and diversion barrier projects, Reclamation worked with the appropriate Administration officials to draft the needed legislation. During FY 2002, it was discovered that 6 of the 16 priority subbasins identified in the Basinwide Salmon Recovery Strategy did not qualify under the requirements of the Endangered Species Act for a Reasonable and Prudent Alternative. Reclamation initiated discussions with NOAA Fisheries and the other Action Agencies to help resolve this issue.</p> <p>During FY 2002, BPA complemented the efforts of Reclamation in the priority subbasins and in other areas by expanding on RPA 149 related measures under the Council program. This included funding a number of passage and screening projects across the basin, as well as funding work to acquire additional flows for fish.</p> <p>The actions are summarized, by subbasin, as follows with a cross reference to the appropriate Data Base ID numbers if more information is needed:</p> <p>Entiat: Reclamation initiated its subbasin program in the Entiat subbasin in FY 2002, one year earlier than originally scheduled (# 4042). As part of this early action, an IFIM study (# 4007) was initiated in partnership with the Entiat Water Planning Unit which will be integrated with an EDT analysis being conducted in conjunction with the Yakama Nation.</p> <p>Grays: One Corps section 206 project to restore a large portion of 7.6 miles of stream and 15 acres of wetlands through culvert replacement, installation of fishways and ladders, and wetland enhancement (ID # 559).</p> <p>Upper John Day: Reclamation continued its subbasin program in the Upper John Day subbasin (ID # (4047), including continuation of a programmatic environmental assessment (# 4091). During FY 2002, a diversion was replaced on Bear Creek ((ID # 4085), a diversion replacement project was initiated on Beech Creek (#4086), and Reclamation entered into an agreement with the Grant County Soil and Water Conservation District to provide design assistance on diversion replacements (# 4116)</p>

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		<p>Middle Fork John Day: Reclamation continued its subbasin program in the Middle Fork John Day subbasin (ID # 4047) including: Reclamation continued its subbasin program in the Methow subbasin which was initiated in FY 2001 (#4091). During FY 2002, a passage, screen, and headgate project was completed at the Oxbow Ranch—Beaver Creek (#4087), and Reclamation entered into an agreement with the Grant County Soil and Water Conservation District to provide design assistance on diversion replacements (# 4089).</p> <p>North Fork John Day: Although Reclamation is not scheduled to initiate a program in the North Fork John Day until FY 2003, this subbasin was included in the programmatic environmental assessment (ID # 4091) for the other two John Day subbasins as a means to streamline early implementation of actions once the subbasin is initiated.</p> <p>Methow: Reclamation continued its subbasin program in the Methow subbasin which was initiated in FY 2001 (#4045). Diversion reconstruction projects were initiated at Campbell Diversion (#4003), Marracci (#4026), Twisp Valley (#4096), and Methow Valley ID East and West Canals (# 4034 and #4035). Screen projects were initiated at Methow Valley ID East and West Canals (# 4095 and # 4093). Reclamation also entered into an agreement with USGS to assist with hydrologic model upgrades (#4027).</p> <p>Salmon River: Twenty-six programs and projects are included in the Salmon River drainage including 3 by BPA, 1 by the Corps, and 22 by Reclamation. Several of these projects are joint ventures by the action agencies and project sponsors, and a cross-reference is noted below where appropriate. BPA has two projects that apply to the entire Salmon River drainage and the remainder can be allocated into subbasins.</p> <p>Entire Salmon River: BPA projects are: (1) a program for consolidation and elimination of irrigation diversions and screen intakes and canals (ID #82), (2) a model watershed habitat improvement project through development of alternative management plans and reestablishment of riparian protection (ID #83) and (3) a multi-year project in the Upper Salmon River to reduce the number of irrigation diversions, enhance in-stream flows through water conservation measures, reduce juvenile delay and entrapment, and construct NMFS approved fish screens (ID #85). Reclamation is providing technical assistance to sponsors under this project.</p> <p>Little Salmon: Although Reclamation was not scheduled to initiate a program in the Little Salmon subbasin until later, this subbasin was included in the programmatic environmental assessment (ID # 4109) with the other Reclamation Idaho subbasins as a means to streamline early implementation of actions once the subbasin program is initiated.</p>

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		<p>Lemhi: Reclamation continued its subbasin program in the Lemhi subbasin which was initiated in FY 2001 #4043) including continuation of a programmatic environmental assessment which was initiated in FY 2001 ((4109). Two screen projects were initiated at L-13 (#4013) and L-35 (#4019). Five diversion replacement projects were initiated at L-3 (# 4022), L-35 (#4017), L-3A (#4020), L-3A0 (# 4021), and L-6/S-14 (#4023). To improve streamflow management, three headgate projects were initiated at L-3 ((#4022), L-3A (#4100), and L-35A (#4018). In addition, to help identify fish flows needs, a streamflow gaging station was installed at L-5 (#4097), a Lemhi River Flow Characterization Study was initiated with multiple partners (#4098) including state and federal entities and the Shoshone-Bannock tribes. A contract was issued to the Idaho Department of Water Resources to fund development of a Lemhi Water Budget Model (#4101). Reclamation also leased 25 cfs of Lemhi River flows downstream from the L-6 diversion (#4108) from July 1 through August 31 to assure access to the lower Lemhi River.</p> <p>Upper Salmon Subbasin: Reclamation initiated its Upper Salmon Subbasin program in FY 2002 (#4050) and continued a programmatic environmental assessment for the subbasin that was initiated in FY 2001 (#4109). During FY 2002, four screens were replaced in the East Fork Salmon, a tributary of the upper Salmon River—EFS-10 (#4103), EFS-11 (#4106), EFS-4 (#4107), and Herd Creek-3 (#4102). A diversion consolidation and screen replacement project was completed at S-11/S-12 (#4104). Reclamation also initiated an upper Salmon Basin Flow Characterization Study in partnership with several state and federal entities and the Shoshone-Bannock tribes (#4099). BPA has 2 projects in the Upper Salmon, the Corps has 1 project. BPA projects are: (1) addressing effectiveness assessments, migration barriers, fine sediments, geomorphic structure, and riparian vegetation in Custer County (ID # 81), (2) an upper Salmon diversion consolidation, fish screen and irrigation water conservation program (ID # 82). The Corps has initiated a project to restore habitat quality in the lower 12 miles of the upper Salmon River through a channel restoration feasibility study (ID # 555).</p> <p>Walla Walla subbasin: the Corps is supporting one study in the Walla Walla. The Corps has a 3-year feasibility study to identify alternatives for increased instream flow, headwater dams for instream flows, water exchanges with the Columbia River, increased irrigation efficiency, and purchase of water rights (ID # 561).</p> <p>Wenatchee subbasin: Reclamation initiated its subbasin program for the Wenatchee subbasin by establishing a subbasin liaison office and initiating contacts with local groups</p>

