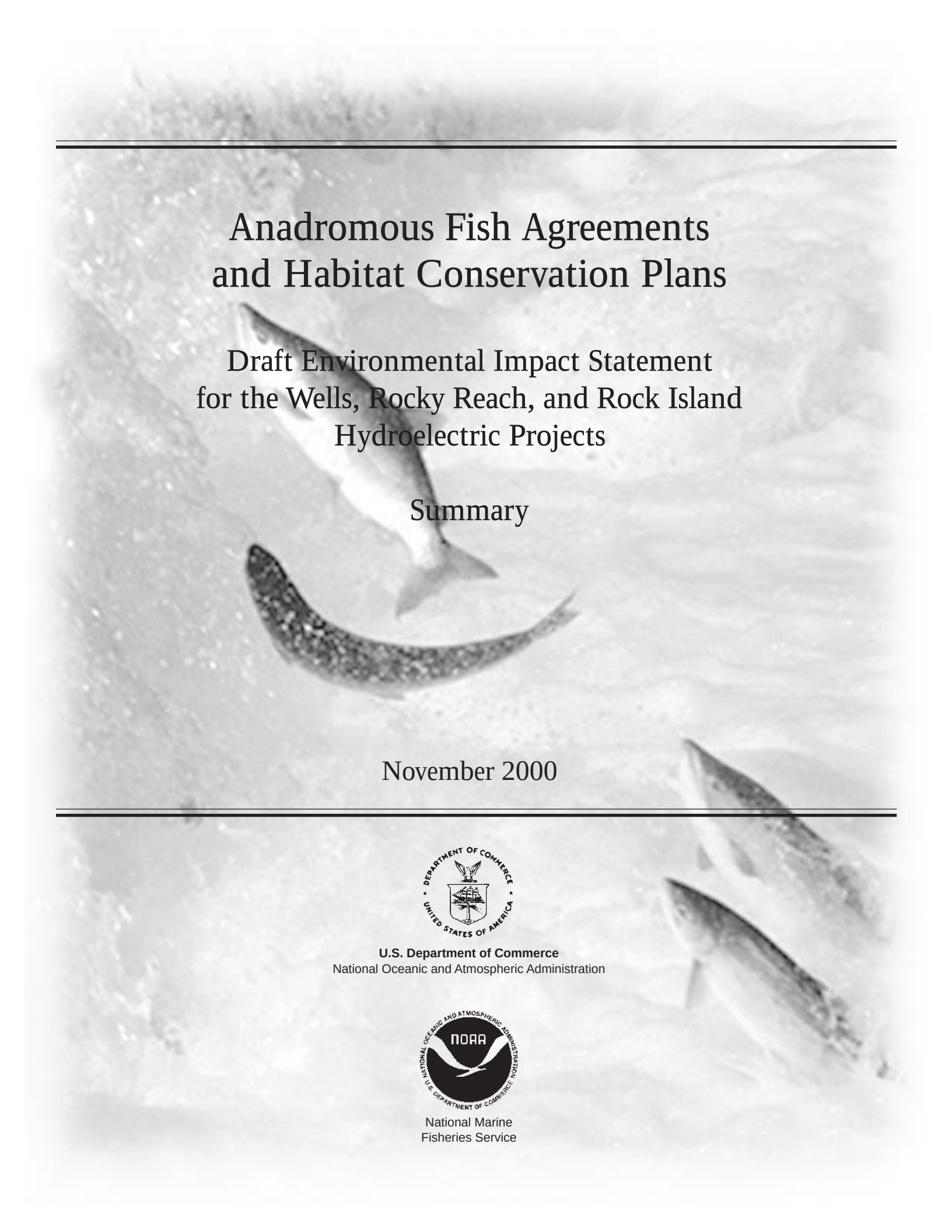

Anadromous Fish Agreements and Habitat Conservation Plans

Draft Environmental Impact Statement for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects

Summary

November 2000

U.S. Department of Commerce
National Oceanic and Atmospheric Administration

National Marine
Fisheries Service

ACRONYMS

ALCOA	Aluminum Company of America
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BOR	Bureau of Reclamation
BP	Before Present
BPA	Bonneville Power Administration
CFR	Code of Federal Regulations
cfs	cubic feet per second
EIS	environmental impact statement
FERC	Federal Energy Regulatory Commission
HCP	habitat conservation plan
JARPA	Joint Aquatic Resource Permit Application
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NTU	nephelometric turbidity unit
ODFW	Oregon Department of Fish & Wildlife
PIT	passive integrated transponder
PUD	public utility district
RCW	Regulatory Code of Washington
ROD	Record of Decision
SEPA	State Environmental Policy Act
USDOE	U.S. Department of Energy
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish & Wildlife Service
USGS	U.S. Geological Survey
WAC	Washington Administrative Code
WDFW	Washington Department of Fish & Wildlife
WDOE	Washington Department of Ecology
WRIA	Watershed Resource Inventory Area

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No. 1 of Douglas County

National Marine
Fisheries Service

Public Utility District
No. 1 of Chelan County

Anadromous Fish Agreements and Habitat Conservation Plans for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects

Draft Environmental Impact Statement

Submitted pursuant to
the National Environmental Policy Act [42 U.S.C. 4322(2)(c)]

by the

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL MARINE FISHERIES SERVICE

in cooperation with

PUBLIC UTILITY DISTRICT NO. 1 OF DOUGLAS COUNTY
PUBLIC UTILITY DISTRICT NO. 1 OF CHELAN COUNTY
FEDERAL ENERGY REGULATORY COMMISSION

Draft Environmental Impact Statement

Anadromous Fish Agreements and Habitat Conservation Plans for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects

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National Oceanic and Atmospheric Administration
National Marine Fisheries Service
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Abstract: The U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS) is evaluating the decision to authorize incidental take permits pursuant to Endangered Species Act Section 10 (a)(1)(B) for 50-year anadromous fish agreements and habitat conservation plans (HCPs) with two Washington State public utility districts (PUDs [Chelan County PUD and Douglas County PUD]). The HCPs were developed to protect five species of Columbia River steelhead and salmon (spring-run chinook salmon [*Oncorhynchus tshawytscha*], summer-/fall-run chinook salmon [*O. tshawytscha*], sockeye salmon [*O. nerka*], steelhead [*O. mykiss*], and coho salmon [*O. kisutch*]), two of which are currently listed as endangered (upper Columbia River spring-run chinook salmon and steelhead) under the Endangered Species Act. The HCP's fish protection measures also satisfy the PUD's regulatory obligations under the Federal Power Act, Fish and Wildlife Coordination Act, Pacific Northwest Electric Power Planning and Conservation Act, and Title 77 RCW. The agreements would set a "no net impact" standard for salmon and steelhead protection at three hydropower projects (Wells, Rocky Reach, and Rock Island) operated by the Chelan and Douglas County PUDs, and provide the PUDs with some degree of certainty for the long-term operation of these projects. Plan coverage of the three species not listed as endangered should help prevent the need to list these species in the future. This EIS describes three alternatives. Alternative 1 is the no-action alternative that represents existing conditions under the project licenses, subsequent license amendments, and settlement agreements. Alternative 2 is application of Section 7 of the Endangered Species Act for the two endangered species and includes issuance of a biological opinion, whereas Alternative 3 represents application of Section 10 of the Endangered Species Act including issuance of an incidental take permit. Under Alternative 3, three HCPs representing Wells, Rocky Reach and Rock Island hydroelectric projects would be approved and in effect over a 50-year permit term.

Reviewers should provide NMFS with their comments during the review period of the Draft Environmental Impact Statement (DEIS). This will enable NMFS to analyze and respond to the comments at one time and to use information acquired in the preparation of the Final EIS, thus avoiding undue delay in the decision-making process. Reviewers have an obligation to structure their participation in the National Environmental Policy Act (NEPA) process so that it is meaningful and alerts the agency to the reviewer's position and contentions. Environmental objections that could have been raised at the draft stage may be waived if not raised until after completion of the Final EIS. Comments on the Draft EIS should be specific and should address the adequacy of the statement and the merits of the alternatives discussed.

