US Army Corps
of Engineers®
Northwestern Division

RECORD OF DECISION

Lower Snake River Juvenile Salmon Migration Feasibility Study

September 2002

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PREFACE

This record documents the decision of the U.S. Army Corps of Engineers (Corps) on the selected action resulting from the Lower Snake River Juvenile Salmon Migration Feasibility Study (Feasibility Study) process. The evaluation of the accumulation of data and documentation as a result of this process is compiled in the Lower Snake River Juvenile Salmon Migration Feasibility Report/Environmental Impact Statement dated February 2002. This Record of Decision is focused on the Corp's actions within the Lower Snake River Project, which includes Lower Granite, Lower Monumental, Little Goose, and Ice Harbor dams and reservoirs. Federal agencies involved with the Corps in the Feasibility Study are the cooperating agencies--Bonneville Power Administration, U.S. Environmental Protection Agency, and U.S. Bureau of Reclamation--and other participating agencies, including the National Marine Fisheries Service and the U.S. Fish and Wildlife Service. The Feasibility Study team analyzed four alternatives intended to provide information on the technical, environmental, and economic effects of actions related to improving juvenile salmon passage through the four lower Snake River dams. The four alternatives include Alternative 1 - Existing Conditions (the no-action alternative) and three different ways to further improve juvenile salmon passage. The action alternatives are as follows: Alternative 2 - Maximum Transport of Juvenile Salmon; Alternative 3 - Major System Improvements; and Alternative 4 - Dam Breaching. Based on a thorough examination of the best available biological, economic, social, and other environmental information, the Corps selected Alternative 3 - Major System Improvements (Adaptive Migration) as the recommended plan (preferred alternative). This Feasibility Study was conducted and this decision has been made in compliance with the National Environmental Policy Act, the Endangered Species Act, the Clean Water Act, and other applicable laws and requirements.

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1. Introduction

This Lower Snake River Record of Decision (2002 LSR ROD) addresses the actions at or that influence the Lower Snake River Project as discussed in the Lower Snake River Juvenile Salmon Migration Feasibility Report/Environmental Impact Statement (FR/EIS). The FR/EIS was initiated in response to the 1995 National Marine Fisheries Service (NMFS) Biological Opinion for the *Reinitiation of Consultation on 1994-1998 Operation of the Federal Columbia River Power System (FCRPS) and Juvenile Transportation Program in 1995 and Future Years* (NMFS 1995 Biological Opinion). In December 1999, Endangered Species Act (ESA) consultation was reinitiated for the operation of the FCRPS. This 2002 LSR ROD adopts, incorporates, and reaffirms the *2001 Record of Consultation and Statement of Decision* (2001 ROCASOD) as it pertains to the Lower Snake River Project in which the U.S. Army Corps of Engineers' (Corps') responded to the recommendations in the *Biological Opinion Effects to Listed Species from Operations of the Federal Columbia River Power System* issued by the U.S. Fish and Wildlife Service (USFWS) on December 20, 2000 (USFWS 2000 Biological Opinion) as amended by letter dated January 25, 2001, and the biological opinion issued by NMFS on December 21, 2000 on the *Reinitiation of Consultation on Operation of the Federal Columbia River Power System, Including the Juvenile Fish Transportation Program, and 19 Bureau of Reclamation Projects in the Columbia Basin* (NMFS 2000 Biological Opinion).

The 2001 ROCASOD addressed the operation of and certain actions at the Corps of Engineers FCRPS projects: Dworshak, Lower Granite, Little Goose, Lower Monumental, Ice Harbor, Libby, Albeni Falls, Chief Joseph, McNary, John Day, The Dalles, and Bonneville hydropower projects located in the states of Idaho, Oregon, Montana, and Washington. The Lower Snake River Project features four locks and dams in the State of Washington: Ice Harbor, Lower Monumental, Little Goose, and Lower Granite. This 2002 LSR ROD is under authorities and requirements related to the operation of the Lower Snake River Project evaluated in the FR/EIS. The Corps intends to take actions in accordance with the 2001 ROCASOD and the NMFS and USFWS 2000 Biological Opinions, continuing coordination with NMFS and USFWS and consultation, as may be required, to meet the adaptive management approach for the Lower Snake River Project.

1.1 Study Area

The Lower Snake River Juvenile Salmon Migration Feasibility Study (Feasibility Study) coverage of the affected environment and the effects of the alternatives on environmental resources and socio-economic uses focused on the 140-mile lower Snake River reach between Lewiston, Idaho, and the Tri-Cities, Washington. The Snake River is the principal tributary to the Columbia River, draining approximately 109,000 square miles in Idaho, Wyoming, Utah, Nevada, Washington, and Oregon.

1.2 Historical Overview

Historically, runs of spring/summer chinook salmon (*Oncorhynchus tshawytscha*) were found throughout the accessible and suitable reaches of the Snake River and its tributaries. On the Snake River, they spawned as far upstream as Auger Falls in Idaho, some 930 miles from the mouth of the Columbia River. Fall chinook salmon (*O. tshawytscha*) were also widely distributed in the mainstem of the Snake River (as far upstream as Shoshone Falls, Idaho) and the lower reaches of its tributaries. Snake River sockeye salmon (*O. nerka*) were found in five lakes in the Stanley Basin, Big Payette Lake on the North Fork of the Payette River in Idaho, and Wallowa

Lake in the Grande Ronde River Basin. Steelhead, the anadromous form of rainbow trout (*O. mykiss*), were also widely distributed in accessible and suitable habitats.

Both the distribution and abundance of these anadromous fish species have declined significantly. As a result, on November 20, 1991, NMFS declared the Snake River sockeye salmon endangered pursuant to the ESA effective December 20, 1991 [56 Federal Register (FR) 58619]. Snake River spring/summer chinook and Snake River fall chinook salmon were listed as threatened on April 22, 1992 (57 FR 14653). Critical habitat was designated for Snake River sockeye, spring/summer chinook, and fall chinook on December 28, 1993 (58 FR 68543). Snake River wild steelhead was formally listed as threatened on August 18, 1997 (62 FR 43937).

Many past and present anthropogenic (human-caused) factors have contributed cumulatively to the decline of the anadromous fish runs within the Snake River Basin. For example, between 1910 and 1967, several hundred miles of spawning area were lost because dams were built upstream from Hells Canyon Dam. Approximately 46 percent of the pre-dam anadromous fish habitat in the Snake River Basin was blocked by the construction of Brownlee Dam in 1958. This dam originally had fish passage facilities, but they were not successful in maintaining upstream runs. In addition, completion of Hells Canyon and Oxbow Dams, downstream of Brownlee Dam, further blocked access to 247 miles of habitat in the Snake River. Hells Canyon Dam is the first barrier to upstream migration of adult fish on the Snake River.

Many factors contribute to the decline of runs in the Snake River Basin; several notable factors are discussed in the following subsections.

1.2.1 Dams and Reservoirs

Dams and reservoirs have altered the natural characteristics of the Columbia and Snake rivers, thus changing or eliminating many of the habitat conditions needed to sustain anadromous fish runs. These changes include inundation of spawning and rearing habitat; total blockage of access to large areas of historical habitat; alteration of depth, flow, and velocity; water quality changes; direct and indirect mortality (e.g., mortalities due to passage through turbines versus delayed mortality that may occur at a later time as a result of passage through the hydrosystem or transportation of fish); and increased predation in reservoirs.

1.2.2 Harvest

Historically, harvest of Snake River salmon and steelhead has occurred in the Snake River, mainstem and estuarine waters of the Columbia River, and in marine waters of the North Pacific. Although current management policies limit harvest and include extensive monitoring, much less restrictive approaches in the past contributed to decreasing overall fish populations, thus reducing the number of adults needed to maintain sustainable run populations. Harvest continues to add to reduced numbers of returning adults for some salmon and steelhead stocks.

1.2.3 Loss of Habitat

Land uses throughout the Columbia and Snake River basins have altered the original habitat. For example, loss of riparian areas along streams from logging, farming, and urban development; water diversion (including unscreened diversion); impoundment of free-flowing tributaries (as much as in the mainstem); and increased infrastructure have changed the original habitat and decreased or eliminated favorable habitat conditions.

1.2.4 Estuary Destruction

Estuarine habitat involves critical life stages for anadromous juvenile fish transitioning from freshwater to marine waters, or returning from marine waters to freshwater as adults. The habitat

available in the lower Columbia River estuary has been altered and the aerial extent diminished through filling, diking, and other development, thus decreasing the original habitat that was available to support larger fish populations.

1.2.5 Hatchery Salmonids

For many decades, large-scale hatchery programs have been implemented throughout the Columbia and Snake River basins as mitigation for loss of habitat and to enhance anadromous fish runs. However, in recent years, the use of hatcheries has been extensively questioned. Issues include hatchery practices and high hatchery fish harvest rates that may be detrimental to wild runs; potential loss of desirable wild fish genetic characteristics through interbreeding with hatchery fish in the wild; competition between hatchery and wild fish for habitat and food; and predation by hatchery fish on wild fish.