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		<p>and individuals as part of program initiation (# 4051).</p> <p>Yakima River: The Yakima is not a high priority subbasin, but BPA is implementing 2 projects that meet the intent of this action. Other projects not listed in this summary also contribute to the basic intent of action 149, but are not located in a high priority subbasin. The 2 projects are part of the Yakama Nation Yakima/Klickitat Fisheries Project and exemplify projects that contribute to the basic intent of action 149. They are: (1) a project to protect and restore off-channel rearing habitats associated with the Yakima and Naches mainstems, (ID #13) and (2) a project to reestablish access into Yakima tributaries through fencing, revegetation, easement and/or property purchases, consolidation of diversions and modernization of irrigation systems (ID # 16).</p>
150	<p>In subbasins with listed salmon and steelhead, BPA shall fund protection of currently productive non-Federal habitat, especially if at risk of being degraded, in accordance with criteria and priorities BPA and NMFS will develop by June 1, 2001.</p>	<p>BPA worked with NOAA Fisheries and other entities to develop priorities for funding projects under this action. BPA funded a number of projects that protect currently productive habitat that is largely self-sustaining. Projects implemented under this action included ongoing work to maintain naturally self-sustaining habitat on Pine Creek Ranch (1998-022-00) through watershed management planning and to enhance and improve protection for productive habitat for the Oxbow Ranch Acquisition (2000-015-00) by removing historic mine tailings and constructing headgates to increase flows. In 2002, BPA funded projects that protected nearly 200 river miles and over 20,000 acres in at least 11 subbasins.</p>
151	<p>BPA shall, in coordination with NMFS, experiment with innovative ways to increase tributary flows by, for example, establishing a water brokerage. BPA will begin these experiments as soon as possible and submit a report evaluating their efficacy at the end of 5 years.</p>	<p>Beginning in 2001, representatives from the Council, NOAA Fisheries, and BPA as well as other regional representatives from non-profit and governmental entities participated in the development of a water transactions program to meet the requirements of Action 151 and the Council's 2000 Fish and Wildlife Program (FWP) section titled, Funding Agreement for Land and Water Acquisitions. From this process and an RFQ solicitation, the Columbia Basin Water Transactions Program was established in 2002 to fulfill these goals.</p> <p>The National Fish and Wildlife Foundation (NFWF) is operating as the regional water entity and facilitating the review and funding of water transactions and related innovative transactional strategies to increase tributary flows proposed by qualified local entities. This innovative experimental program to increase tributary flows includes efforts by the Oregon Water Trust, Oregon Water Resources Department, and Deschutes Resources Conservancy in Oregon, the Washington Water Trust, Washington Department of Ecology, and the Walla Walla Watershed Alliance in Washington, and the Idaho Water Resources Department to to implementation of innovative approaches to acquire and</p>

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		<p>secure instream flows for fish.</p> <p>Per BPA agreement with the Council, the ISRP reviewed the program criteria and transaction checklist in 2002 that had been developed with input from the Council, NOAA Fisheries, BPA, and staff from various other entities. BPA intends to use the Columbia Basin Water Transactions Program in order to test innovative transactional strategies for delivering water in flow-limited tributaries in each of the Columbia Basin states and apply the effective strategies in the field to make progress toward meeting performance standards.</p>
152	<p>The Action Agencies shall coordinate their efforts and support offsite habitat enhancement measures undertaken by other Federal agencies, states, Tribes, and local governments by the following: (See RPA)</p>	<p>In FY2002, the Action Agencies coordinated efforts with other Federal agencies, states, Tribes, and local governments in support of development and implementation of TMDLs.</p>
153	<p>BPA shall, working with agricultural incentive programs such as the Conservation Reserve Enhancement Program, negotiate and fund long-term protection for 100 miles of riparian buffers per year in accordance with criteria BPA and NMFS will develop by June 1, 2001.</p>	<p>BPA, working with NOAA Fisheries, Farm Services Administration, NRCS, the states, and others, continued to strengthen support for riparian protection through CREP and other incentive programs, and work on a collaborative process to develop a mechanism for longer term or permanent easement protection of riparian buffer areas. Action 153 has a goal to negotiate and fund long-term protection for 100 miles of riparian buffer each year.</p> <p>In the realm of riparian protection, BPA helped facilitate the protection of over 300 miles of riparian buffer protection in 2002 alone. This facilitation included funding to leverage resources for CREP and other incentive program coordinators to enroll land into riparian protection programs, as well as providing financial assistance for fencing and planting of riparian buffer areas. BPA understands that NOAA Fisheries goal is for long-term protection to enable protection of the riparian buffers for at least 30 years through a conservation easement or contract mechanism. While all of this protection may not be legally protected for 30 or more years, opportunities may exist to extend the duration of the protection at a future time.</p> <p>One of the serious challenges identified in implementing this action is the relatively slow implementation of the Conservation Reserve Enhancement Program (CREP) by the Northwest states. Only Oregon and Washington have agreements with the USDA to implement CREP, but neither state's program currently has a mechanism to extend to</p>