Summary

SUMMARY

S.1 PROPOSED ACTION

The U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS) is evaluating the decision to authorize incidental take permits for 50-year anadromous fish agreements and habitat conservation plans (HCPs) with two Washington State public utility districts (PUDs). The HCPs were developed to protect five species of Columbia River steelhead and salmon, two of which are currently listed as endangered under the Endangered Species Act. The fish protection measures of the HCPs are also intended to satisfy the PUD's obligations under the Federal Power Act, Fish and Wildlife Coordination Act, Pacific Northwest Electric Power Planning and Conservation Act, and Title 77 Regulatory Code of Washington (RCW). The agreements would set a "no net impact" standard for salmon and steelhead protection at three hydropower projects operated by the Chelan and Douglas County PUDs, and provide the PUDs with some degree of certainty for the long-term operation of these projects. Plan coverage of the three species not listed as endangered should help prevent the need to list these species in the future.

The anadromous fish agreements and HCPs are the result of more than 6 years of cooperative planning. In addition to NMFS and the PUDs, participants in the HCP development process are the U.S. Fish and Wildlife Service (USFWS); Washington Department of Fish and Wildlife (WDFW); the Yakama, Colville, and Umatilla Tribes; American Rivers, Inc., and the major wholesale purchasers of the PUDs electricity. [Note: Not all of these parties concur with the issues and measures identified in the current version of the HCPs.]

The NMFS is the Federal agency responsible for protecting anadromous salmon and steelhead and is the lead agency for this National Environmental Policy Act (NEPA) draft environmental impact statement (EIS). The Federal Energy Regulatory Commission (FERC) is a cooperating agency for the purposes of developing this draft EIS and the PUDs will coordinate compliance with the State Environmental Policy Act (SEPA).

To implement the HCP agreements, NMFS would issue incidental take permits under Section 10 (a)(1)(B) of the Endangered Species Act of 1973. The PUD No. 1 of Douglas County (Douglas County) is applying for a permit covering the Wells project, and the PUD No. 1 of Chelan County (Chelan County) is applying for permits to cover the Rocky Reach and Rock Island projects. The permit applications are based upon the HCPs and their exhibits.

The incidental take permits would be for four Permit species:

1. Upper Columbia River spring-run chinook salmon (*Oncorhynchus tshawytscha*),
2. Upper Columbia River summer/fall chinook salmon (*O. tshawytscha*),
3. Okanogan River and Lake Wenatchee sockeye salmon (*O. nerka*), and
4. Upper Columbia River steelhead (*O. mykiss*).

Currently, upper Columbia River steelhead and spring-run chinook salmon are listed as endangered under the Endangered Species Act. Although summer/fall chinook and sockeye salmon have not been listed, the permits apply to them according to the June 17, 1999 Federal policy governing the use of HCPs for the conservation of candidate or potential candidate species. The "no surprises policy" associated with these agreements ensures the PUDs that no additional measures will be required by NMFS for the duration of the permits, for any of the Permit species.

Coho salmon *(O. kisutch)*, an extinct species in the Mid-Columbia River region, is also included in the HCPs as a "Plan species." Recently, attempts have been made to re-introduce coho salmon into the area.

Coho salmon are not considered a Permit species because an extinct species is not subject to Endangered Species Act jurisdiction. Thus, there are four Permit species and five Plan species.

S.2 PROJECT APPLICANT AND SUPPORTING ENTITIES

The project proponents are the following:

- The Douglas County PUD, a Washington municipal corporation, is sponsoring the Wells Anadromous Fish Agreement and HCP.
- The Chelan County PUD, a Washington municipal corporation, is sponsoring the Rocky Reach and Rock Island Anadromous Fish Agreements and HCPs.

The Chelan and Douglas County PUDs will file applications requesting FERC to amend their existing licenses to include the HCPs. In addition, the PUDs will rely upon the HCPs to fulfil their obligations for salmon and steelhead under new license agreements. The HCPs will meet the Endangered Species Act requirements for the permit species through the 50-year HCP terms.

S.3 PURPOSE AND NEED

The purpose of the HCPs is to protect fish in the Mid-Columbia River while generating electricity. The HCPs are needed to:

- obtain Section 10 incidental take permits, which would allow the Chelan and Douglas County PUDs to comply with the Endangered Species Act as they maintain and operate their power projects;
- support a comprehensive strategy for protecting and recovering five Plan species of anadromous salmonids in the Mid-Columbia River, two of which are currently listed as endangered under the Endangered Species Act;
- allow the Chelan and Douglas County PUDs to plan their long range operations with a degree of certainty to be able to economically operate their projects and fulfill their long-term bonding and contractual sales obligations;
- help ensure stable power supplies and pricing for the utilities' customers; and
- provide a coordinated approach to fisheries issues for relicensing the three projects under the Federal Power Act.

The HCPs are intended to constitute a comprehensive and long-term adaptive management concept for Plan species (spring-run and summer/fall chinook, sockeye, and coho salmon, and steelhead) and their habitat as affected by the hydroelectric projects.

Pending support of the HCP agreements by a coalition of Columbia River fishery resource managers and other public and private interests, their approval could reduce the risk of protests, delays or litigation during FERC relicensing for each of the three projects. They would also treat the areas around the three projects as a single habitat area, avoiding fragmentation.

The HCPs include a "no surprises" clause that provides the PUDs with a degree of certainty regarding the required mitigation and costs associated with the 50-year HCP implementation period. At the same time, there are specific performance standards, time lines and termination

clauses, and an adaptive management approach to ensure that the HCPs are adequately protecting the resources.

S.4 PROJECT LOCATION

The Wells, Rocky Reach, and Rock Island hydropower projects are part of an 11-dam system on the mainstem Columbia River within the continental United States. Their location, relative to the other projects in the region, is shown in Figure S-1. Most of the projects on the mainstem Columbia River are Federally operated, although local PUDs operate five of the projects in the Mid-Columbia River segment. In addition to the three projects operated by the Chelan and Douglas County PUDs, the Grant County PUD operates the Priest Rapids and Wanapum dams.

The Douglas County PUD operates the Wells project located at river mile 515.8 on the Columbia River, north of the City of Wenatchee. Wells began commercial operations on August 22, 1967, and is operated under a license issued by FERC, which expires in the year 2012.

Chelan County PUD operates the Rock Island and Rocky Reach hydroelectric projects. Rocky Reach is about 7 miles upstream from the City of Wenatchee, at river mile 474.5. The original operating license for Rocky Reach was issued on July 11, 1957 by the Federal Power Commission. The license expires in 2006. Rock Island, which was the first project to span the Columbia River, is located about 12 miles downstream from the City of Wenatchee at river mile 453.4. Rock Island began operating in 1933, and its operating license expires in the year 2028.

The project boundaries include the forebay (from the dam to approximately 500 feet upstream), tailrace (from the dam to approximately 1,000 feet downstream), and reservoir associated with each dam. The Rock Island reservoir extends approximately 20 miles upstream of the dam to the Rocky Reach tailrace; the Rocky Reach reservoir extends approximately 41 miles upstream of the dam to the Wells tailrace; and the Wells reservoir extends approximately 30 miles upstream of the dam to the Chief Joseph Dam tailrace. Considering all components of the three projects, the entire project area extends from the tailrace of the Rock Island Dam upstream to the tailrace of Chief Joseph Dam. Project effects however, may continue downstream through the Hanford reach to the McNary Dam (inclusively defined as the action area).

All three of the hydroelectric projects discussed in this EIS are "run-of-the-river" facilities, which means that they have limited storage capacity compared to larger reservoir projects, such as Grand Coulee and Chief Joseph.

S.5 ALTERNATIVES CONSIDERED IN DETAIL

S.5.1 ALTERNATIVE 1 (NO ACTION)

Alternative 1 represents baseline conditions, which include the FERC licenses and amendments that govern current operations. These licenses cover all aspects of dam operation, as well as resource protection. Under Alternative 1, analyses in this EIS review how the licenses and the applicable amendments affect the environmental resources within the project area, including mitigation sites and hatcheries that may be outside of the immediate project boundary.