1.2.6 Other Human-related Problems

In addition to the above factors, use of the Columbia and Snake River basins for timber harvest, farming, industrial facilities, urbanization, water supply for municipal and industrial purposes, and other effects directly related to human activities has contributed cumulatively to habitat changes that have often not been favorable for supporting healthy anadromous fish populations.

1.3 Feasibility Study Process

The genesis of this Feasibility Study was the NMFS 1995 Biological Opinion. In 1998, NMFS issued a supplement to their 1995 Biological Opinion (NMFS 1998 Biological Opinion), and in 2000, NMFS issued the current Biological Opinion on FCRPS operations. The Final FR/EIS responds to the reasonable and prudent alternative in these documents.

The Feasibility Study was officially announced to the public on June 5, 1995. In July 1995, the Corps conducted public scoping meetings to initiate the Feasibility Study and begin the National Environmental Policy Act (NEPA) process. The stated purpose of the Feasibility Study was to evaluate and screen structural alternative measures that may increase the survival of juvenile anadromous fish through the Lower Snake River Project and assist in the recovery of listed salmon and steelhead stocks. In December 1996, the Corps issued the Interim Status Report, which marked the decision point to elevate dam breaching--removal of the earthen embankments at all four dams to allow for a near-natural flow--as the drawdown alternative that would be evaluated in the environmental impact statement (EIS).

Because the alternatives considered in this study would affect resources of concern to all people of the Pacific Northwest (i.e., salmon, hydropower production, navigation), the Corps structured the Feasibility Study process to involve participation of the entire region.

The Draft FR/EIS and its appendices were released for public review and comment in December 1999. The Draft FR/EIS synthesized the biological, environmental, engineering, and economic information and evaluation to allow for a comparison between four selected alternatives.

The comment period on the Draft FR/EIS began December 1999 and extended through April 30, 2000. Formal public meetings were conducted in conjunction with the Federal Caucus (representatives from Federal agencies with interests in salmon recovery efforts) after the Draft FR/EIS was distributed for public review (see 2002 LSR ROD, Section 5.4). Oral and taped comments (over 9,000 participants), and written comments (over 230,000 written comment documents) were received during the comment period.

The Corps announced the release of the Final FR/EIS and its 21 appendices on March 1, 2002, by publishing a Notice of Availability (NOA) in the Federal Register. The Final FR/EIS incorporates evaluation of additional data, comments, and other information gathered since release of the draft document.

The Final FR/EIS combines the format of a traditional Corps feasibility planning document and a NEPA EIS. The FR/EIS and associated technical appendices provide: 1) a complete presentation of study results and findings; 2) compliance with applicable statutes, executive orders, and policies; 3) a sound and documented basis with which both Federal and regional decision makers can judge the recommended solution; 4) scope, schedule, budgets, and technical performance requirements for the implementation of the selected alternative; and 5) documentation for subsequent funding for the implementation of specific measures associated with the preferred alternative (recommended plan).

During the development of this 2002 LSR ROD, the Corps considered all comments and new information received between the March 2, 2002, NOA in the Federal Register and the signing of this 2002 LSR ROD.

1.4 FCRPS Biological Opinions

Numerous studies and decision documents have been prepared by the Corps and other FCRPS operating and resource agencies that address salmon recovery and improved conditions for salmon survival. Important documents that provide specific background to this study on the lower Snake River include the *Columbia River Salmon Flow Measures Options Analysis (OA) EIS (1992)*, the *Corps Interim Columbia and Snake River Flow Improvement Measures for Salmon Final Supplemental EIS (1993)*, and the *Final Columbia River System Operation Review EIS (1995)*. The FR/EIS tiers off previous studies and was prepared directly in response to the requirements outlined in the NMFS 1995 and 1998 Biological Opinions and the USFWS 1995 Biological Opinion.

With the listing of Snake River salmon and steelhead species under the ESA in 1991, 1992, and 1997, the Corps' existing programs of structural modification and flow augmentation for the benefit of anadromous fish focused on modifying the structures and operation of the Lower Snake River Project to avoid jeopardizing listed species and adversely affecting critical habitat. In the NMFS 1995 Biological Opinion, the Corps was asked to examine options for improving juvenile salmon survival in the lower Snake River to include breaching the four lower Snake River dams (Lower Granite, Little Goose, Lower Monumental, and Ice Harbor) by 1999.

In 1999, NMFS listed six additional populations of anadromous fish and USFWS listed one additional resident fish species pursuant to the ESA. System configuration changes have been made and operation of the FCRPS has been modified relative to that which existed in 1995. Finally, additional information has become available since 1995 concerning the species covered by the NMFS 1995 and 1998 Biological Opinions and the USFWS 1995 Biological Opinion.

In response, the action agencies (Corps, Bureau of Reclamation (BOR), and Bonneville Power Administration (BPA)) reinitiated consultation. On December 21, 1999, the action agencies submitted to NMFS and USFWS the *Multi-Species Biological Assessment of the Federal Columbia River Power System* (1999 Multi-species BA). The 1999 Multi-species BA proposed operations that had been developed as part of the NMFS 1995 and 1998 Biological Opinions, and included a status of its examination of alternatives for the lower Snake River dams. It also proposed a conceptual framework that would establish performance measures for the FCRPS, prioritize actions, measure results, and experimentally manage to help resolve key uncertainties.

A *Biological Opinion on Effects to Listed Species from Operations of the Federal Columbia River Power System* (USFWS 2000 Biological Opinion) was issued by USFWS on December 20, 2000. The NMFS 2000 Biological Opinion was issued by NMFS on December 21, 2000, on the *Reinitiation of Consultation on Operation of the Federal Columbia River Power System, Including the Juvenile Fish Transportation Program, and 19 Bureau of Reclamation Projects in the Columbia Basin*. By letter dated January 25, 2001, USFWS amended its opinion to correct some editorial mistakes, omission of an analysis of anticipated take, and added terms and conditions. Critical habitat has been designated for 12 anadromous species and the NMFS 2000 Biological Opinion "reasonable and prudent alternative" (RPA) concluded that the actions detailed did not destroy or adversely modify designated critical habitat for all listed anadromous species. The USFWS had not designated critical habitat for the Kootenai River white sturgeon and bull trout at the time of issuance of the USFWS 2000 Biological Opinion; therefore, USFWS did not analyze critical habitat. On September 6, 2001, however, critical habitat was published by the USFWS for Kootenai River white sturgeon. Along with the completion of the biological opinions, a *Conservation of Columbia Basin Fish: Final Basinwide Salmon Recovery Strategy* (December 2000) was developed by several Federal agencies, including the Corps. It is a comprehensive, long-term strategy to restore threatened and endangered salmon and steelhead throughout the Columbia-Snake River Basin of the Pacific Northwest. This strategy outlines specific actions to be taken by the Federal government and proposes additional actions for tribal, state, and local governments which, together, are intended to lead to recovery of 12 anadromous fish species. The strategy also considers other listed species such as bull trout and sturgeon. The biological goals are to halt the decline in salmon populations within 5 to 10 years and establish increasing trends in abundance within 25 years. The Corps supports the goals of the strategy. In implementing the biological opinions, the Corps will contribute to attainment of these goals. This 2002 LSR ROD deals with one segment (i.e., the Lower Snake River Project) of the Corps' efforts toward attainment of those goals. The lower Snake River species addressed in the NMFS 2000 Biological Opinion and the USFWS 2000 Biological Opinion and their status are shown in Table 1.

Table 1. Status of Threatened, Endangered, and Candidate Lower Snake River Species

Anadromous Fish (NMFS oversight species):		
Snake River sockeye salmon	*Oncorhynchus nerka*	Endangered
Snake River spring/summer Chinook salmon	*Oncorhynchus tshawytscha*	Threatened
Snake River fall chinook salmon	*Oncorhynchus tshawytscha*	Threatened
Snake River steelhead	*Oncorhynchus mykiss*	Threatened
Resident Fish, Wildlife, and Plants (USFWS oversight species):		
Bull trout	*Salvelinus confluentus*	Threatened
Oregon spotted frog	*Rana pretiosa*	Candidate
Bald eagle	*Haliaeetus leucocephalus*	Threatened, Proposed for delisting
Grizzly bear	*Ursus arctos*	Threatened
Gray wolf	*Canis lupus*	Endangered
Canada lynx	*Lynx canadensis*	Threatened
McFarlane's four o'clock	*Mirabilis macfarlanei*	Threatened
Water howellia	*Howellia aquatilis*	Threatened
Ute's ladies tresses	*Spiranthes diluvialis*	Threatened
Howell's spectacular thelypodium	*Thelypodium howellii var. spectabilis*	Proposed
Basalt daisy	*Erigeron basalticus*	Candidate

The action area for the NMFS 2000 Biological Opinion encompasses the mainstem Columbia from Libby and Hungry Horse Dams in Montana, the mainstem Snake River, up to the Hells Canyon Dam and down to and including the estuary and plume (nearshore ocean) of the Columbia River.