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		<p>protection beyond fifteen years by adding an increment to the contract price. BPA has funded riparian protection not associated with CREP but with the same overall goal to obtain miles of riparian protection. Many of these miles may provide better opportunities to secure long-term protection in riparian areas, and BPA considers these miles of protection applicable under the action. BPA continued discussions with the Oregon Watershed Enhancement Board and the Washington Conservation Commission to explore options to add an easement component to CREP as done in several states outside of the Northwest. Until the states agencies implementing CREP add such an easement component to their programs, no additional benefits or efficiencies would be achieved by making protection long-term on CREP enrolled lands compared to other areas targeted for riparian protection.</p> <p>BPA still pursued a two-tier approach to leverage agricultural incentive programs, primarily CREP, to fund long-term protection for riparian buffers. Tier 1 is a continued effort to develop and implement a program for establishing long-term protection for lands enrolled in these programs. Tier 2 consists of continued support of CREP implementation and other similar programs as needed to develop, refine, and implement and support components of a long-term protection mechanism. To this end, BPA, working with NOAA, FSA, NRCS, OWEB, WA Conservation Commission, and others, began exploring development and implementation of a means to strengthen CREP and increase riparian protection in areas within the range of listed fish species. The ultimate objective of the multi-agency process would be to establish a mechanism to ultimately achieve long-term or permanent protection of 100 miles of riparian habitat per year.</p>
154	<p>BPA shall work with the NWPPC to ensure development and updating of subbasin assessments and plans; match state and local funding for coordinated development of watershed assessments and plans; and help fund technical support for subbasin and watershed plan implementation from 2001 to 2006. Planning for priority subbasins should be completed by the 2003 check-in. The action agencies will work with other Federal agencies to ensure that subbasin and watershed assessments and plans are coordinated across non-Federal</p>	<p>Subbasin Planning under the Council's process continued in FY 2002. The Council established its management plan and BPA issued the master contracts for the Council to produce the subbasin plans. Subbasin planning will utilize over \$15 million in funds provided by BPA. The Council developed guidance for that planning in concert with NOAA Fisheries so that the Council's subbasin plans can also be utilized as anadromous fish recovery plans under the ESA. In addition to arranging the review of the Clearwater Plan, the Council helped put in place work plans for the Kootenai, Flathead, and Lower Columbia Fish Recovery Board. The Action Agencies continued to provide a share of technical support for the development of subbasin assessments and plans as requested by the subbasin planners. BPA also funded a number of projects that support coordinated development of state and local watershed assessments and plans..</p>

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	and Federal land ownerships and programs.	
155	BPA, working with BOR, the Corps, EPA, and USGS, shall develop a program to 1) identify mainstem habitat sampling reaches, survey conditions, describe cause-and-effect relationships, and identify research needs; 2) develop improvement plans for all mainstem reaches; and 3) initiate improvements in three mainstem reaches. Results shall be reported annually.	BPA continued to implement 3 existing projects including an evaluation of fall Chinook and chum salmon spawning, the restoration of the Sandy River delta, and the evaluation of factors limiting Columbia River Gorge chum salmon populations.
156	The Action Agencies and NMFS shall study the feasibility (including both biological benefits and ecological risks) of habitat modification to improve spawning conditions for chum salmon in the Ives Island area.	The Corps began the Ives Island project in March 2002. Project goal is to create chum salmon habitat that will compensate for loss of habitat near Ives and Pierce Island during low tailwater conditions. During the year, the team worked closely with regional salmon managers and determined locations for potential habitat restoration; three in Lower Columbia and three near Bonneville Dam. A feasibility report on actions to restore and/or protect chum spawning areas should be completed and available 2003.
157	BPA shall fund actions to improve and restore tributary and mainstem habitat for CR chum salmon in the reach between The Dalles Dam and the mouth of the Columbia River.	BPA continued to implement 4 ongoing projects (1999-003-01, 1999-025-00, 2001-012-00, and 2001-053-00) that apply to this Action.
158	During 2001, the Corps and BPA shall seek funding and develop an action plan to rapidly inventory estuarine habitat, model physical and biological features of the historical lower river and estuary, identify limiting biological and physical factors in the estuary, identify impacts of the FCRPS system on habitat and listed salmon in the estuary relative to other factors, and develop criteria for estuarine habitat restoration.	The Corps continued coordination to identify cost-sharing partners and scoping for General Investigation Study. For estuary mapping, the Corps signed a planning assistance to States agreement and completed planning. Initiated estuary studies in cooperation with BPA.
159	BPA and the Corps, working with LCREP and NMFS, shall develop a plan addressing the habitat needs of salmon and steelhead in the estuary.	BPA and the Corps worked with LCREP and the Columbia River Estuary Study Taskforce (CREST) to develop this plan. This project, initiated in FY 2002, will provide the foundational plan for habitat restoration activities in the estuary.
160	The Corps and BPA, working with LCREP, shall	The Corps and BPA began working on a cost share agreement that will allow the Corps to