Provided below are the protection measures pertinent to anadromous fish for direct comparison

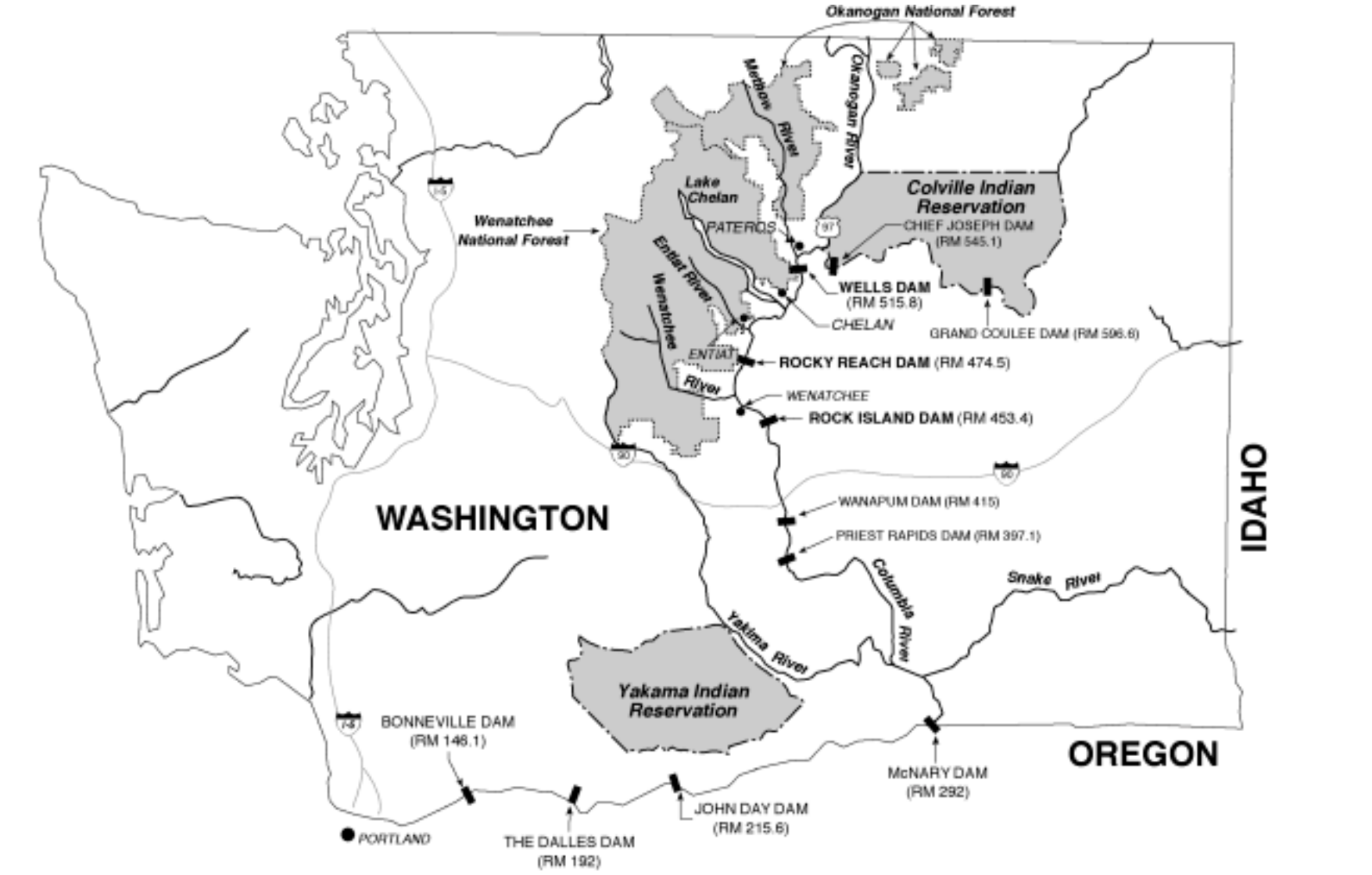

Figure S-1
General Location of Columbia River Dams

to Alternatives 2 and 3, which pertain primarily to either two endangered fish species (Alternative 2) or five Plan species of anadromous fish (Alternative 3).

S.5.1.1 Wells Hydroelectric Project

The original FERC license stipulated that two adult fishladders would be constructed at the Wells Project (adjacent to each embankment), as well as a "low bucket" spillway design that was approved by the State of Washington Department of Fisheries and Game (FERC 1962a). A subsequent amendment to the license stipulated a general requirement to provide mitigation for project construction, alteration, and operations, and to comply with reasonable requests to modify project structures and operations in the interest of fish and wildlife (FERC 1962b). Project structure revisions were approved in 1970 to comply with fishery agency requirements regarding fishladder design and operation (FERC 1970). The FERC (1982) amended the license to raise the forebay elevation by two feet.

In 1990, the Douglas County PUD, the Wells Project power purchasers, resource agencies, and Tribes entered into a long-term fisheries settlement agreement regarding the Wells Project (FERC 1991). The 1990 Wells Settlement Agreement established the Douglas County PUD's obligations for the installation and operation of juvenile downstream migrant bypass facilities, hatchery compensation for fish losses, and adult fishway operations, through at least March 1, 2004. These measures, in conjunction with existing hatchery compensation programs, were considered to fulfill Douglas County PUD's obligation to protect, mitigate and compensate for the effects of the Wells Project on anadromous fish. The agreement also stipulates evaluation programs for fishery measures and establishes procedures for coordination among the PUD, it's power purchasers, and the Joint Fishery Parties through the Wells Coordinating Committee. Coordinating Committee decisions are made on a consensus basis.

The 1990 Wells Settlement Agreement established the requirements for the PUD to fund, operate, maintain and evaluate three anadromous fish related programs. These programs consist of: (1) juvenile fish passage measures, (2) adult fish passage measures, and (3) hatchery-based compensation measures.

Juvenile Fish Passage

The juvenile fish passage program called for the installation and evaluation of a juvenile bypass system to route juvenile salmonids around turbine units. The established program uses controlled spill through modified spill bays to provide a non-turbine passage route through the project. The agreement includes specific operation, performance, and evaluation standards, as well as procedural guidelines for modifying the operational components of the system if necessary to meet the performance standards. The performance standards are set to provide fish passage efficiency (the percentage of fish bypassing the project through non-turbine routes over the total population of fish passing the project) of at least 80 percent during the juvenile spring-run migration period and at least 70 percent during the juvenile summer migration period.

Adult Fish Passage

The 1990 agreement called for evaluations of adult delay and mortality at the project beginning in 1991. If the evaluations identified delays and/or mortality, the agreement specified that operational modifications would be used to alleviate the problems. If those modifications could not correct the problems, the adult fishways would be modified.

Hatchery-Based Compensation

Under the Wells Settlement Agreement, the PUD agreed to fund a hatchery program to mitigate for fish passage losses at the Wells Dam. The agreement identifies specific production levels for the anadromous fish species affected by the project

that are in addition to the existing mitigation program at the Wells Dam. The agreement also provides the ability to adjust these additional compensation levels based on actual juvenile and adult losses at the dam. However, production levels based on impacts of project inundation would not be altered. The agreement also establishes specific operational standards for the fish production facilities.

Measures Planned

The existing fish mitigation and compensation measures for the Wells Dam were developed through the Wells Settlement Agreement and subsequent negotiations within the Wells Coordinating Committee. A summary of measures expected to continue under Alternative 1 are:

1. Adult Passage:

    a. Continue operation and maintenance of the existing adult fishways.

    b. Investigate entrance and ladder modifications that may be necessary to improve ladder operation and minimize fish passage delay.

    c. Conduct modeling or other appropriate evaluations to determine the best actions for correcting any significant delay.

    d. Develop solutions and implement corrective actions where adult passage problems are identified. Specifically, improve the efficiency of the existing fishways by maximizing the number of adult migrants that enter the facilities.

    e. Continue operation of the juvenile surface bypass system from April through August to provide a fallback and downstream passage route for adult spring-run chinook salmon and steelhead through the dam.