The NMFS 2000 Biological Opinion, like some of the previous opinions, includes an RPA. The RPA establishes performance standards that would avoid jeopardizing the continued existence of listed species or adversely modifying their critical habitat. These standards are established in three tiers including:

- Population-level: needed for the listed population to achieve an adequate likelihood of survival and recovery.
- Life-stage specific: needed across the lifecycle to achieve the population level performance standards.
- Categorized action in habitat, harvest, hatcheries, and hydropower. These standards are applicable to all activities in the specific category and are intended to achieve the life-stage-specific performance standards.

The categorized performance standards in hydropower are very focused on operations of Federal dams on the Columbia and Snake rivers. The full details of the standards are presented in Sections 6.1 and 9.7 and Appendix D of the NMFS 2000 Biological Opinion.

The RPA in the NMFS 2000 Biological Opinion includes nearly 200 action items that are part of the overall approach for the FCRPS to meet the performance standards. Many of these actions are specifically aimed at improving passage survival of juvenile and adult salmonids through the four dams and reservoirs on the lower Snake River. The RPA also includes an annual and multiyear planning process to refine, implement, evaluate, and adjust ongoing efforts to achieve performance standards.

The Corps concurs with NMFS' determination that the integrated operation of the FCRPS by the three action agencies, in a manner consistent with the NMFS 2000 Biological Opinion, will avoid jeopardy to listed anadromous fish stocks and lead to the survival and recovery of the listed species. The Corps also concurs with USFWS' determination that the integrated operation of the FCRPS by the three action agencies, in a manner consistent with the USFWS 2000 Biological Opinion and, as further described below, will avoid jeopardy to listed Kootenai River white sturgeon and bull trout and will ensure the survival and recovery of the listed species. The Corps also concurs that the operation of the FCRPS would not likely adversely affect the other listed species (see Table 1) under USFWS jurisdiction.

The Corps will rely on the annual and 5-year plans as the mechanism to implement the action items in the recommended plan (preferred alternative) described in the FR/EIS. The majority of the structural and operational items included in the recommended plan (preferred alternative) are addressed in the RPAs of the NMFS and USFWS 2000 Biological Opinions. Implementation of actions is dependent upon receiving adequate funding, completing appropriate engineering designs and prototype tests, obtaining favorable test conditions (weather and available fish), and engaging the region on the priority of each action. For instance, the level of funding from Congressional appropriations for general construction activities or from the BPA for certain operations and maintenance activities is uncertain from year to year. Appropriate modifications to the actions and/or performance standards would be made as new scientific information is gathered, as activities are prioritized given available funding, and as progress is made on biological and engineering designs. The Corps is committed to perform research, monitoring, and

evaluation to resolve uncertainties and evaluate the effects of actions within the scientific framework and provide the basis for evaluation and adaptive management. Decisions will be based on determinations of ESA compliance made by NMFS and USFWS in response to the Action Agencies' 1- and 5- year plans.

The Corps and the other action agencies may reinitiate Section 7 consultation if NMFS and/or USFWS make a determination through the annual planning process or at the check-in milestones that there is not timely or sufficient progress to avoid jeopardizing listed species, or the status of one or more of the listed species has changed materially for the worse. Consultation must be reinitiated if the amount or extent of taking specified in the incidental take statement is exceeded or is expected to be exceeded, if new information reveals effects of the action may affect listed species in a way not previously considered, if the action is modified in a way that causes an effect on listed species that was not previously considered, or if a new species is listed or critical habitat is designated that may be affected by the action. The Corps may also reinitiate consultation based on new scientific information or after making a determination that the conditions have changed from the assumptions and judgment used during the current consultation.

An ESA FCRPS consultation history of the last 10 plus years is provided in Attachment D. The 2001 ROCASOD is the Corps' notification to NMFS and USFWS of its decision to implement actions in the biological opinions in accordance with 50 Code of Federal Regulations (CFR) Part 402.15.

2. Affected Projects and Programs

The Feasibility Study is concerned with actions for improving juvenile salmon and steelhead passage at the Corps' four FCRPS dams on the lower Snake River. The four lower Snake River dams are Lower Granite (River Mile 107.5), Little Goose (River Mile 70.3), Lower Monumental (River Mile 41.6), and Ice Harbor (River Mile 9.7). (See Figure 1). The dams became operational between 1961 and 1975.

The Lower Snake River Project was constructed and is operated and maintained under laws that may be grouped into three categories: 1) laws initially authorizing construction of the project (i.e., Public Law 79-14); 2) laws specific to the project passed subsequent to construction; and 3) laws that generally apply to all Corps projects. Using these and other authorities, the Corps operates these multiple-use water resource development projects to meet the authorized project uses and other statutory and regulatory responsibilities. This operation is coordinated with BPA, BOR, and other regional interests. The authorized uses of the Lower Snake River Project are power generation, inland navigation, fish and wildlife, irrigation, water supply, and recreation. See Attachment B, Project Uses for more information.

Figure 1. Columbia River Basin

2.1 Lower Snake River Project

The dams became operational between 1961 and 1975. The four dams are all run-of-river facilities, which means that they have limited storage capacity in their reservoirs and pass water through the dam at about the same rate as it enters the reservoir. All four of these dams are multiple-use facilities that provide navigation, hydropower, irrigation, recreation, water supply and fish and wildlife conservation benefits. These dams were not built to control floods. Storage reservoirs, such as the Dworshak Reservoir on the North Fork of the Clearwater River, are used to store water and adjust the river's natural flow patterns. The normal operating ranges and usable storage volumes for the affected four lower Snake River facilities are listed in Table 2.

Table 2. Characteristics of the Four Lower Snake River Facilities

Facility	Type of Facility	Snake River Mile	Reservoir Name	Reservoir Capacity 1/ (acre-feet)	Total Reservoir Capacity (acre-feet)	Reservoir Elevation 1/ (NGVD29)
Lower Granite	run-of-river	107.5	Lower Granite Lake	49,000	483,800	733 to 738
Little Goose	run-of-river	70.3	Lake Bryan	49,000	565,200	633 to 638
Lower Monumental	run-of-river	41.6	Lake Herbert G. West	20,000	432,000	537 to 540
Ice Harbor	run-of-river	9.7	Lake Sacajawea	25,000	406,500	437 to 440

1/ normal operating range
NGVD29 = National Geodetic Vertical Datum
Source: Table ES-1, Final FR/EIS

The four lower Snake River dams were designed with features to aid the migration of both juvenile and adult fish. In the last 25 years, the Corps has consistently investigated and adopted new technologies for maximizing the number of fish that safely pass the dams in both directions. Successful features of the current program for fish passage at the lower Snake River dams include adult fish ladders, juvenile bypass systems, spillways, and the fish transportation program. Since 1996, according to NMFS research, the cumulative survival for adult salmon through all four lower Snake River dams and reservoirs ranges from 92 to 98 percent. The average survival of juvenile spring chinook salmon and steelhead is in the high 80 to 90 percentile range, where the juvenile fall chinook salmon average survival has been lower due to their life history ranging from 50 to 80 percentile. (NMFS 2000 Biological Opinion). Cumulative survival for juvenile spring chinook salmon through all four lower Snake River dams and reservoirs is over 80 percent.

Under the Corps' current program for aiding juvenile salmon, the Corps, in coordination with NMFS, manages juvenile fish passage to "spread the risk." This spread-the-risk approach affects the number of fish that pass through the Lower Snake River Project in the river versus those that are diverted and transported below Bonneville Dam by barge or truck. Currently, about 50 to 65 percent of all fish traveling through the lower Snake River are diverted and collected for transport. The remainder of the fish migrate in the river. The percentage varies throughout the season based on fish manager recommendations. For instance, in the late summer when the fall chinook run is going through the river system at the warmest time of the year, NMFS recommends transporting all these fish. This spread-the-risk approach is used because there is some uncertainty regarding the long-term positive and negative effects of both in-river migration and barge/truck transportation. Until critical uncertainties are resolved, the spread-the-risk strategy ensures that no inadvertent reduction in survival occurs by favoring one approach over another.

2.2 Juvenile Salmon Transportation Program

The Corps plans to transport in accordance with the NMFS 2000 Biological Opinion criteria and existing ESA Section 10 Permit. This includes transportation of all juvenile fish collected at Lower Granite, Little Goose, and Lower Monumental in the spring and transportation of all juvenile fish collected at the these Snake River projects and McNary Dam in the summer. The Corps, in conjunction with fish managers, considers the existing biological information and runoff conditions in making decisions on the amount, location, and timing of the overall juvenile transportation program as part of an adaptive management approach. In low runoff years, the

Corps considers this program to be one of the options that would increase overall system survival of migrating juvenile salmonids.