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	develop and implement an estuary restoration program with a goal of protecting and enhancing 10,000 acres of tidal wetlands and other key habitats over 10 years, beginning in 2001, to rebuild productivity for listed populations in the lower 46 river miles of the Columbia River. The Corps shall seek funds for the Federal share of the program, and BPA shall provide funding for the non-Federal share. The Action Agencies shall provide planning and engineering expertise to implement the non-Federal share of on-the-ground habitat improvement efforts identified in LCREP, Action 2.	use existing and new authorities to protect and enhance 5,000 acres of estuary habitat during the next 5 years (2003-2007). The Corps initiated planning and preparation of a preliminary restoration plan for Crims Island and southwest Washington streams, and planning was continued for the Brownsmead project.
161	Between 2001 and 2010, the Corps and BPA shall fund a monitoring and research program acceptable to NMFS and closely coordinated with the LCREP monitoring and research efforts (Management Plan Action 28) to address the estuary objectives of this biological opinion.	The Estuary/Ocean RM&E Work Group was established in the summer of 2002 and began developing an RM&E plan for the estuary. The work group includes NOAA-Fisheries and a representative from the Lower Columbia River Partnership (LCREP). Initial efforts focused on assessing the on-going RM&E efforts and identifying any gaps (gap analysis). This gap analysis was provided to the RM&E Planning Group for incorporation into the RM&E Framework document. The Action Agencies also reviewed proposals for estuarine research in the Provincial Review Process and provided recommendations on which would help to meet FCRPS BiOp requirements. Several RM&E efforts were funded in the estuary and ocean plume in 2002.
162	During 2000, BPA, working with NMFS, shall continue to develop a conceptual model of the relationship between estuarine conditions and salmon population structure and resilience. The model will highlight the relationship among hydropower, water management, estuarine conditions, and fish response. The work will enable the agencies to identify information gaps that have to be addressed to develop recommendations for FCRPS management and operations.	The Estuary/Ocean RM&E Work Group began reviewing available conceptual models, including Dr. Thom's model developed for the Columbia River Channel Improvement Project, NOAA Fisheries' Salmon at Rivers End report, and Dr. Simenstad's work on food web interactions and nutrient cycling in the estuary and considering how well they meet the RPA requirements.
163	The Action Agencies and NMFS, in conjunction with the Habitat Coordination Team, will	The Action Agencies are using an Access database for project level BiOp implementation planning and progress reporting. This provides the initial effort towards development of

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	develop a compliance monitoring program for inclusion in the first 1- and 5-year plans.	a compliance monitoring program. The Action Agencies will continue to work with other parties to develop a compliance monitoring program.
164	The Action Agencies shall work with NMFS, USFWS, and Tribal and state fishery management agencies in a multiyear program to develop, test, and deploy selective fishing methods and gear that enable fisheries to target nonlisted fish while holding incidental impacts on listed fish within NMFS-defined limits. The design of this program and initial implementation (i.e., at least the testing of new gear types and methods) shall begin in FY 2001. Studies and/or pilot projects shall be under way and/or methods deployed by the 3-year check-in.	<p>The Action Agencies funded its second year of testing and assessing selective fishing gear in the lower Columbia River (BPA 2001-007-00). The 2002 non-Indian commercial tangle net fishery harvested 14,238 spring Chinook, released 14,095 spring Chinook and released 20,854 steelhead. The large handle of steelhead likely was the result of too large a maximum mesh strata allowed combined with an exceptionally large steelhead run in 2002. Information on short term catch and release mortality was obtained. Future modifications will focus upon reducing handling of non-target species and improving estimates of pre-spawning mortality of released fish, including steelhead.</p> <p>Through the Select Area Fishery Evaluation (SAFE) project (BPA 1993-060-00), the Action Agencies continued to collect and analyze homing and straying information, and evaluate the suitability of the use of Willamette and Cowlitz stock of spring Chinook for optimal use in select fishing areas. This included a treatment/control test using morpholine drip to enhance homing of spring Chinook. Continuing efforts to optimize fishery value by rearing and release of spring Chinook occurred during 2002. SAFE production contributed over 105 thousand salmon toward commercial and recreational fisheries, with an estimated economic value of \$1,588,000 in 2002.</p>
165	The Action Agencies shall work with NMFS, USFWS, Tribal and state fishery managers, and the relevant Pacific Salmon Commission and Pacific Fishery Management Council (PFMC) technical committees to develop and implement methods and analytical procedures (including revising and/or replacing current fishery management and stock assessment models based on these methods and procedures) to estimate fishery and stock-specific management parameters (e.g., harvest rates). The Action Agencies shall place particular emphasis on current methods and procedures affected by the transition to mass marking of Columbia River basin hatchery produced fish and/or deployment	No fundable proposals specific to implementation of this item appeared in the Mainstem/Systemwide solicitation, nor was any specific project implemented by the Action Agencies in 2002. However, progress toward the intended purpose of this RPA has occurred through funding by NOAA Fisheries for a project to update the Chinook harvest management model used by the Pacific Salmon Commission - Chinook Technical Committee. This project was initiated in 2002.