2. Juvenile Passage

    a. Turbine Operations - Operate turbines at peak efficiency ratings, to the extent possible.

    b. Surface Bypass Operation - Operate at least one spillway bypass, 24 hours a day, throughout the juvenile downstream migration periods. The operation of the five bypass system bays (# 2,4,6,8 and 10) will be paired with associated turbine units. (Table S-1).

    c. Predators - continue to refine and implement a northern pikeminnow removal program.

    d. Gas Abatement - Control total dissolved gas levels under total river flows up to the 7-day 10-year peak flow event to 120 percent of saturation.

3. Hatchery Program

    Continue to provide funding and hatchery capabilities to rear and release up to 49,200 pounds of spring-run chinook, 32,000 pounds of yearling summer chinook, 24,200 pounds of sub-yearling summer chinook, 8,000 pounds of sockeye, and 80,000 pounds of yearling steelhead, according to provisions in the settlement agreement. Under the settlement agreement, hatchery production for unavoidable losses could be reduced if survival studies indicate that fish passage mortality is less than the assumed 14 percent, which was the basis for the current mitigation level.

4. Monitoring and Evaluation

    a. Juvenile Run Timing - Utilize hydroacoustic techniques to determine the timing of bypass system operations.

    b. Survival - Develop and utilize the best techniques to estimate the survival of juvenile salmon and steelhead passing the project. Techniques may include the use of radio-telemetry or tag release and recapture methodologies.

TABLE S-1. SUMMARY OF EXISTING BYPASS SYSTEMS AND SPILL OPERATIONS AT WELLS, ROCKY REACH, AND ROCK ISLAND DAMS

PROJECT	BYPASS SYSTEM	PERIOD OF OPERATION
Bypass Systems/Operations		
Wells	Surface bypass (baffled spill gates with discharge through controlled spill of up to 8% of total river discharge)	24 hours/day; between at least April 10 and August 15, depending on the hydroacoustic index of juvenile fish migration timing
Rocky Reach	Turbine screens in two units; prototype surface bypass (discharge through conduit to tailrace)	Continue to evaluate and improve the efficiency of the bypass system, and provide spill as an interim measure (see below)
Rock Island	Passive gatewell orifice bypass (discharge through conduit to tailrace)	24 hours/day (spill is the primary bypass system used at Rock Island as described below)
Spill Operations		
Wells	See bypass operations (above)	See bypass operations (above)
Rocky Reach	15% of previous day's average flow in spring-run	30 days with an additional 6 days if necessary to encompass 90% of the Okanogan River sockeye run
	10% of previous day's average flow in summer	Total of 34 days between June 15 and August 15
Rock Island	Spring and summer spill purchased by joint request of the Fisheries Agencies and Tribes from a Fisheries Conservation Account of $2.05 million (1986 dollars adjusted for inflation) at the market price of energy	The Fisheries Agencies and Tribes decide when and how much spill to purchase based on funds available in the Fisheries Conservation Account

c. Total Dissolved Gas Monitoring – Monitor total dissolved gas levels and temperature at fixed location monitors in the forebay and downstream of the dam. Provide biological monitoring to determine the incidence of gas bubble disease symptoms in adult salmonids.

d. Fish Counting - Provide adult fish counts on a 24-hour basis.

S.5.1.2 Rocky Reach Hydroelectric Project

The existing fishery protection measures undertaken by the Chelan County PUD for the Rocky Reach Dam are the result of mitigation and compensation requirements in the original project license and subsequent amendments (FERC 1953, 1957a, 1957b, and 1968), as well as an interim stipulation resulting from the Mid-Columbia Proceedings (Docket No. E-9569 [FERC 1987a]). The interim stipulation was an agreement between the Chelan County PUD and the Joint Fishery Parties with respect to juvenile and adult fish passage measures and hatchery compensation levels to mitigate for impacts resulting from project operations. The interim stipulation identified compensation and operational requirements that would be in effect from July 1, 1987 through August 31, 1988. Subsequently, the stipulation was extended and revised several times (FERC 1989b, 1991b, and 1993c). The latest revision (Fourth Revised Interim Stipulation) was negotiated to include the period September 1, 1995 through December 31, 1997 (FERC 1996b). Although there is no current agreement for Rocky Reach, Chelan County PUD has continued to operate the project in coordination with the Mid-Columbia Coordination Committee, as it has under the previous stipulations. Coordinating Committee decisions are made on a consensus basis.

The main goal of the Fourth Revised Interim Stipulation was to develop a safe (less than 2 percent mortality) juvenile bypass system capable of bypassing 80 percent of the juvenile salmon and

steelhead over 90 percent of the migration period. Passage efficiency would then be used in developing a survival based performance standard for the Rocky Reach Project. This agreement led to the development of prototype surface bypass system that was installed at Rocky Reach Dam in the fall of 1994. Since that time, the bypass system has been modified based on the results of hydraulic modeling and fish passage evaluations. During development of the surface bypass system, the Fourth Revised Interim Stipulation provided a protection plan for juvenile migrants through the use of spill.

Despite the expiration of the interim stipulation, Chelan County PUD has continued implementation of the associated programs through coordination with the Mid-Columbia Coordinating Committee. The fish protection measures consistent with the 4th Revised Interim Stipulation include:

1. Continue operation and maintenance of the adult fishways.

2. Spill at a level equal to 15 percent of the daily average flow for a 30-day period, with up to 6 additional days to compensate for the Okanogan River sockeye run in the spring-run. In the summer, spill at a level equal to 10 percent of the daily average flow for a total of 34 days between June 15 and August15 (Table S-1).

3. Construct a permanent juvenile bypass facility capable of bypassing 80 percent of the juvenile migrating salmon and steelhead over 90 percent of the migration period.

4. Continue to refine and implement a northern pikeminnow removal program, as well as continue to fund a hazing program to minimize the loss of juvenile fish to avian predators.

5. Continue to provide funding and hatchery facilities adequate to rear and release up to 54,400 pounds of fall chinook and 30,000 pounds of steelhead annually.

S.5.1.3 Rock Island Hydroelectric Project

The original FERC license for the Rock Island Dam was issued in 1930 and construction was completed in 1933. In 1987, the Chelan County PUD, Puget Sound Energy (formerly Puget Sound Power & Light), resource agencies, and Tribes entered into a long-term fisheries settlement agreement for the Rock Island Hydroelectric Project (FERC 1987b). The provisions in the settlement agreement were included in the documentation for relicensing the project in 1989 (FERC 1989c). The Rock Island Settlement Agreement was amended in 1993 to replace the requirement to conduct an adult fish mortality study with the requirement to conduct an adult fish passage study (FERC 1993b).

The Rock Island Settlement Agreement established the requirements for the PUD to fund, operate, maintain and evaluate three anadromous fish related programs. These programs consist of: (1) juvenile fish passage measures, (2) adult fish passage measures, and (3) hatchery-based compensation measures. Coordinating Committee decisions are made on a consensus basis.

Juvenile Fish Passage

The Rock Island Settlement Agreement called for a bypass development program to study, design, develop, test, and install a mechanical juvenile fish bypass system at the project. The performance standards targeted for the bypass system included achieving at least 80 percent fish passage efficiency during the spring-run migration period and at least 70 percent fish passage efficiency during the summer migration period. Unfortunately, subsequent efforts to develop an adequate mechanical solution to the juvenile bypass issue were unsuccessful. Therefore, the PUD is currently evaluating modifications at the spillway to increase the rate of non-turbine passage at the project and use a conservation account to provide spill.

As an alternative to juvenile bypass system development, the agreement established a Fisheries Conservation Account. This account (with an annual funding level of $2.05 million in 1986

dollars) could be used by the fishery agencies and Tribes to purchase spill as a means to increase the non-turbine passage of juvenile fish at the project.

Adult Fish Passage

The agreement called for modifications to the adult fishladder at Rock Island Dam to meet fishery agency operating standards, as well as a comprehensive hydraulic evaluation of the right bank ladder to ensure that the design flows were met.