2.3 Columbia River Fish Mitigation Program

The Columbia River Fish Mitigation Program (CRFMP) was initiated in 1988 to focus efforts on finding ways to improve these systems as part of the continuing mitigation for construction of the dams. Changes such as improvements to attraction flows for the adult fish ladders and extended-length guidance screens for juvenile bypass systems have been made, and more are being studied and implemented.

Much of the current emphasis is on improving juvenile fish passage at the dams. Existing bypass systems make use of large submerged screens placed in front of the powerhouse turbine intakes to intercept juvenile fish as they dive toward the turbine intakes and guide them through bypass channels. The fish are then either released back into the river below the dam or collected for transport by barge or truck to be released at a point below the remaining dams. Several of the dams now have new, larger (40-foot as opposed to the standard 20-foot) screens, which increase guidance efficiency by about 20 percent. Spill is another way to move juvenile fish through the dams; water and fish are diverted through the dam spillway rather than through the powerhouse.

2.4 Phase II Dissolved Gas Abatement Program

The Dissolved Gas Abatement Study was initiated in 1994 to examine potential methods for reduction of total dissolved gas (TDG) produced by spillway operations on the Corps' eight dams on the lower Snake and Columbia Rivers. The study was also called for in the NMFS 1995 Biological Opinion. Ten structural alternatives were evaluated. The final report for Phase II was completed May 2002. Recommendations from this program are being implemented as part of the recommended plan (preferred alternative) in the FR/EIS.

2.5 Anadromous Fish Evaluation Program

The Corps Northwestern Division, has sponsored biological studies continuously since 1952 in an integrated, applied research program to better understand and improve anadromous fish passage conditions at its multi-purpose facilities on the lower Snake and Columbia Rivers. The monitoring, research, and evaluation studies are managed under the Anadromous Fish Evaluation Program (AFEP) and are funded through the CRFMP and the operating budgets of current facilities. The AFEP is coordinated with Federal, state, and tribal fish agencies who provide both technical and policy level input to the Corps on study objectives, experimental design, and methodologies.

2.6 Water Quality Plan

In conjunction with the other Federal agencies, tribes, states, public utility districts and other entities, the Corps is committed to development and implementation of a water quality plan (included as Appendix B of the NMFS 2000 Biological Opinion) to address Clean Water Act (CWA) objectives. The geographic scope of this plan is broader than the FCRPS and the lower Snake River and would include additional actions to improve mainstem water quality by reducing TDG and temperature. See Attachment E, Clean Water Act History.

2.7 Dredged Material Management Program

The Corps, Walla Walla District's Dredged Material Management Plan/Environmental Impact Statement (DMMP/EIS) is a programmatic plan to maintain the authorized navigation channel in

the lower Snake River reservoirs between Lewiston, Idaho, and the Columbia River, and McNary Lock and Dam reservoir on the Columbia River for 20 years after the DMMP/EIS Record of Decision is signed; maintain limited public facilities within the reservoirs, such as recreational boat basins and irrigation intakes for the wildlife habitat management units; manage dredged material from these reservoirs, including beneficial uses for habitat creation; and maintain flow conveyance capacity at the most upstream extent of the Lower Granite Lake for the remaining economic life of the project (to year 2074). The Draft DMMP/EIS was distributed for public review in November 2001. The Final DMMP/EIS was released in July 2002.

2.8 Payos Kuus Cuukwe Cooperating Group

The Payos Kuus Cuukwe Cooperating Group was developed as a result of recommendations stemming from the Columbia River System Operation Review (SOR). Funding is expended annually to address resources in the FCRPS under Corps jurisdiction. The Payos Kuus Cuukwe is the Walla Walla District's cooperative working group that makes recommendations to the Corps concerning management of cultural resources. The cooperative working group is composed of representatives of the Walla Walla District, BPA, and affected tribes. State Historic Preservation Office representatives periodically participate.

3. Alternatives Considered

The four alternatives that are evaluated in detail in the FR/EIS are:

- Alternative 1 - Existing Conditions
- Alternative 2 - Maximum Transport of Juvenile Salmon
- Alternative 3 - Major System Improvements (Adaptive Migration)
- Alternative 4 - Dam Breaching

A brief description of the components of the alternatives is provided here. Figure 2 displays those existing system operations, which would occur with each of the four alternatives.

3.1 Alternative 1 - Existing Conditions

Alternative 1 - Existing Conditions consists of continuing the operation of the fish passage facilities and project operations that were in place or under development at the time that this FR/EIS was initiated. Operations under Alternative 1 - Existing Conditions would continue to meet the authorized uses of the Lower Snake River Project. In addition to the structural changes that would be implemented (e.g., additional barges for transporting juvenile fish, new turbine cams and runners, and upgraded Lower Granite juvenile fish facilities), it is assumed that flow augmentation would continue. Project operations - including all ancillary functions such as fish hatcheries and Habitat Management Units (HMUs), recreation facilities, power generation, navigation, and irrigation--would remain the same, unless modified through future actions. Alternative 1 - Existing Conditions would include the spread-the-risk strategy for downstream juvenile fish passage using existing or currently planned facilities. This alternative is the base case or "no action" alternative considered in this NEPA process.

3.2 Alternative 2 - Maximum Transport of Juvenile Salmon

All of the existing or planned structural configurations and flow augmentation of 427 thousand acre-feet from the existing conditions would be included in this alternative. However, this alternative assumes that the juvenile fish transportation systems would be operated to maximize

fish transport and that voluntary spill would not be used to bypass fish through the spillways (except at Ice Harbor). To accommodate maximum transport of juvenile salmon, measures would be used to maintain, upgrade, and significantly improve fish facilities that would focus on limiting in-river migration.

3.3 Alternative 3 - Major System Improvements (Adaptive Migration)

The Corps has selected Alternative 3 as the recommended plan (preferred alternative). This alternative has been modified slightly since the Draft FR/EIS to provide more of a focus on adaptive migration, reflecting the strategies in the NMFS 2000 Biological Opinion. Adaptive migration is an approach that provides greater flexibility to switch between in-river migration and barge or truck transportation as conditions require and as new information becomes available.

Alternative 3 - Major System Improvements (Adaptive Migration) assumes that juvenile fishway systems would be operated under an adaptive migration strategy that balances the passage of fish between in-river and transport (via barge or truck) methods. It would allow the flexibility for implementing operational changes within a migration season, if necessary. This alternative would include all of the existing or planned structural configurations from Alternative 1 - Existing Conditions and Alternative 2 - Maximum Transport of Juvenile Salmon. For example, spillway flow deflectors and pier extensions would be used to help lower TDG concentrations. In addition, Alternative 3 - Major System Improvements (Adaptive Migration) would include major system improvements that would provide a greater ability and more options to better adjust migration approaches (i.e., either in-river or transport).

Operations under Alternative 3 - Major System Improvements (Adaptive Migration) would include applicable activities prescribed in the 1995, 1998, and 2000 Biological Opinions to improve juvenile fish passage conditions. Alternative 3 would incorporate several recently developed and/or tested technological improvements to increase survival through the Lower Snake River Project. Figures illustrating the surface bypass collector (SBC), behavioral guidance structure (BGS), removable spillway weir (RSW), and technology for reducing TDG are provided in Section 2.1 of the FR/EIS. Even though survival rates through the Lower Snake River Project dams are improved, prototype systems of the SBC, BGS, and RSW have been tested at Lower Granite Dam to see if survival and passage conditions can be increased. Preliminary tests indicate increased fish passage efficiency through a combined system, including submerged screens. Development of additional system technologies is one of the measures recommended in the NMFS 2000 Biological Opinion.

3.4 Alternative 4 - Dam Breaching

Dam breaching would create a 140-mile stretch of river with near-natural flow by removing the earthen embankment section of each dam and eliminating the reservoirs at all four lower Snake River dams. The powerhouses, spillways, and navigation locks would not be removed, but would no longer be functional. All facilities for transporting fish would cease to operate, as would hydropower operation. The navigation locks would no longer be operational, and navigation for commercial and large recreation vessels would be curtailed. Similarly, recreation opportunities, operation and maintenance of hatcheries and HMUs, and other activities associated with the modification from a reservoir environment to an unimpounded river in the lower Snake River would entail important changes. Under Alternative 4 - Dam Breaching, some water quality conditions such as TDG concentrations, would likely be at or near natural conditions. However, other conditions such as water temperature, would still be affected by upstream conditions or releases.