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	of selective fishery regimes in the Columbia River basin, addressing these concerns within a time frame necessary to make the new selective fishing regimes feasible. Specifically, the Action Agencies shall facilitate the development of models, methods, and analytical procedures by the 3-year check-in.	
166	The Action Agencies shall work with NMFS, USFWS, the Pacific States Marine Fisheries Commission, and Tribal and state fishery management agencies to implement and/or enable changes in catch sampling programs and data recovery systems, including any required changes in current databases (e.g., reformatting) and associated data retrieval systems, pursuant to the time frame necessary to implement and monitor mass marking programs and/or selective fishery regimes in the Columbia River basin. Specifically, the Action Agencies shall facilitate the revision of programs and systems, as needed, by the 3-year check-in.	<p>The Action Agencies supported a study to assess the feasibility of removing ghost fishing nets in the mainstem Columbia River in 2002 (BPA 2001-058-00). Unaccounted loss of salmonids due to lost nets has been identified as a potential contributor to loss estimates within harvest data systems. Preliminary results indicate the ability to target and locate submerged nets using side-scan sonar. A total of 8 fishing nets of various length, diameter and condition were removed in 2002. A total of 80 white sturgeon carcasses and/or notochords were retrieved from the nets. No other fish species were found in the nets. The Action Agencies will assess the priority of continuing to implement this project after the report of research is delivered.</p> <p>The Action Agencies continued funding support for the Coded Wire Tag (CWT) and harvest monitoring database, including any changes necessitated by the ongoing refinements of fishery and stock assessment programs. Additionally, in 2002, the harvest managers began to look at adult pit tag data at Bonneville Dam to try to improve stock run-timing estimates (spring/summer Chinook) for inclusion in inseason management decisions.</p>
167	The Action Agencies shall work with NMFS, USFWS, and Tribal and state fishery management agencies to develop improved methods for estimating incidental mortalities in fisheries, with particular emphasis on selective fisheries in the Columbia River basin, doing so within the time frame necessary to make new marking and selective fishery regimes feasible. The Action Agencies shall initiate studies and/or develop methods by the 3-year check-in.	<p>The Action Agencies funded its second year of testing and assessing selective fishing gear in the lower Columbia River (BPA 2001-007-00). Results from this study indicate a 50% mortality rate on spring Chinook and steelhead for modified conventional gillnets. Information derived from 2002 spring Chinook long-term mortality research using 4.5-inch tooth-tangle nets shows a 25% mortality rate.</p> <p>The Action Agencies supported a study to assess the feasibility of removing ghost fishing nets in the mainstem Columbia River in 2002. Preliminary results indicate the ability to target and locate submerged nets using side-scan sonar. A total of 8 fishing nets of various length, diameter and condition were removed in 2002. A total of 80 white sturgeon carcasses and/or notochords were retrieved from the nets. No other fish species were found in the nets. The Action Agencies will assess the priority of continuing to</p>

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		implement this project after the report of research is delivered.
168	The Action Agencies shall work with NMFS, USFWS, and Tribal and state fishery management agencies to develop methods for crediting harvest reforms, and the survival benefits they produce, toward FCRPS offsite mitigation responsibilities. A crediting approach shall be agreed upon by the 3-year check-in.	In 2002, the Action Agencies and NOAA fisheries discussed options and methodology for crediting harvest reforms sponsored by the Action Agencies. The product of this discussion is a white paper to address crediting approaches for harvest-related reforms to be completed by the 2003 Action Agency check-in.
169	The Action Agencies shall fund the development of NMFS-approved HGMPs for implementation, including plans for monitoring and revising them as necessary as new information becomes available. HGMPs have to be completed first for the facilities and programs affecting the most at-risk species (Upper Columbia and Snake River ESUs), followed by those affecting mid-Columbia, and then the Lower Columbia ESUs. HGMPs for all the Columbia basin hatchery programs and facilities should be completed (and approved by NMFS) by the 3-year check-in.	NOAA and the Action Agencies developed a 3-phased process for producing NOAA-approvable HGMPs. The Corps funded HGMP development for Spring Creek and Bonneville fish hatcheries. These were completed and should be through the NOAA approval process prior to September 2003.
170	Using new authorizations and appropriations and/or BPA funds as necessary and appropriate, the Corps, working with USFWS, shall oversee the design and construction of capital modifications identified as necessary in the HGMP planning process for Lower Snake River Compensation Plan anadromous fish hatchery programs. These improvements shall begin immediately after the relevant HGMPs are completed and approved by NMFS, and shall be completed as expeditiously as is feasible. BPA shall provide for the operations and maintenance costs of these reforms and shall reimburse the Federal Treasury for an appropriate share of the	As the HGMPs are completed and approved, the Corps, USFWS, and NOAA will coordinate implementation schedules and funding mechanisms to expedite recommended construction modifications and operations and maintenance reforms. No new processes are required to secure BPA funding. Prompt review (Council's 3-step Hatchery Review process) and implementation (through mid-year reallocations) can be used. Non-BPA avenues of funding (authorizations and appropriations) will require more agency lead time. It is likely that some reforms will not be subject to the 3-step process, which is designed primarily for new hatchery production or significant changes to existing hatchery programs.

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	capital costs. The Corps shall have begun to implement reforms for programs affecting the most at-risk species by the 3-year check-in.	
171	BOR shall implement the reforms identified in the HGMP planning process for the Grand Coulee mitigation anadromous fish hatchery programs, beginning immediately following completion of the relevant (NMFS approved) HGMPs and completing the work as expeditiously as feasible. BPA shall fund the operations and maintenance costs of the reforms and shall reimburse the Federal Treasury for an appropriate share of the capital costs. BOR shall have begun to implement reforms for programs affecting the most at-risk species by the 3-year check-in	HGMPs for Leavenworth, Entiat and Winthrop National Fish Hatcheries will be completed and submitted to NOAA in FY2003 for review and approval. Approval of HGMPs should occur either in late FY2003 or early FY2004. Planning for and implementation of reforms will begin as soon as practical after receiving NOAA approval.
172	The Corps shall implement the reforms identified in the HGMP planning process for the Corp's Columbia River basin mitigation anadromous fish hatchery programs, beginning immediately after the relevant HGMPs are completed and are approved by NMFS. The work shall be completed as expeditiously as feasible. BPA shall fund the operations and maintenance costs of the reforms and shall reimburse the Federal Treasury for an appropriate share of the capital costs. The Corps shall have begun to implement reforms for the programs affecting the most at-risk species by the 3-year check-in.	The Corps will work with each hatchery operating agency to ensure prompt implementation of recommended HGMP reforms. Reforms requiring additional funding will be submitted in the first available budget request. Dependent upon the relative priority of the reform action compared to other ongoing fish activities, funds may be supplied sooner if available. The Corps will implement the HGMP reforms as the HGMPs are completed.
173	BPA shall implement the reforms identified in the HGMP planning process for Federal and Federally funded hatcheries, beginning immediately after the relevant HGMPs are completed and approved by NMFS. The work	BPA will implement the HGMP reforms as the HGMPs are completed. BPA and NOAA will work with hatchery operators to coordinate implementation schedules and funding mechanisms to expedite recommended construction modifications and operations and maintenance reforms. No new processes are required to secure BPA funding. Prompt review (Council 3-step Hatchery Review process) and implementation (through mid-year