Hatchery-Based Compensation

Under the Rock Island Settlement Agreement, the PUD agreed to construct, maintain, and fund a hatchery program to mitigate for fish passage losses at the Rock Island Dam. The agreement identifies the specific construction standards, production levels and evaluation procedures to be implemented. The agreement also provides the ability to adjust these additional compensation levels based on actual juvenile and adult losses at the project, although production levels intended to compensate for project inundation would not be altered. The agreement also establishes specific operational standards for the fish production facilities.

Fish protection measures developed in the Rock Island Settlement Agreement and included in Alternative 1 are:

1. Modify the existing adult fishladders so their operation meets current fishery agency operating criteria.

2. Utilize the conservation account to provide spill for spring and summer outmigrants up to $2.05 million (in 1986 dollars).

3. Continue to provide funding and hatchery capability to rear and release 250,000 pounds of salmon and 30,000 pounds of steelhead in a manner that is consistent with the maintenance of genetically distinct stocks.

4. Evaluate fish guidance efficiency using hydroacoustic and direct capture methods including assessments of injury and stress, and evaluate the hatchery programs, including sampling to determine hatchery versus natural components of steelhead returns, and an evaluation of hatchery production and its inter-relationship with natural production.

S.5.2 ALTERNATIVE 2 (SECTION 7 CONSULTATION)

In order for the utilities to be exempt from the take prohibitions imposed under Section 9 of the Endangered Species Act, they must consult with NMFS either directly via Section 10 (a)(1)(B) or indirectly through FERC under Section 7 (a)(2). Under Alternative 2, Section 7 (a)(2) consultations would produce a biological opinion following consultations between NMFS and FERC. As a result, the Wells, Rocky Reach and Rock Island hydroelectric projects would be operated according to existing FERC licenses and settlement agreements for unlisted species and according to additional measures potentially required as a result of this consultation process for listed species.

The Section 7 (a)(2) formal consultation process results in NMFS issuing a biological opinion on the effects of the proposed actions. In this case, the proposed actions are continuing operation of the Wells, Rocky Reach, and Rock Island hydroelectric projects. With the assistance of each utility, FERC would provide NMFS with the following information:

- a description of the action being considered;
- a description of the specific area that may be affected by the action;
- a description of any listed species or critical habitat that may be affected by the action;

- a description of the manner in which the action may affect any listed species or critical habitat; and

- an analysis of the cumulative effects, relevant reports and analyses prepared on the proposal, and, any other relevant studies or information on the action, the affected species, or critical habitat.

The NMFS would then evaluate this information and any other information available to determine whether the proposed action was likely to jeopardize the continued existence of listed species or was likely to result in the destruction or adverse modification of critical habitat. Depending on this conclusion, NMFS would potentially require additional protection measures to ensure that listed species would continue to persist into the future with adequate potential for recovery (up to full mitigation for the project effects). Under this process, FERC would then have the responsibility of ensuring that measures identified in the biological opinion were implemented at the PUD projects. The PUDs may either implement measures required by the biological opinion and FERC, or formally object to the mandatory requirements through litigation.

The Section 7 (a)(2) biological opinion is considered a living document that would be updated at any time given new information. Specific measures required in the initial biological opinion may be modified or new measures may be required as a result of this process. In addition, if other species were listed under the Endangered Species Act, additional consultation processes would occur. Although NMFS has not determined what, if any, additional measures would be required over the next 50 years to protect listed species, it is likely that they would require all measures necessary to ensure that the proposed actions were not likely to jeopardize the continued existence of endangered species or result in the destruction or adverse modification of critical habitat.

Measures may include corrective actions at the projects to improve survival through the action area and offsite mitigation measures if project specific measures were determined to be insufficient to recover listed species (offsite measures would likely be proposed before consideration of non power options).

Based on completed consultations at other mainstem Columbia and Snake River hydroelectric projects, protection measures would likely include a combination of the following:

- Measures that allow for increased upstream passage of adult fish through fishways and reservoirs and decreased fish injury and pre-spawning mortality (examples include hydraulic and structural fishway improvements – specifically, ladder modifications and improved attraction flow to help move fish more quickly into the ladder systems and over the dams).

- Measures that provide for increased downstream passage of juvenile salmonids while minimizing fish injury (examples include increased spill programs [in association with operational and structural modifications to reduce total dissolved gas levels], expanded predator control programs, drawdown, and the development of improved fish bypass systems).

- If necessary to meet recovery standards, offsite compensation measures, such as tributary habitat improvements or artificial propagation may also be proposed (prior to requiring non power options).

These measures would be directed only at listed species and would possibly only occur during specific periods (seasonal). As a result, the benefits of these measures may not apply to unlisted species.

Initial survival standards for protection of the species have been developed as a result of preliminary survival information and life-history analyses. Evaluations conducted as part of the Quantitative Analytical Report (QAR) (NMFS

2000b) indicate a substantial risk of extinction for Mid-Columbia River spring-run chinook salmon and steelhead if recent ocean and freshwater survival rates continue. The Wenatchee River spring-run chinook and Methow River steelhead populations have the highest extinction risks based on these modeling assessments.

Expanding the baseline survival rates to reflect those observed from the 1960s through 1990 would lower the projected extinction risks to a degree, although these survival assumptions may be overly optimistic. Under all but the most optimistic scenarios, improvements in the average population growth rates are necessary to lower the extinction risks to acceptable levels (i.e., to levels below the extinction risks criteria established by the QAR workgroup).

Even assuming hatchery supplementation could increase population sizes to the interim recovery levels, these levels cannot be sustained naturally under recent total life-history survival rates. According to the QAR analyses, even the removal of the Mid-Columbia River dams would not be sufficient to recover these species if recent total life-history survival rates continue. Therefore, in addition to improved survival through the middle and lower Columbia River projects, and during the early life stages of the fish, improved environmental/climate conditions are necessary for the listed species to survive and recover.

Each measure implemented under Alternative 2 would continue until such time that NMFS determine that:

- other protective measures would increase survival,
- the proposed measures are determined to be ineffective or unsuccessful in increasing fish survival, or
- a species is delisted and it is determined that a previously approved protection measure is no longer warranted.

The decision to apply specific measures at each dam would depend on the benefit of the measures to Endangered Species Act-listed fish species, and not necessarily to all species passing through the projects. However, it is envisioned that each dam would have a combination of juvenile bypass options including a screened bypass and/or a surface bypass system, a spill program designed to maximize non-turbine passage, and improvements to the adult facilities intended to maximize project and pre-spawning survival.

If listed fish populations continue to decline, NMFS would likely find that additional protection measures are needed. Most of these additional measures may be in-water facility improvements although additional offsite measures would likely be recommended prior to requiring any decommissioning or drawdown options.

If required, natural river drawdown would have significant and substantial environmental effects to many of the existing natural, physical, and social resources. However, this type of operation would help to mimic the natural river conditions that existed prior to the construction of the hydroelectric facilities, and thereby minimize the impacts caused by the hydro system.

Although not recommended by a Federal, State, or local agency at this time, the review of natural river drawdown was requested by organizations during public scoping for this EIS. Consequently, natural river drawdown at the three dams (Wells, Rocky Reach, and Rock Island) has been evaluated for Alternative 2 at a brief summarizing level to help understand and compare the overall differences between the alternatives. Although natural river drawdown is not an option under the existing FERC licenses, it could be evaluated during relicensing procedures. The current FERC licenses expire in 2006, 2012, and 2028 for the Rocky Reach, Wells, and Rock Island dams, respectively.

Drawdown to minimum operating pool (seasonal reservoir drawdown), which is an option under the current licenses, has not been shown to increase

juvenile survival in the Mid-Columbia River. Therefore, it was not evaluated in this EIS.

S.5.2.1 Wells Hydroelectric Project

In 1990, the Douglas County PUD, the Wells project power purchasers, resource agencies, and Tribes entered into a long-term fisheries settlement agreement for the Wells Project. This agreement established the Douglas County PUD's obligation for the installation and operation of juvenile downstream migrant bypass facilities; hatchery compensation for fish losses, and adult fishway operation. These measures, in conjunction with existing hatchery compensation programs, were considered to fulfill the Douglas County PUD's obligation to protect, mitigate and compensate for the effects of the Wells project on the anadromous fish resource.