Figure 2. Lower Snake River Juvenile Salmon Migration Feasibility Study, Alternatives Matrix

	Alternative 1 - Existing Conditions	**Alternative 2** - Maximum Transport	**Alternative 3** - Major System Improvements (Adaptive Migration)	**Alternative 4** - Dam Breaching
Existing System Operations				
Adult Fish Passage Systems				
Fish Ladders	√	√	√	
Pumped Attraction Water Supplies	√	√	√	
Powerhouse Fish Collection Systems	√	√	√	
Juvenile Fish Bypass and Collection Systems				
STS – IHR, LMO	√	√	√	
ESBS – LGO, LGR	√	√	√	
Collection and Transportation Facilities	√	√	√	
Trash Shear Boom	√	√	√	
Minimum Operating Pool – During Fish Migration	√	√	√	
Turbine Operations – Within 1 percent Peak Efficiency	√	√	√	
Voluntary Spill				
Current Operations	√			
Minimize Operations – IHR Only		√		
Optimize Operations			√	
No Spill				√
Flow Augmentation (Dworshak)	√	√	√	√
Flow Augmentation (Upper Snake River) – 427,000 acre feet	√	√	√	√
Dissolved Gas Abatement Measures				
Spillway Gas Control Measures (Deflectors)	√	√	√	
Spillway Gas Monitoring	√	√	√	
Continue Fish Facility Operations	√	√	√	
Continue AFEP Evaluations	√	√	√	
Power				
Current Production	√		√	
Increased Production		√		
No Production				√
Navigation				
Current Operations	√	√	√	
No Operations				√
Fish Transportation				
Spread-the-Risk	√			
Optimize Transportation			√	
Maximize Transportation		√		
No Transportation				√

STS submerged traveling screen
ESBS extended submerged bar screen
IHR Ice Harbor Dam
LMO Lower Monumental Dam
LGO Little Goose Dam
LGR Lower Granite Dam
AFEP Anadromous Fish Evaluation Program

4. Recommended Plan (Preferred Alternative)

4.1 Description of the Recommended Plan

Based on a thorough examination of the best available biological, economic, social, environmental, and other related information, the Corps has selected a recommended plan (preferred alternative). The recommended plan (preferred alternative) is a modified version of Alternative 3 - Major System Improvements (Adaptive Migration), with increased focus on adaptive migration capabilities. The alternative analysis and evaluation of impacts summarized in this document and described in detail in Chapter 5 of the Final FR/EIS include all components or actions contained in the recommended plan (preferred alternative). Sensitivity and trade-off analyses were conducted and considered for each alternative.

The recommended plan (preferred alternative) combines a series of the structural and operational measures described and evaluated in the FR/EIS for Alternative 3 - Major System Improvements (Adaptive Migration) that are intended to improve fish passage through the four lower Snake River dams. This alternative provides the maximum operational flexibility for juvenile fish passage, it optimizes in-river passage when river conditions are best for fish, and it optimizes the juvenile transportation program when that operation is best for fish. It also allows for optimized combined passage when necessary for spread-the-risk operation or to conduct needed research. These improvements are not only intended to reduce direct mortality associated with dam passage, but also to reduce stress on juvenile fish, reduce TDG, and improve operational reliability.

4.2 Plan Selection Rationale

The rationale for selecting the recommended plan (preferred alternative) is a composite of analyses, information briefings, evaluations, technical expertise, and comments concerning the factors evaluated as part of the Feasibility Study. The selection of the recommended plan (preferred alternative) resulted from the evolution and development of the extraordinary collection of scientific data and information presented in the FR/EIS, its associated appendices, and supporting research materials and reports. Although not without uncertainties, the Corps believes the information collected represents the best available science and information to date.

4.2.1 Key Selection Factors

The key factors supporting the selection of this alternative were:

- Compatibility with NMFS and USFWS 2000 Biological Opinions.
- Improvements to the juvenile and adult salmon and steelhead survival rates through the Lower Snake River Project.
- Proposed improvements provide the maximum flexibility of all alternatives in terms of optimizing both in-river migration conditions and transport conditions.
- Lesser magnitude of uncertainty in current biological information.
- Minimizes economic impacts to users.
- Minimizes effects to other environmental resources.

Environmental resources and other factors considered in this selection include, but were not limited to, those effects associated with social and community resources, Tribal/Trust responsibilities, air quality, water resources and quality, resident fish, wildlife, vegetation,

technical feasibility, effectiveness of structural modifications, regional acceptability, public comments, length of implementation, and cumulative impacts.

The structural and operational measures identified for the recommended plan (preferred alternative) are considered to be technically feasible, indicating that the Corps has the capability to design, construct, and operate these measures.

See the FR/EIS Chapter 6 and the supporting documentation for information on each of these and other measures related to implementing the selected alternative.

4.2.1.1 Compatibility with NMFS and USFWS 2000 Biological Opinions

One of most critical factors in selecting an alternative was how it fits with the region's ongoing recovery strategy regarding salmon and other listed species. This strategy is reflected in the NMFS and USFWS 2000 Biological Opinions, which set forth recommended RPA measures for the action agencies to implement. The FR/EIS alternatives were evaluated for consistency with the RPA action items and the NMFS and USFWS Biological Opinions, in general.

Of the alternatives evaluated in the FR/EIS, the recommended plan (preferred alternative) is aligned and consistent with the measures in the NMFS 2000 Biological Opinion on the FCRPS for the Lower Snake River Project.

4.2.1.2 Improvements to Juvenile and Adult Salmon and Steelhead Survival Rates through the Lower Snake River Project

Survival rates through the Lower Snake River Project vary depending on the species, in river conditions, transportation conditions and various other factors. The in-river survival rates for juvenile spring/summer chinook salmon and steelhead in the Lower Snake River Project are high. Whereas the Snake River fall chinook salmon survival has remained relatively low with in-river passage, which is why transport is maximized for this species.

Alternative 3 – Major System Improvements (Adaptive Migration) incorporates actions to improve survival and perhaps reduce stress in juvenile salmon and steelhead. These improvements were considered within the overall recovery strategy of the NMFS 2000 Biological Opinion. Even though there are improvements in the (1994 to 1999) survival rates averaging 59 to 79 percent (83 to 99 percent per dam) for spring/summer chinook salmon, 8 to 42 percent (34 to 92 percent per dam) for fall chinook salmon, and 62 to 77 percent (81 to 97 percent per dam) for steelhead through this part of the lower Snake River (NMFS 2000 Biological Opinion, Table 6.2-7), future structural efforts to improve the migration in the hydro-system corridor alone are not expected to reverse the overall decline of the listed species. The Cumulative Risk Initiative (CRI) matrix analyses used by NMFS indicate the improvements in in-river survival cannot, by themselves, reverse population declines in Snake River spring/summer chinook salmon. If any one of the considered hydropower alternatives is to reverse the population decline in Snake River spring/summer chinook salmon by itself, it would have to result in the survival of roughly an additional 5 to 10 percent of smolts to offset those that are currently dying in the estuary. The Corps is currently testing structural modifications to these lower Snake River dams (i.e., BGS and RSW) that have the potential to improve the passage over spillways. The planned improvements are expected to improve survival and assist in recovery.

The Plan for Analyzing and Testing Hypotheses (PATH) analyses suggest that breaching is more likely than any other change in the hydropower system to meet survival and recovery criteria for the listed species across the widest range of assumptions and scenarios; however, the PATH analyses did not determine whether breaching is necessary and/or sufficient for recovery. Under current conditions, focusing on reductions in mortality in the estuarine environment, or in the first year of life, may be more productive.

4.2.1.3 Proposed Improvements Provide the Maximum Flexibility of all Alternatives in Terms of Optimizing Both In-river Migration Conditions and Transport Conditions

The improvements incorporated into Alternative 3 - Major System Improvements (Adaptive Migration) were formulated to provide flexibility to either keep juvenile fish in river or transport by:

- Maximizing operational flexibility by optimizing in-river migration conditions and collection and transport conditions.
- Improving the operational reliability of juvenile and adult fish passage facilities
- Reducing detrimental effects of TDG on juveniles by reducing the volume of voluntary spill.

There are several new design technologies and features that are included in the Corps' recommended plan (preferred alternative) for improved juvenile passage. Among these are Behavioral Guidance Structures (BGSs) and Surface Bypass Collectors (SBCs) with dewatering to allow for collection and transport at Lower Granite and Lower Monumental Dams. These passage structures, along with Removable Spillway Weirs (RSWs), have the potential to improve juvenile fish passage survival and may be necessary to obtain the maximum amount of flexibility in the system to provide for optimal passage conditions. Recent transport research has shown a trend whereby fish that migrate in river tend to return at higher rates during the early part of the out-migration, while fish transported later in the season tend to have a higher survival rate than in-river migrating fish. During times when in-river migration is the best strategy, it is desirable to have a bypass system that will pass a relatively large percentage of fish with a comparatively small amount of water. During times when in-river migration is desired, the SBC would be shut off and used, along with the BGS, as a powerhouse occlusion device to direct fish to an RSW for passage to the tailrace. When maximum transport is desired, an SBC would be used, along with the existing turbine intake screen system, to maximize collection for transport.