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	shall be completed as expeditiously as possible. BPA shall have begun to implement reforms for the programs affecting the most at-risk species by the 3-year check-in.	reallocations) can be used. It is likely that some reforms will not be subject to 3-step process, which is designed primarily for new hatchery production or significant changes to existing hatchery programs.
174	Working through regional prioritization processes to the extent feasible and in coordination with NMFS, BPA shall collaborate with the regional, state, Tribal, and Federal fish managers and the Pacific States Marine Fisheries Commission to enable the development and implementation of a comprehensive marking plan. Included in this action are the following four steps:	Development of a comprehensive plan to mark hatchery produced salmon was delayed in 2002. The delay enabled differentiation between hatchery and naturally-produced salmon and ensure that appropriate tagging and sampling rates are being implemented.
	1. Develop a comprehensive marking strategy for all salmon and steelhead artificial production programs in the Columbia River basin by the end of 2001.	See above.
	2. Provide funding by March 1, 2001, to begin marking all spring chinook salmon that are currently released unmarked from Federal or Federally funded hatcheries.	No progress in FY 2002.
	3. Provide funding, beginning in FY 2002, to implement the Action Agencies' share of the comprehensive marking plan for production not addressed in (2) above.	
	4. Obtain funding contributions as appropriate for additional sampling efforts and specific experiments to determine relative distribution and timing of hatchery and natural spawners.	
175	BPA shall, in coordination with NMFS, USFWS, and the relevant state and Tribal comanagers, fund the four-step planning process described above as quickly as possible and, if so determined by that process, implement safety-net projects as quickly as possible at least for the	The NOAA Findings Letter (July 2002) acknowledged that the planning process was delayed by up to one year to allow co-managers to better define and coordinate the components of the program. The planning process was expanded to include analysis of 38 populations instead of the original 10 populations specified in Action 175. Planning was delayed for approximately six months while the consolidated Safety-Net Artificial Propagation Program (SNAPP) proposal was undergoing review and approval through the

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	following salmon and steelhead populations: 1) A-run steelhead populations in the Lemhi River, main Salmon River tributaries, East Fork Salmon River, and Lower Salmon River; 2) B-run steelhead populations in the Upper Lochsa River and South Fork Salmon River; and 3) spring/summer chinook populations in the Lemhi, East Fork, and Yankee Fork Salmon rivers, and Valley Creek.	Provincial Review process. As a result of this review, the SNAPP planning process was more closely aligned and coordinated with the efforts of the Interior Columbia Technical Recovery Team, making the SNAPP schedule somewhat dependent on the TRT's completion of its work products. In August 2002, BPA began to initiate contracts for the SNAPP extinction risk analysis and state and tribal co-manager participation in SNAPP. Because of all of these changes to the SNAPP program, the end of 2003 is now a realistic target date for completion of the initial products from SNAPP, the NOAA-approved HGMPs for contingency safety-net projects.
176	BPA shall, in coordination with NMFS, USFWS, and the relevant state and Tribal comanagers, fund the development of HGMPs for the Grande Ronde and Tucannon spring/summer chinook safety-net programs.	BPA funded the Grande Ronde and Tucannon safety-net HGMPs under a Memorandum of Agreement with the USFWS, which oversees the Congressionally-mandated Lower Snake River Compensation Plan (LSRCP). Oregon Department of Fish and Wildlife completed a Phase I HGMP for Grande Ronde River Spring Chinook salmon program. Washington Department of Fish and Wildlife completed a Phase I HGMP for Tucannon River Spring Chinook salmon program. Both of these Phase I products were submitted to USFWS.
177	In 2002, BPA shall begin to implement and sustain NMFS-approved, safety-net projects.	Existing safety-net projects (e.g., the Snake River spring/summer chinook and Snake River sockeye captive brood programs) were sustained when required.
178	BPA shall commit to a process whereby funds can be made quickly available for funding the planning and implementation of additional safety-net projects for high-risk salmon and steelhead populations NMFS identified during the term of this biological opinion.	BPA worked with NOAA on developing an approach for funding planning and implementation of additional safety-net projects if and when these projects become necessary during the term of the 2000 BiOp after the current SNAPP four-step planning process is completed.
179	The Action Agencies and NMFS shall work with affected parties to establish regional priorities within the congressional appropriations processes to set and provide the appropriate level of FCRPS funding to develop recovery goals for listed salmon ESUs in the Columbia River basin. Tasks shall include defining populations based on biological criteria and evaluating population viability in accordance with NMFS' viable salmonid population approach. These tasks shall be completed by	The Action Agencies cost-shared with NOAA Fisheries to produce draft TRT recovery planning products for Columbia Basin ESUs. BPA initiated funding through the Council's Fish & Wildlife Program for contract 2002-075-00 to directly support this Action.