Initial compensation was established at 14 percent based on the estimated survival of juvenile salmonids passing through the original turbine units. Measures undertaken by the Douglas County PUD that would likely continue to be incorporated in a long-term fish recovery plan include those proposed in the existing biological assessments for the project (Douglas County PUD 1998, 1999a) and resulting interim biological opinion (NMFS 2000b). Additional measures may also be required by NMFS, including any actions necessary to increase the survival of listed species.

Measures currently anticipated to be part of the protection program required by NMFS include:

1. Adult Passage – In addition to the measures described under Alternative 1 for Wells Dam:

    a. Conduct evaluations on spawning success and fecundity as it relates to passage through a multiple dam system.

    b. Operate the surface bypass system during the upstream adult steelhead and spring-run chinook migration periods and during the downstream kelt passage period to maximize the survival of fallbacks and downstream migrating adults.

2. Juvenile Passage – Operating within 1 percent of peak turbine efficiency at all times during the juvenile and adult listed species passage periods would be required, with appropriate reporting and monitoring requirements to ensure compliance.

3. Hatchery Program – The same amount of chinook, sockeye, and steelhead would be produced as described under Alternative 1. In addition, Douglas County PUD would fund the changes in hatchery procedures and evaluations needed to make the hatchery compensation program consistent with recovery of spring-run chinook salmon and steelhead populations.

4. Monitoring and Evaluation – Measures are the same as described under Alternative 1 for juvenile run timing, survival, total dissolved gas monitoring, and fish counting. The following additional measures are expected to be implemented:

    a. Cumulative Effects - In conjunction with NMFS, develop methodologies and conduct evaluations to assess the effects of passage through multiple dam systems on the fecundity, spawning success, and survival of adult spring-run chinook salmon and steelhead.

    b. Evaluate adult fishladder passage standards, as they relate to spring-run chinook salmon and steelhead, and modify facilities as needed.

As stated, NMFS would require any additional measures necessary to recover listed species based on information obtained from monitoring and evaluation of project survival and on the species recovery status.

S.5.2.2 Rocky Reach Hydroelectric Project

Long-term protection measures for the Rocky Reach Dam would likely be similar to those described in biological assessments submitted to NMFS in 1998 and 1999 (Chelan County PUD 1998a, 1999a) as well as any additional measures necessary to maximize survival and recovery of listed species, based on additional information available to NMFS and as a result of continued monitoring and evaluation.

Measures currently anticipated to be part of the protection program required by NMFS include:

1. Adult Passage – In addition to continuing operation of the fishladders:

    a. Enhance the fishway entrance attraction conditions through planned operation of spill gates and turbines.

    b. Investigate ladder modifications to improve operations within specified standards, and minimize fish passage delay.

    c. Provide safe downstream passage facilities for adult fallbacks and kelts (e.g., bypass system operations, spill, etc.).

    d. Conduct modeling or other appropriate evaluations to determine the best actions for correcting passage problems, and implement measures as necessary.

    e. Conduct evaluations on spawning success and fecundity as it relates to passage through a multiple dam system.

2. Juvenile Passage – Measures in addition to those described in Alternative 1 would include:

    a. Construct a permanent juvenile bypass system to NMFS criteria that maximizes the non-turbine passage of listed species.

    b. Operate turbine units within 1 percent of peak turbine efficiency at all times during the juvenile and adult listed species passage periods, with appropriate reporting and monitoring to ensure compliance.

    c. Increase spill as necessary to prevent the extinction of listed species.

    d. Implement measures to ensure that total dissolved gas levels are maintained below 120 percent of saturation under total river flows up to the 7-day 10-year peak flow event.

    e. Implement effective predator control measures.

3. Hatchery Program – The same amount of chinook and steelhead would be produced as described under Alternative 1. In addition, fund the changes in hatchery procedures and evaluations needed to make the hatchery compensation program consistent with recovery of spring-run chinook salmon and steelhead populations.

4. Monitoring and Evaluation – In addition to those measures described under Alternative 1:

    a. Cumulative Effects – In conjunction with NMFS, develop methodologies and conduct evaluations to assess the effects of passage through multiple dam systems on the fecundity, spawning success, and survival of adult salmonids.

    b. Survival - Utilize the best techniques to estimate the survival of spring-run chinook salmon and steelhead through the project. Techniques would likely include the use of PIT-tags for juveniles and radio-telemetry methodologies for adults.

    c. Total Dissolved Gas Monitoring - Conduct physical monitoring of total dissolved gas levels and temperature within the project area. Conduct biological monitoring to

determine the incidence of gas bubble disease symptoms in juvenile steelhead and spring-run chinook.

d. Fish Counting - Provide adult fish counts on a 24-hour basis.

e. Evaluate adult fish passage efficiencies through radio telemetry studies.

As stated, NMFS would require any additional measures necessary to prevent the extinction of listed species based on information obtained from monitoring and evaluation requirements imposed under Alternative 2, and on the species recovery status.

S.5.2.3 Rock Island Hydroelectric Project

Long-term protection measures for the Rock Island Dam would likely be similar to those described in biological assessments submitted to NMFS in 1998 and 1999 (Chelan County PUD 1998b, 1999c), as well as any additional measures necessary to maximize the survival and recovery of listed species, based on additional information available to NMFS and as a result of continued monitoring and evaluation.

Measures currently anticipated to be a part of the protection program required by NMFS include:

1. Adult Passage –In addition to continuing operation of the fishladders:

   a. Provide safe downstream passage facilities for adult fallbacks and kelts (e.g., bypass system operations, spill, etc.).

   b. Evaluate passage facilities through hydraulic evaluations and adult passage studies and correct problems when identified.

   c. Investigate ladder modifications to improve operations within specified standards, and minimize fish passage delay.

   d. Conduct evaluations on spawning success and fecundity as it relates to passage through a multiple dam system.

2. Juvenile Passage – Measures in addition to those described under Alternative 1 would likely include:

   a. Construct a permanent juvenile bypass system to NMFS criteria that maximizes the non-turbine passage of listed species.

   b. Operate turbine units within 1 percent of peak turbine efficiency at all times during the juvenile and adult listed species passage periods, with appropriate reporting and monitoring to ensure compliance.

   c. Increase spill as necessary to prevent the extinction of listed species.

   d. Implement measures to ensure that total dissolved gas levels are maintained below 120 percent of saturation under total river flows up to the 7-day 10-year peak flow event.

   e. Implement effective predator control measures.

3. Hatchery Program – The same amount of salmon and steelhead would be produced as described under Alternative 1. In addition, fund the changes in hatchery procedures and evaluations needed to make the hatchery compensation program consistent with recovery of spring-run chinook salmon and steelhead populations.

4. Monitoring and Evaluation – In addition to those measures described under Alternative 1:

   a. Cumulative Effects - In conjunction with NMFS, develop methodologies and conduct evaluations to assess the effects of passage through multiple dam systems on the fecundity, spawning success and survival of adult salmonids.

b. Survival - Utilize the best techniques to estimate the survival of spring-run chinook salmon and steelhead through the project. Techniques would likely include the use of PIT-tags for juveniles and radio-telemetry methodologies for adults.

c. Total Dissolved Gas Monitoring - Provide physical monitoring of total dissolved gas levels and temperature within the project area. Provide biological monitoring to determine the incidence of gas bubble disease symptoms in juvenile steelhead and spring-run chinook.

d. Fish Counting - Provide adult fish counts on a 24-hour basis.

e. Evaluate adult fish passage efficiencies through radio-telemetry studies.

As stated, NMFS would require any additional measures necessary to recover listed species based on information obtained from monitoring and evaluation requirements imposed under Alternative 2, and on the species recovery status.