Installation of the RSW is projected for two spillway bays of all four lower Snake River dams (dependent upon future research on the effectiveness of these structures) to provide in-river passage when desired. The RSW concept is being tested at Lower Granite Dam in 2002. If tests are positive, the RSW will pass a large percentage of fish with a relatively small percentage of water. This will result in reduced dissolved gas levels in the river during periods of low to moderate flows in the spring. Fish passed over an RSW may also experience less stress and forebay delay than those passed through conventional spillways or bypass systems. The RSWs at Lower Granite, Little Goose, and Lower Monumental would be used only when in-river migration is desired (or when spread-the-risk strategy is being employed). The RSW at Ice Harbor Dam would be used during most or all of the out-migration because there is no provision for collection and transportation at Ice Harbor Dam.

4.2.1.4 Lesser Magnitude of Uncertainty in Current Biological Information

There is a high level of biological uncertainty associated with the biological modeling information available. This magnitude of uncertainty was a key factor in the selection process. The NMFS discussed the uncertainties in Appendix A, Anadromous Fish Modeling, of the FR/EIS. This section describes a few of the uncertainties that are considered to be critical. The PATH and CRI analyses highlight differential delayed transportation mortality and extra mortality as critical uncertainties in the analyses. The efficiency of dam breaching for spring/summer chinook salmon is strongly affected by these two uncertainties. Dam breaching eliminates smolt transport from the Lower Snake River Project, so differential delayed

transportation mortality would not exist. Extra mortality would likely persist with breaching and the out-migrant population would be much more susceptible to seasonal flows and other factors.

The CRI analysis also highlighted an additional suite of critical uncertainties due to lack of data, including the possibility of attaining increased productivity with habitat management and of enhancing survival via improved hatchery practices and the control of salmonid predators. This analysis emphasized that, apart from uncertainty about the effectiveness of different management actions, there is also uncertainty about the status and trend of wild salmon populations. The reason for this uncertainty involves the contribution hatchery fish make to recruits located in the natural spawning grounds.

There are a number of possible impacts associated with breaching that should be further addressed if dam breaching is re-evaluated. These impacts include the effect on juveniles migrating through the lower Snake River during the same time that large amounts of sediments may also be present due to breaching. The amount of resuspended sediment may also affect adults returning to spawn. The effect of the proposed short-term trap-and-haul program (during dam breaching construction) on the survival of returning adults is yet another uncertainty.

4.2.1.5 Minimizes Economic Impacts to Users

The evaluation of alternatives required a thorough assessment of the costs and benefits associated with each alternative. The most common areas of economic discussion relate to the loss of hydropower production, loss of navigation, loss of water supply, and the projected increase of recreational opportunities under a Alternative 4 - Dam Breaching. These and other impacts are discussed in more detail in Chapter 5 of the FR/EIS. The recommended plan (preferred alternative) was determined to minimize the net economic impacts in these areas. In addition, the Basinwide Recovery Strategy, prepared by the Federal Caucus, references breaching on the Lower Snake River Project and states:

> ". . . its high cost could preclude other actions needed throughout the basin. The option of Snake River drawdown ranks as a lower priority than other available options because of the likely long time to implement, narrow benefits, biological uncertainties, and high costs."

4.2.1.6 Minimizes Effects to Other Environmental Resources

The environmental effects, in addition to effects on anadromous fish, were considered in the selection of the recommended plan (preferred alternative) and are discussed in Section 6.4, Comparison of Alternatives, of the FR/EIS. The Summary Comparison chart in Section 6.4.2 shows a composite of the alternatives compared to the existing conditions. The most controversial environmental resource area relates to water quality. Concerns involve potential sediment-related problems associated with Alternative 4 - Dam Breaching and the current water temperature and TDG conditions in the lower Snake River associated with Alternatives 1, 2, and 3. These areas are individually discussed in Section 6.4.2. There is no single equation or formula that can be used to weigh and consider each of these resource areas. Analyses to achieve the proper balance or comparison were used and the degree to which each resource area is affected (directly, indirectly, or cumulatively) was considered in the selection of the recommended plan (preferred alternative).

4.2.2 Considerations Affecting Decisions and Implementation

The following factors are some of the considerations in addition to the adaptive management framework that the Corps will examine in implementing the actions in the biological opinions. These factors may affect the schedule and scope of the proposed actions, and operational decisions on flows, spill, and juvenile fish transportation.

4.2.2.1 Authorities

Currently, the Corps has authority to implement the actions described in the recommended plan (preferred alternative) for the Lower Snake River Project. However, if any additional action is deemed necessary in the Lower Snake River Project hydropower and habitat sectors, requiring additional authority and/or Congressional direction, the Corps, on a case-by-case basis, will examine the appropriate course of action. This may include preparation of authorizing documents, requests for appropriations, notification to congressional committees, preparation of NEPA documents, or other actions.

4.2.2.2 Emergencies

Unforeseen project emergencies, drought, power reliability, floods, or other natural disasters can occur and may require modifications in operations at Corps projects. The NMFS 2000 Biological Opinion considered there could be low runoff years, which could result in lower in-river survival conditions (NMFS 2000 Biological Opinion, Appendix D, pages D 12 and D 21). The opinion also anticipated situations such as power emergencies, navigation and flood control operations, or other emergencies that would require variation from the operations described in the reasonable and prudent alternative (NMFS 2000 Biological Opinion, page 9-62). Operational measures, including spill, flow objectives, reservoir fill or draft goals, and other actions, may be curtailed if necessary for such emergencies. Action 11 of the RPA in the NMFS 2000 Biological Opinion provides that the action agencies develop procedures for carrying out actions that could not be anticipated in the planning process. The Corps and the other action agencies, in conjunction with NMFS and USFWS, have developed protocols to address emergency situations requiring the Corps to adopt operations different than those measures in the biological opinions. The protocols provide guidance to the Technical Management Team (TMT) to consider the impact to listed fish resulting from the variation. The Corps would consider the effects identified through this process and coordinate with NMFS and/or USFWS in making final decisions on variations to the operations recommended in the biological opinions.

4.2.2.3 Tribal/Trust Responsibilities

The sovereign status of Native American tribes has long been recognized. Principles outlined in the Constitution, treaties, Federal statutes, regulations, and executive orders continue to guide national policy towards Native American nations. Working within a government-to-government relationship with Federally recognized tribes, agencies consult, to the extent practicable and permitted by law, with tribal governments; assess the impact of agency activities on resources; ensure that tribal interests are considered before the activities are undertaken; and remove procedural impediments to working directly with tribal governments on activities that affect the rights of the tribes.

This relationship recognizes that tribal governments are sovereign entities with rights to set their own priorities, develop and manage tribal resources, and be involved through the consultation process in Federal decisions or activities that have the potential to affect these rights. The development of this FR/EIS has included efforts to obtain tribal views of agency responsibilities or actions related to this study, in accordance with provisions of treaties, laws, and executive orders, as well as principles found in the United States Constitution. Several tribal chairs/leaders have met with Corps commanders/leaders with regard to this study. The Corps has also reached out, through designated points of contact, to involve tribes in collaborative processes designed to facilitate information exchange and consideration of various viewpoints. Tribal members have also participated or attended regional forums or meetings where these issues were discussed.

The Corps will comply with the Executive Order on Consultation and Coordination with Indian Tribal Governments. In formulating and implementing policies with regard to the Lower Snake

River Project that have tribal implications, the Corps has taken actions to consult with the affected tribes in this process. In addition, the Corps will work with NMFS and USFWS in their implementation of the Secretarial Order on American Indian Tribal Rights, Federal-Tribal Trust Responsibilities and Endangered Species Act. Attachment F, Tribal Coordination/Consultation, discusses the consultation/coordination efforts made by the Corps during the FR/EIS process.

4.2.2.4 Northwest Power Planning Council

The Corps continues to meet its responsibilities under the Pacific Northwest Electric Power Planning and Conservation Act (Northwest Power Act). Through its consideration of the Northwest Power Planning Council's (NPPC's) Fish and Wildlife Program, the Corps will continue to provide input to the NPPC's periodic review and update. Where the requirements of the biological opinions and NPPC's Fish and Wildlife Program are not consistent, the Corps will continue its dialogue with the NPPC.

4.2.2.5 Columbia River Treaty

The Corps is a member of the U.S. Entity along with BPA and others. The U.S. Entity coordinates the planning and operation of the FCRPS with Canada through a variety of arrangements. Examples include development of assured operating plans and detailed operating plans under the Columbia River Treaty and arrangements with Canada for mutually beneficial non-power uses agreements. To the extent possible, the Corps utilizes these mechanisms to coordinate operations identified in the biological opinions. However, in agreeing to implement the biological opinions or the actions described in this 2002 LSR ROD, the Corps is not relying on specific operations of projects in Canada.