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	2003.	
180	<p>The Action Agencies and NMFS shall work within regional prioritization and congressional appropriation processes to establish and provide the level of FCRPS funding to develop and implement a basinwide hierarchical monitoring program. This program shall be developed collaboratively with appropriate regional agencies and shall determine population and environmental status (including assessment of performance measures and standards) and allow ground-truthing of regional databases. A draft program including protocols for specific data to be collected, frequency of samples, and sampling sites shall be developed by September 2001. Implementation should begin no later than the spring of 2002 and will be fully implemented no later than 2003.</p>	<p>NOAA and the Action Agencies developed a detailed plan for this Action item, including pilot scale projects. Ongoing RM&E consistent with the plan continued and is being augmented by the Action Agencies and NOAA.</p>
181	<p>The Action Agencies and NMFS shall work within regional prioritization and congressional appropriations processes to establish and provide the appropriate level of FCRPS funding for a program to acquire and digitize aerial or satellite imagery of the entire Columbia River basin once every 3 to 5 years.</p>	<p>Reclamation purchased aerial imagery in FY2002 for a significant portion of the Columbia River Basin.</p>
182	<p>The Action Agencies and NMFS shall work within regional priorities and congressional appropriations processes to establish and provide the appropriate level of FCRPS funding for studies to determine the reproductive success of hatchery fish relative to wild fish. At a minimum, two to four studies shall be conducted in each ESU. The Action Agencies shall work with the Technical Recovery Teams to identify the most appropriate populations or stocks for</p>	<p>The RM&E Plan was written and included an evaluation of RM&E needs for determining the reproductive success of hatchery salmon and steelhead relative to wild salmon and steelhead.</p>

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	these studies no later than 2002. Studies will begin no later than 2003.	
183	Initiate at least three tier 3 studies (each necessarily comprising several sites) within each ESU (a single action may affect more than one ESU). In addition, at least two studies focusing on each major management action must take place within the Columbia River basin. The Action Agencies shall work with NMFS and the Technical Recovery Teams to identify key studies in the 1-year plan. Those studies will be implemented no later than 2003.	Implementation of effectiveness monitoring projects under this Action was coordinated with the implementation of the status monitoring program under Action 180 and the data management program under Action 198. The Action Agencies implemented a steelhead data information system in John Day, conducted fish production and flow analysis, assessed salmonids in Asotin Creek, conducted Chinook smolt-to-adult return studies, and evaluated stream habitat using Nez Perce Tribe Fisheries/Watershed as part of fulfillment of this RPA
184	The Action Agencies and NMFS shall work within regional prioritization and congressional appropriation processes to establish and provide the appropriate level of FCRPS funding for a hatchery research, monitoring, and evaluation program consisting of studies to determine whether hatchery reforms reduce the risk of extinction for Columbia River basin salmonids and whether conservation hatcheries contribute to recovery.	The RM&E Plan was written and included an evaluation of RM&E needs relating to the effectiveness of hatchery reforms and conservation hatchery actions.
185	The Action Agencies shall continue to fund and expand, as appropriate, fish marking and recapturing programs aimed at defining juvenile migrant survival for both transported and nontransported migrants and adult returns for both groups. These studies shall also compare the SARs of transported and nontransported fish to calculate the differential delayed mortality (D), if any, of transported fish.	In fulfillment of this Action, the Action Agencies implemented the following projects: delayed mortality studies on juveniles, estimated survival for the passage of juvenile salmonids through dams, and conducted a survival study of salmonids on the continental shelf and ocean habitats.
186	The Action Agencies and NMFS shall work within the annual planning and congressional appropriation processes to establish and provide the appropriate level of FCRPS funding for	Ongoing studies were continued to compare survival of radio tagged run-of-river and transported fish to partition delayed mortality downstream of Bonneville (also to evaluate transportation) and to compare survival of acoustically tagged transported and run-of-river smolts through the saltwater interface and Columbia River Plume. Final reports will

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	comparative evaluations of the behavior and survival of transported and downstream migrants to determine whether causes of D can be identified for the reach between Bonneville Dam and the mouth of the Columbia River.	be available in 2004.
187	The Action Agencies and NMFS shall work within the annual planning and congressional appropriation processes to establish and provide the appropriate level of FCRPS funding for studies and analyses to evaluate relationships between ocean entry timing and SARs for transported and downstream migrants.	The Action Agencies conducted a comparative survival rate study of hatchery PIT tagged Chinook.
188	The Action Agencies and NMFS shall work within the annual planning and congressional appropriation processes to establish and provide the appropriate level of FCRPS funding for studies of PIT-tagged wild stocks from the lower river streams. The studies shall be used to contrast stock productivity and hydrosystem effects.	The Action Agencies implemented the following studies: statistical support for salmonid survival studies, Comparative survival rate study of hatchery PIT Tagged Chinook, nd trend and habitat monitoring of salmonid productivity and escapement.
189	The Action Agencies and NMFS shall work within the annual planning and congressional appropriation processes to establish and provide the appropriate level of FCRPS funding for studies to investigate the causes of discrepancies in adult return rates for juvenile salmonids that have different passage histories through the hydrosystem.	Continued the rearing study to evaluate differences in survival of fish with different routes of passage. A final report will be available in spring 2006. Physiology evaluations continued and a final report will be available in 2004. Adult and juvenile PIT tag recovery data were analyzed to compare survival estimates for transported fish of known origin, downriver stocks, wild and hatchery transported fish and fish handled and not handled at dams. Installed adult PIT detection systems in all ladders at Bonneville and McNary; and installed an innovative, less-expensive, alternative, adult PIT detection system in McNary Oregon-shore ladder. The focus is on determining the absolute and comparative adult return rates of smolts transported from Lower Granite and McNary to smolts that complete their outmigration within the river. Lower Granite transport evaluation, spring chinook and steelhead completed.
190	The Action Agencies shall continue to fund	Provided precise measurements of survival of juvenile salmon as they pass through dams