S.5.3 ALTERNATIVE 3 (APPLICANTS' PROPOSED ACTION – PROJECT HCPS)

The applicants' proposed action consists of implementing the three HCPs for the operation of the Wells, Rocky Reach, and Rock Island hydroelectric projects. The HCPs were developed to conserve and protect listed *and* non-listed anadromous fish species over the long term, and to support ongoing compliance with the Endangered Species Act, while allowing continued operation of the three projects. The HCPs would be comprehensive long-term settlement agreements under the Endangered Species Act, the Federal Power Act, the Fish and Wildlife Conservation Act, the Northwest Power Planning and Coordination Act, and Title 77 RCW.

This EIS reviews only NMFS' decision to issue the incidental take permits required by the HCPs. NMFS is not required to prepare an EIS for its decision to sign the settlement agreement portions of the HCPs (the EIS required for implementing measures in the HCPs would be undertaken by FERC with a separate Section 7 consultation with NMFS regarding the effects of the settlement agreements on listed species).

The requirements of Section 10 of the Endangered Species Act provide the guidelines for HCP preparation. The information within each of the HCPs includes the following:

- the environmental setting in the project vicinity,
- structural and operational features of the project,
- existing operations related to anadromous salmonids,
- existing mitigation and monitoring measures, and their effectiveness,
- unresolved issues related to anadromous salmonids (note: an adaptive management plan to address changing circumstances and unknown future events addresses this issue in the proposed HCPs),
- proposed mitigation and enhancement measures to address unresolved and unknown future issues (note: an adaptive management plan to address changing circumstances and unknown future events addresses this issue in the proposed HCPs),
- proposed monitoring,
- costs and funding, and
- alternatives to the proposed measures.

S.5.3.1 HCP Species

In addition to the Endangered Species Act-listed species, the HCPs provide additional protection to the other anadromous fish species that occur in the Mid-Columbia River (Plan species).

The Plan species addressed in the HCPs are spring-run chinook salmon, summer/fall chinook salmon, sockeye salmon, coho salmon, and steelhead inhabiting the Mid-Columbia River basin. In addition, the HCPs also identify Permit species (species covered under the incidental take permit application). The Permit species include all the Plan species, except coho salmon. The native coho salmon populations are considered extirpated from the Mid-Columbia River region, and are therefore not subject to Endangered Species Act protection or an incidental take permit.

S.5.3.2 HCP Baseline Conditions

The HCPs do not address impacts resulting from original project construction or mitigation for past damages (Regulations Preambles 1986-1990, FERC Stats. and Regs, paragraph 30,869 at 31,613 (1989), 55 Fed. Reg. 4:8-9 (Jan. 2, 1990). Mitigation measures for these impacts have already been implemented as part of the existing licenses. Prior activities are not considered an action subject to additional mitigation beyond license requirements unless they are considered to cause a continuing "take " of a listed species as defined under the Endangered Species Act.

Existing hatchery production levels are initially assumed to provide adequate compensation for original inundation by the projects. Therefore, the baseline is considered to be the existing conditions.

These baseline conditions also form the basis for determining what effect continuation of the existing conditions would have on listed species. The baseline conditions that existed as of January, 1997, would be used to determine if progress were being made to increase the survival of the Plan species through the implementation of the HCPs.

S.5.3.3 HCP Term

The terms of the three HCPs and any incidental take permits are to be 50 years from the date the HCPs are executed. In the event any PUD project is not relicensed to that PUD, the component HCP for that project would terminate.

The HCPs also have termination provisions if the performance standards are not achieved. An HCP could be less than 50 years under the following circumstances:

- FERC issues a non-power license for the project,
- FERC orders removal or drawdown of the project, or
- 15 years after March 1, 1999 (20 years for Douglas County PUD) if no net impact has not been achieved or maintained, or if no net impact has been achieved and maintained but Plan Species are not rebuilding and the Project is a significant factor in the failure to rebuild,
- if a party fails to comply with the terms of the HCP,
- if the obligations imposed by the HCP are impossible to achieve,
- if NMFS revokes the incidental take permit,
- if a regulatory entity takes action that materially alters or is contrary to one or more provisions of the HCP.

Any party to the HCP (except the PUDs) may elect to withdraw from the agreement at any time, based on the non-compliance provisions of the HCP agreements. However, NMFS and USFWS will not exercise their right to withdraw from the HCP if the PUDs have complied with all aspects of the agreement but have not met the survival standards. If mutual agreement is reached between the PUDs and the two Federal agencies, the Services (NMFS and USFWS) can seek natural river drawdown, dam removal, and/or non-power operations without withdrawing from the agreement or suspending or revoking the Incidental Take Permit.

During the 50-year HCP term, all three projects would undergo a relicensing process with FERC. It is the intention of the PUDs that mitigation measures agreed to as part of the HCP be consistent with, and where possible form the basis of subsequent FERC license articles developed to address impacts on anadromous salmonids. Therefore, unless the parties to the HCPs withdraw from the HCP agreements (following the prescribed withdrawal procedures), they will be supportive of a new license, and the HCPs would constitute the terms, conditions, and recommendations for Plan species under Section 10 (a), Section 10 (j), and Section 18 Fishway Prescriptions in the new license.

The HCP agreements stipulate a dispute resolution procedure that would apply to all disputes over the implementation and compliance of the agreements. While it is the intention of the parties to utilize dispute resolution whenever possible, NMFS specifically reserved the right to use whatever enforcement powers and remedies are available under the Endangered Species Act by law or regulation, without first resorting to this resolution process. In the event that NMFS elects to pursue an enforcement action for a violation under the Endangered Species Act, the PUDs shall be given notice and an opportunity for a hearing with respect to such violation. It should be noted that measures consistent with the HCP agreements and protocols, by definition could not violate the Endangered Species Act.

S.5.3.4 HCP Mitigation Objectives

All measures proposed in the HCPs are intended to minimize and mitigate impacts to the Plan species, to the "maximum extent practicable" as required by the Endangered Species Act. Measures are developed by considering what is necessary from a biological standpoint to mitigate impacts of operating the hydroelectric facilities on the Plan species, and what the PUDs determine is economically feasible in terms of the continued operation of PUD facilities.

The HCPs would mitigate impacts from dam operations in areas directly affected by those operations (project areas). The project areas extend from approximately 1,000 feet downstream of each dam (tailrace) to about 1,000 feet downstream of next dam upstream (reservoir). The PUDs would also provide funding and other assistance for off-site measures intended to increase the natural productivity of Plan species, to offset losses not directly mitigated within the project areas. These off-site measures might also benefit other aquatic species, which might occupy the same habitat.

S.5.3.5 HCP Performance Standards

The HCPs have specific performance standards that relate to the survival of each Plan. The overall performance standard is to achieve no net impact to the Plan species through each dam, and is referred to as "100 percent no net impact." This term takes into account the fact that 100 percent survival cannot be achieved at the projects alone, but also must include off-site measures to increase salmonid productivity (e.g., hatchery supplementation programs and tributary habitat improvements).

The 100 percent no net impact standard consists of two components:

1) 91 percent project survival rate achieved within the geographic area of the projects by fish passage improvement measures, including an independent standard of 95 percent juvenile dam passage survival.

2) 9 percent compensation for unavoidable project mortality provided through hatchery and tributary programs, with 7 percent compensation provided through hatchery programs and 2 percent compensation provided through tributary habitat improvement programs.

Tributary habitat improvement programs would involve the protection and restoration of salmonid habitat within the Columbia River watershed (from the Chief Joseph tailrace to the Rock Island

tailrace), and the Okanogan, Methow, Entiat, and Wenatchee river basins.

The PUDs would use "best efforts" to evaluate, improve, maintain, and operate adult and juvenile fish passage systems to meet the performance standards. Best efforts are referred to as "tools" which are any action, structure, facility or program (on-site only) that are intended to improve the survival of Plan species migrating through the project areas.

Monitoring of both on-site and hatchery mitigation measures would be conducted, and mitigation measures would be modified, as necessary, to achieve or maintain 100 percent no net impact, provided that no more than 7 percent of unavoidable project mortality would be supplied through hatchery compensation without concurrence of the Joint Fisheries Parties. Two percent of the unavoidable project mortality will be compensated for by tributary habitat improvements. However, this component will not be monitored for survival contribution or modified during the 50-year term of the HCPs due to the difficulty and uncertainties associated with monitoring and quantifying the effects of tributary habitat improvements.