4.2.2.6 Environmental Compliance Documentation

When selecting the recommended plan (preferred alternative) for the Lower Snake River Project, the Corps reviewed its compliance with applicable laws. These laws include, but are not limited to:

- Archaeological Resources Protection Act.
- National Historic Preservation Act.
- Native American Graves Protection and Repatriation Act.
- Clean Air Act.
- Federal Water Pollution Control Act (Clean Water Act).
- Endangered Species Act.
- Fish and Wildlife Coordination Act.
- National Environmental Policy Act.
- Pacific Northwest Electric Power Planning and Conservation Act.
- Migratory Bird Treaty Act.
- Coastal Zone Management Act.
- Safe Water Drinking Water Act.
- Flood Control Act of 1944.
- Magnuson Fishery Conservation and Management Act.
- Wild and Scenic Rivers Act.
- River and Harbors Acts.

- Executive Orders and Council on Environmental Quality (CEQ) Guidelines and Memorandum.
- Other Federal, State, and Local Plans and Laws.

Attachment C, Environmental Documentation, further discusses several of these acts and Corps compliance. Because the ROCASOD addressed 2001 and future years, the Corps does not anticipate issuing RODs on an annual basis to address general or covered specific FCRPS operations. The Corps will consider the available information on the effects of different operations and results of subsequent operations. This ROD addresses actions related to the Lower Snake River Project.

Several of these acts warrant specific discussion in this 2002 LSR ROD. The Corps has considered the effects of certain operations of the FCRPS recommended in the biological opinions. The ROCASOD discusses these operations, including dam and reservoir operations, spill, and a juvenile fish transportation program. In addition, there are other actions in the biological opinions that will require additional environmental compliance prior to implementation. Such actions include a study to consider system flood control changes, implementation of an alternative flood control operation in the upper Columbia Basin (referred to as Variable discharge, or VARQ), actions resulting from the Lower Snake River Juvenile Salmon Migration Feasibility Study, habitat actions and other potential changes to the operation and configuration of the FCRPS.

There are other laws and regulations that the Corps has the responsibility to consider in making decisions on the actions contained in the NMFS and USFWS 2000 Biological Opinions. Such laws and regulations include the Fish and Wildlife Coordination Act; Pacific Northwest Electric Power Planning and Conservation Act; Executive Orders and CEQ Memorandum; Corps regulations; and other Federal, state, and local plans and laws. The Corps has evaluated the Lower Snake River Project hydropower operations described in this 2002 LSR ROD and has considered the effects of those actions in regard to standards or requirements set forth in these laws and regulations in making decisions.

All required Federal coordination has been completed. The recommended plan is in compliance with all laws governing water, air, and land resources including the Clean Water Act, ESA, fish and wildlife requirements, and cultural resources requirements. The Corps will obtain full compliance with NEPA with the completion of this 2002 LSR ROD.

Summaries of certain laws pertaining to the actions being implemented as a result of this Record of Decision are provided in Attachment C, Environmental Documentation; Attachment D, Endangered Species Act; and Attachment E, Clean Water Act.

4.2.2.7 Funding/Appropriations

The Corps prepares a budget request approximately 2 years ahead of actually receiving an appropriation from Congress. The Corps also receives funding from BPA for certain powerhouse improvements as well as for operation and maintenance of project features. The Corps will review the actions in the recommended plan (for preferred alternative) and the biological opinions within the annual budgetary guidance. Based on annual appropriations, the Corps will work through the regional forum with NMFS, USFWS, and other Federal and state agencies and tribes and prioritize the work for that fiscal year.

4.2.2.8 Incidental Take Statement and Conservation Recommendations

The Corps has considered the terms and conditions of the incidental take statements of the NMFS and USFWS 2000 Biological Opinions. The Corps will work with the other action agencies and

intends to implement the measures that are assigned to the Corps. In addition, the Corps will coordinate these measures through the regional forum as explained in Section XIII of the 2001 ROCASOD. If implementation of the terms and conditions is delayed, the Corps, NMFS, and USFWS will determine whether further consultation is required. The Corps will also review the incidental take statement through the 1 and 5 year implementation planning process. The Corps is also considering implementation of the conservation recommendations. The recommended plan (preferred alternative) is consistent with the NMFS and USFWS 2000 Biological Opinions. See Attachment D, Endangered Species Consultation.

4.2.2.9 Best Information and Science Available

As discussed previously, there are substantial uncertainties and controversy in the scientific information regarding the biology, as well as water quality impacts and economics (specifically power, recreation, transportation, and passive use). Negative and positive attributes revolve around two primary areas of uncertainty. These include delayed mortality and sedimentation-related impacts. There is a need for continued study to resolve uncertainties. However, the Final FR/EIS contains the best information available to date and is sufficient to support the selection of Alternative 3 - Major System Improvements (Adaptive Migration) as the recommended plan (preferred alternative).

4.2.2.10 Environmentally Preferable Alternative

In 40 CFR §1505.2 CEQ requires that, in cases requiring EISs, an alternative or alternatives that are considered environmentally preferable should be identified. The objective of the Feasibility Study was to screen and evaluate structural alternative measures and identify measures to improve juvenile salmon migration through the Lower Snake River Project. In addition, the measures taken as a result of the study were intended to assist in the recovery of ESA-listed species.

The Corps believes the alternative identified as the environmentally preferred alternative is the one with the greatest biological benefits and the least environmental impacts. Taking into consideration all the alternatives and the uncertainties in the current science, both Alternative 3 – Major System Improvements (Adaptive Migration) and Alternative 4 - Dam Breaching can be identified as environmentally preferred alternatives. Both of these alternatives have negative and positive attributes and short-term and long-term effects.

Of all the alternatives investigated in the FR/EIS, the recommended plan (preferred alternative) is aligned and is consistent with recommendations in the NMFS 2000 Biological Opinion RPA concerning the Lower Snake River Project. The NMFS 2000 Biological Opinion concluded that dam breaching on the lower Snake River is not necessary at this time, but reserved this action as a contingency management alternative depending upon the findings in the 2005 and 2008 check-in.

In implementing the lower Snake River actions in the NMFS and USFWS 2000 Biological Opinions', the Corps will also contribute to the attainment of the goals identified in the *Conservation of Columbia Basin Fish: Final Basinwide Salmon Recovery Strategy,* December 2000. This strategy was developed by several Federal agencies (including the Corps) and is a comprehensive, long-term plan to recover 12 anadromous fish stocks and other listed species (i.e., bull trout and sturgeon) in the Columbia-Snake River Basin.

4.2.2.11 Other Considerations

Several other factors including, but not limited to, regional participation, implementation duration, short-term uses and long-term productivity, irreversible and irretrievable commitment of resources, short-term and long-term effects, and indirect, direct and cumulative impacts were also considered in this decision-making process. See the FR/EIS for further details.

4.2.2.12 Cumulative Effects

Cumulative impact analyses were considered throughout the FR/EIS. The geographic scope of the Feasibility Study is larger than the Lower Snake River Project area as defined by the direct effect area associated with the four lower Snake River dams and their immediate reservoirs. The footprint for indirect and cumulative impact analyses was not confined to the Lower Snake River Project area and is not necessarily the same for each resource area.

In Section 4 of the FR/EIS, each affected resource is described as to its current condition and history with respect to past and present factors that have contributed to its current status. These factors, taken together, are cumulative effects.

In Section 5 of the FR/EIS, the alternative evaluations incorporate cumulative effects of past, present, and ongoing conditions by presenting the overall impacts that can be expected as a result of implementing each alternative. Section 5.17 of the FR/EIS summarizes the cumulative effects efforts. Annex A of Appendix J, Plan Formulation, of the FR/EIS also presents cumulative effects for each resource area.

4.3 Implementation Plan

4.3.1 Existing System Operations

The implementation of Alternative 3 - Major System Improvements (Adaptive Migration) includes not only the structural and operational measures described below, but also those FCRPS management actions recommended in the NMFS 2000 Biological Opinion RPA that involve the Lower Snake River Project (i.e., flow objectives, spill, minimum operating pool, etc.). A more detailed discussion of the implementation actions at the Lower Snake River Project, which will include the existing system actions plus the additional actions, is described below.

4.3.2 Structural Measures

The structural improvements associated with the recommended plan (preferred alternative) can be placed into two categories. The first category is near-term improvements, consisting of modifications to existing systems using current technology. These require little or no additional study or research. Near-term improvements can be implemented relatively quickly (within the first 5 years after the final ROD is signed). The second category is long-term improvements. These improvements require additional evaluation, prototype development, and testing. Therefore, these improvements take more time to put into place. The actual determination on implementation of these long-term improvements would be contingent on the testing associated with the prototype and evaluation results. Implementation would also be dependent on a continued need for improvements in the hydropower system.