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	studies that monitor survival, growth, and other early life history attributes of Snake River wild juvenile fall chinook.	and reservoirs in the Snake and Columbia Rivers. This work is closely related to RPA 187. Explored holdover behavior of fall chinook salmon in Lower Granite Reservoir and refining existing methods of scale pattern analysis for determining age and DNA analysis for determining genetic lineage of holdover fish. Using radio telemetry to determine where fish hold over in Lower Granite Reservoir and document passage timing past Lower Granite Dam.
191	The Action Agencies shall continue to implement adult salmonid counting programs at FCRPS dams, but shall improve the reporting of these counts.	The Corps continued to implement its annual adult fish counting program at mainstem Columbia and Snake river projects and will continue routine operation of fish passage facilities, including monitoring adult fallback. .
192	As set out in Action 50 (Section 9.6.1.3.4), BPA and the Corps shall install necessary adult PIT-tag detectors at appropriate FCRPS projects before the expected return of adult salmon from the 2001 juvenile outmigration. These adult PIT-tag detectors shall be used as needed for calculating transport benefits, conversion rates, and SARs for listed salmon and steelhead.	Provided basic infrastructure for all PIT tag related projects in Columbia River Basin. Operated and maintained long-term data repository for PIT tag information, permanent PIT tag interrogation sites, and supports other PIT tag research. Adult PIT tag interrogation systems were installed in all four of the adult fish ladders at the Bonneville project for use beginning in 2002. Also, the two fish ladders and one of the counting stations at McNary project were equipped. Significant problems with shields leaking and fall chinook using the overflow weirs caused the implementation team to re-evaluate future deployments. Installation was completed at the Bonneville ladders.
193	The Action Agencies shall investigate state-of-the-art, novel fish detection and tagging techniques for use, if warranted, in long-term research, monitoring, and evaluation efforts.	Developed, installed, and evaluated a prototype adult PIT detection system in Bonneville WA-shore ladder. 2) Continued development of the flat-plate PIT detection system in the Bonneville 1st powerhouse sluiceway. 3) Continued development of small-stream PIT detection systems. 4) Designed adult PIT detection systems for all ladders at Bonneville and McNary under project number 2001-003-00. Assessed the feasibility/validity of remote monitoring approaches to quantify adult steelhead escapement in select tributaries of the Imnaha River subbasin. Completed feasibility project to evaluate new acoustic tracking technology to verify its capabilities and designed an acoustic monitoring network to track movement of salmon smolts into the ocean and along the continental shelf to areas of ocean residency.
194	The Action Agencies and NMFS shall work within the annual planning and congressional appropriation processes to establish and provide the appropriate level of FCRPS funding for	The RM&E Estuary/Ocean Work Group is evaluating available physical models and considering their applicability to evaluating hydrosystem impacts on the estuary. These include the OGI work under project 1998-014 (CORIE model), which continued to be funded and developed in 2002, and other physical models, which were developed by the

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	studies to develop a physical model of the lower Columbia River and plume. This model will characterize potential changes to estuarine habitat associated with modified hydrosystem flows and the effects of altered flows where they meet the California Current to form the Columbia River plume.	Corps for other specific purposes but may be useful in identifying potential changes in the estuary.
195	The Action Agencies shall investigate and partition the causes of mortality below Bonneville Dam after juvenile salmonid passage through the FCRPS.	Work began in 1998 under project 1998-014-00. A major component is the Canadian Shelf monitoring project that samples salmonids from Canadian waters up into Alaskan waters. Additional work has been completed under project 2000-08 to develop an innovative sonic tag tracking system to monitor fish movement from the estuary through the near shore waters of the continental shelf. The Corps is developing a smaller sonic tag in order to partition mortality below Bonneville. Over time these projects will address the causes and partition mortality below Bonneville Dam. The Action Agencies agree to fund additional studies through the mainstem/systemwide Provincial Review process and through targeted solicitations that specifically meet needs and requirements identified by the Action Agency/NMFS Hydro RM&E Technical Work Groups work plan.
196	The Action Agencies and NMFS shall work within the annual planning and congressional appropriation processes to establish and provide the appropriate level of FCRPS funding for studies to develop an understanding of juvenile and adult salmon use of the Columbia River estuary. These studies support the actions to develop criteria for estuarine restoration (Action 158), restoration planning (Action 159), and implementation (Action 160) in Section 9.6.2.2.	Studies of juvenile salmonid use of the estuary, including a study to estimate survival through the estuary, another to evaluate current and historical use and linkages, and one evaluating the relationship between time of ocean entry, physical and biological characteristics of the estuary and adult returns were conducted in 2002.
197	The Action Agencies and NMFS shall work within the annual planning and congressional appropriation processes to establish and provide the appropriate level of FCRPS funding for studies to develop an understanding of juvenile and adult salmon use of the Columbia River plume.	Studies evaluating the relationship between time of ocean entry, physical and biological characteristics of the estuary and adult returns and evaluating survival and growth of juvenile salmon in the Columbia River plume occurred in 2002.
198	The Action Agencies, in coordination with	The Action Agencies continued to support this Action through the following efforts:

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	NMFS, USFWS, and other Federal agencies, NWPPC, states, and Tribes, shall develop a common data management system for fish populations, water quality, and habitat data.	regional database, ESA coordination at Chief Joseph Dam, second tier database support, Montana Natural Heritage Program, StreamNet Pacific Northwest Hydro power database, Genetic Monitoring and evaluation and analysis system, develop data management system, information system monitoring wild smolt migrations, coded wire tag recovery program, and the Idaho Conservation Data Center.
199	The Action Agencies shall implement the specific research/monitoring actions outlined in Appendix H.	The Action Agencies worked within AFEP and the Regional process (including NOAA) to ensure that the elements of App. H are integrated with the broader R, M&E framework.