Near-term improvements proposed as part of the recommended plan (preferred alternative) are:

- Complete installation of spillway flow deflectors at Lower Monumental and Little Goose.
- Upgrade auxiliary fish ladder water supply systems at Ice Harbor, Lower Monumental, Little Goose, and Lower Granite.
- Modify extended submerged bar screens at Little Goose and Lower Granite.
- Use additional barges for transport with upgraded mooring facilities at Lower Granite.

Long-term improvements proposed as part of the recommended plan (preferred alternative) are:

- Install new juvenile fish facility at Lower Granite.
- Install new cylindrical dewatering screens at all dams.
- Replace submerged traveling screens with extended-length submerged bar screens at Ice Harbor and Lower Monumental.
- Install new wet separators at Lower Monumental and Little Goose.
- Install turbine improvements (as powerhouses are rehabilitated).
- Install RSW with or without BGS at all four dams.
- Install two-unit powerhouse surface bypass with or without dewatering system at Lower Monumental and Lower Granite.
- Build full-length powerhouse occlusion structure at Little Goose.

4.3.3 Operational Measures

In addition to current operational measures called for in the NMFS 2000 Biological Opinion and contemplated in the FR/EIS such as flow augmentation, spill, operating to minimum operating pool, and continued participation in ongoing monitoring, evaluation, and regional coordination programs, there are two principal areas where potential future operational changes for the lower Snake River need to be further investigated. These areas are:

- Develop and implement biological rules for flow augmentation.
- Develop and implement biological rules for smolt transportation including optimal spill for salmon.

The Corps plans to coordinate with Federal agencies to establish these specific rules for both smolt transportation and flow augmentation. All such operational rule development will continue to be regionally coordinated in a manner consistent with the NMFS 2000 Biological Opinion.

5. Regional Coordination and Public Outreach

5.1 Regional Coordination

Throughout the Feasibility Study process, the Corps committed to working cooperatively with a variety of groups to exchange input and foster understanding. In addition to consulting with NMFS and USFWS on ESA issues and coordinating with the cooperating agencies (EPA, BOR, and BPA) for the Feasibility Study, the Corps convened Regional Roundtable Workshops and technical work groups. The Corps will continue to participate through several avenues to solicit and consider Federal, tribal, state, and public comments on actions being taken to implement the biological opinions.

The Regional Roundtable Workshops were held in Portland, Richland, Clarkston, and Boise to encourage active participation and involvement in the study by the public, special interest groups, and communities.

Technical work groups with representatives from the Corps, cooperating agencies, NMFS, USFWS, the NPPC, Native American tribes, state agencies, academia, and interested organizations and individuals produced some of the analyses conducted for the Feasibility Study. The Drawdown Regional Economic Workgroup (DREW) assembled and analyzed economic and social data through the many work teams. Several open focus meetings were held in the region

that provided preliminary economic work team evaluations on hydropower, transportation, irrigation, and regional and social analysis. The PATH workgroup consisted of regional fisheries biologists who measured projected salmon and steelhead survival and recovery rates.

Additional workgroups of engineers and fisheries biologists designed and tested specific structural changes that could help salmon and steelhead pass safely through the dams. These workgroups were crucial to the Feasibility Study and the Corps' regional coordination effort.

Throughout the Feasibility Study, the Corps also worked with others in the region to develop and analyze alternative management plans for fish and wildlife resources of the entire Columbia-Snake River Basin. Some of the entities involved in related regional salmon recovery efforts include the Federal Caucus, and the NPPC.

5.2 Regional Forums

The Corps will continue to participate to the extent practicable in the NMFS regional forum established to improve coordination of actions identified in the biological opinions (i.e., implementation team (IT), TMT, System Configuration Team (SCT), and Water Quality Team (WQT)). The forums are a collaborative effort of Federal, state, and tribal agencies, with participation of other interested regional entities.

5.3 Public Outreach

The Corps' public outreach program for the Feasibility Study began with scoping meetings in 1995, intensified in 1997 with the implementation of the Public Outreach Plan, and continued on through the Draft FR/EIS to the Final FR/EIS release using the following public information and public involvement techniques to communicate information and/or solicit input as appropriate: Public Outreach Plan, informational video, web site, mailing list, newsletters, brochure, traveling displays, information sheets, information packets, media coverage, newspaper insert and advertising, scoping meetings, public information meetings, formal public meetings, community assessment forums, briefings, presentations, tours of facilities, and the Response to Public Comments appendix to the FR/EIS.

5.4 Public Comment Process on Draft FR/EIS

The Draft FR/EIS and its appendices were released for public review and comment in December 1999. The Draft FR/EIS synthesized the biological, environmental, engineering, and economic information and evaluation to allow for a comparison between four selected alternatives.

The comment period on the Draft FR/EIS began December 1999 and extended through April 30, 2000. Formal public meetings were conducted after the Draft FR/EIS was distributed for public review. In conjunction with the Federal Caucus (a group of Federal agencies with interests in salmon recovery efforts), a series of 15 formal meetings were held around the region in February and March 2000 to provide an opportunity for public questions and comments on the Draft FR/EIS, the Corps' John Day Drawdown Study, and the Federal Caucus Conservation of Columbia Basin Fish "All H" Paper. A total of nearly 9,000 participants consisting of stakeholders, special interest groups, elected officials, and individuals from the public presented 1,787 oral and taped comments. Oral comments, taped comments, and written comments (over 230,000 written comment documents) were received during the comment period. Written comments were received in the form of individual letters, reports, notecards, petitions, e-mails, etc.

The Corps evaluated each comment received so issues of concern could be identified and considered by technical experts. Issues raised in public comment were summarized into issue statements and are provided, along with a response, in Appendix U to the Final FR/EIS. Along with this display of issues and responses, a Web site has been set up that identifies comment documents received as part of the Draft FR/EIS review process and the Corps' responses (http://www.nww.usace.army.mil/lsr/comments.htm).

6. Record of Decision Statement

I have taken into consideration the environmental consequences, the socio-economic costs, and the biological data pertinent to the hydropower operations and project improvements, habitat actions, and hatchery reforms discussed in the 2001 ROCASOD and any additional actions relating to the Lower Snake River Project as a result of the FR/EIS. The Corps has determined that adequate authority, NEPA documentation, and biological rationale exist to implement the Lower Snake River Project hydropower operations and investigate future hydropower, habitat, and hatchery actions associated with the lower Snake River.

I have taken into account the effect of current and proposed project operations on compliance with water quality standards. With the information available to date on water quality standards and attainment of those standards, the Corps has determined that the actions set forth in this 2002 LSR ROD and the NMFS and USFWS 2000 Biological Opinions are consistent with our legal obligations under the CWA. I have taken into account the Northwest treaty tribes' fishing rights, the United States' trust responsibility to Native American Indian Tribes, and the United States' responsibility to act in a manner consistent with the trust responsibility. The actions the Corps will implement are designed to lead to increased survival and recovery of the listed salmon species with beneficial results to the treaty tribes' fishery and benefits to the Northwest region as a whole.

Although there is scientific disagreement, the conclusions in the NMFS and USFWS 2000 Biological Opinions take into account the differing scientific opinions and interpretations of available information, including the dam breaching alternative. The Corps' decision to rely on the biological information contained in the NMFS and USFWS 2000 Biological Opinions is based, in part, on NMFS and USFWS consideration of the differing scientific (biological) information and their expertise on the effects on other species of interest to Northwest tribes.

I find that the evaluations and documentation that support the NMFS and USFWS 2000 Biological Opinions, the 2001 ROCASOD, and the FR/EIS are sufficient to support the selection of the recommended plan (preferred alternative): Alternative 3 - Major System Improvements (Adaptive Migration). These actions are a coordinated composite of system operations, configuration measures, and continued monitoring activities that are consistent with the reasonable and prudent alternative and incidental take statement in the USFWS and NMFS 2000 Biological Opinions. The Corps has determined that these actions, taken together, will meet the Corps' responsibilities under the ESA to avoid jeopardy to the listed anadromous species: the Snake River spring/summer chinook salmon, fall chinook salmon, steelhead, and sockeye salmon. Also, these actions will not further adversely affect bull trout critical habitat. Further, it will not adversely affect bald eagles, grizzly bears, woodland caribou, Canada lynx, northern Idaho ground squirrel, gray wolves, and four plant species listed under the ESA.

I have taken into consideration the specific environmental consequences, the socio-economic costs, and the biological data pertinent to each alternative and compared each FR/EIS alternative for improving juvenile salmon and steelhead passage survival through the four lower Snake River

dams. After careful evaluation of all these issues, those above, and consideration of public concerns, I have decided to implement the recommended plan (preferred alternative), Alternative 3 - Major System Improvements (Adaptive Migration), as the selected plan.

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