The no net impact standard represent input from NMFS, USFWS, and WDFW biologists, and was developed in coordination with tribal and PUD biologists. In addition, it is consistent with the performance standards included in Section VIII.A.15 of the 1995 Federal Columbia River Power System biological opinion for the lower Snake and Columbia River projects (NMFS 1995). In-river survival evaluations would determine if the survival standards were being met.

The no net impact and survival standards are designed to have several layers of requirements to provide the most flexibility to achieve the goal of recovering and stabilizing the anadromous fish runs in the Mid-Columbia River. For example, while the 95 percent juvenile dam passage survival standard is applicable to 95 percent of the run period of each species, the 91 percent project survival standard is a requirement of the entire run. In addition, the 91 percent survival standard also includes reservoir survival and the dam passage survival of returning adults.

Although there is limited survival information available for all the Plan species at each of the three dams, recent improvements in fish tagging technology (e.g., passive integrated transponder [PIT]-tags, miniature radio, sonic and balloon tags) will provide much more detailed and accurate future assessments. These tag improvements and other assessment techniques should provide quantifiable survival estimates through the entire project areas, as well as individual passage routes.

The overall survival rate estimates would determine if the survival standards are being met. However, the off-site compensation activities (e.g., hatchery production and tributary improvement activities) are based on specific levels that are assumed to be adequate. These compensation levels would not be increased.

The HCPs set an initial 5-year period for the PUDs to meet the 95 percent juvenile dam passage survival standard followed by up to 3 years of evaluation. If the survival standards are not met, the HCP Coordinating Committees (which includes NMFS) would then identify additional tools to implement, prior to the next migration period, to achieve 95 percent juvenile dam passage survival and 91 percent project survival.

S.5.3.6 HCP Phases

The HCPs would be executed in three phases. Phase I would occur during the initial 5-year period (1998 – 2002). During Phase I, the PUDs should reach or demonstrate steady progress toward reaching and maintaining HCP project survival standards through implementation of protection measures. During Phase I, the PUDs would have the ultimate decision on the implementation of tools to achieve the 95 percent juvenile dam passage survival standard. The Coordinating Committees would evaluate the success of the protection

measures to determine if the measures are likely to meet the survival standards. If the committees conclude that the standards will not be met, parallel actions (e.g., additional spill) can be required.

Note that the PUDs are currently working towards meeting the survival standards. If the HCPs are implemented, Phase I begins April 1, 1998 with the baseline conditions represented as 1997. This baseline would be used to assess steady progress toward achieving the survival standards over the remaining period, through 2003. Adherence to steady progress however, would not be monitored until the HCPs were actually implemented.

At the end of Phase I, the Coordinating Committees would conclude whether passage survival meets the HCP requirements. Where survival standards are met for specific dams or species, the PUDs would proceed to Phase III. For those dams and species where survival standards are not met, the PUDs would proceed to Phase II.

Phase II includes additional tools that are needed to meet the passage survival standards. The Coordinating Committees would identify the additional tools or studies that are to be implemented for the projects to meet the survival standards, using the following criteria:

1. likelihood of biological success;

2. time required to implement; and

3. cost-effectiveness of solutions, but only where two or more alternatives are comparable in their biological effectiveness.

For Phase III, where the survival standards are met for specific species, the Coordinating Committees would periodically review project survival to ensure that it is maintained according to the HCP requirements. If project survival falls below the standards during Phase III, Phase II would be reinitiated for those species.

S.5.3.7 HCP Committees

The three HCPs would be implemented through four committees:

- two Coordinating Committees,
- one Tributary Committee, and
- one Hatchery Committee.

All of the committees are represented by one member of each signatory party. Douglas County and Chelan County PUDs would have separate Coordinating Committees for the Wells and Rocky Reach/Rock Island projects, respectively. There would be one Tributary Committee and one Hatchery Committee that cover all three HCPs.

The Coordinating Committees would oversee HCP monitoring programs, and periodically evaluate the protection measures to assess actual project survival and unavoidable project mortality provided that no more than 9 percent unavoidable project mortality shall be made up through hatchery and tributary compensation. If any project, for any species, cannot obtain the 91 percent project survival (including the 95 percent juvenile dam passage survival standard), then the PUDs shall consult with the signatory parties through the Coordinating Committees to jointly seek a solution.

The Tributary Committee is charged with the task of selecting projects and approving project budgets from the Plan Species Account for purposes of implementing the Tributary Conservation Plan based on the 2 percent compensation standard.

The Hatchery Committee is responsible for evaluating the hatchery program and ensuring that adequate compensation is being maintained based on the 7 percent compensation standard.

S.5.3.8 HCP Conservation Plan and Compensation Measures

The measures described below are currently considered to be the tools that Chelan and Douglas County PUDs would use to meet the 91 percent

project survival and the 95 percent juvenile dam passage survival standards.

Wells Dam

Outside of the existing mitigation measures negotiated during the 1990 long-term fisheries settlement agreement for the Wells project (FERC 1991), no new structural modifications have been identified to date. The existing juvenile fish bypass system at Wells Dam is estimated to have an overall survival rate of about 98 percent. However, Douglas County PUD would continue to work with fishery agencies and Tribes to optimize passage conditions by refining operating standards for adult fishladders and developing minor structural changes to improve ladder efficiencies. The Douglas County PUD would use its best efforts to undertake any feasible passage project measure that is biologically effective and cost efficient. A 3-year project survival study to assess reservoir and project passage survival would be funded, as well as additional studies of predator behavior and population dynamics to reduce the number of predators in the project area.

Rocky Reach Dam

The Chelan County PUD would be undertaking various interim, prototype, and permanent measures at the Rocky Reach Dam in an effort to achieve a 95 percent juvenile dam passage survival rate for juvenile salmonids migrating through the Rocky Reach forebay, dam, and tailrace. These measures would include interim spill; bypass diversion screen operations; surface collection system development, testing and installation; turbine replacement; and predator control. The appropriate mix of measures would vary as the surface collection system is improved and its efficiency tested and quantified. Survival data would determine the number, type, and magnitude of the various protective measures needed to achieve the 95 percent juvenile dam passage survival standard and an adult passage rate through the project that would meet the overall 91 percent project survival standard that includes both juveniles and adults. Actions would also be taken to improve survival and assure timely passage of adult salmonids through the project. Measures in the Rocky Reach HCP include:

- Design, model, prototype test, and install a turbine bypass system consisting of a surface collection system with or without secondary collection from a limited number of turbine intake screens.
- Modify replacement turbine runners to improve survival of juvenile salmonids as much as possible, given manufacturing, technical, and installation schedule limitations.
- Continue implementing a spill program that provides spill levels of 15 percent of the daily average flow for a 30-day period during the spring-run juvenile migration. In addition, provide up to 6 additional days of 15 percent spill to encompass 90 percent of the Okanogan sockeye run. During the summer, spill 10 percent of the daily average flow for a total of 34 days between June 15 and August 15. Spill may be adjusted or discontinued based on the relative success of other protection measures.
- Immediately initiate evaluations of spill efficiency and total dissolved gas abatement options. To the extent that spill or other spillway-type passage measures are employed at the project to achieve 95 percent juvenile fish dam passage survival and no net impact, Chelan County PUD would coordinate its use with upstream and downstream projects to address total dissolved gas levels.
- Maintain effective predator control measures.
- Perform the necessary studies to properly monitor and evaluate on-site mitigation measures.

Rock Island Dam

Similar to the Rocky Reach Project, the Chelan County PUD would undertake various interim, prototype, and permanent measures at Rock Island Dam in an effort to achieve the 95 percent dam passage survival standard for juvenile salmonids migrating through the Rock Island forebay, dam, and tailrace. These measures could include a juvenile bypass system, modified spill gates for surface spill, continued or expanded measures for predator control, and possible improvements to turbines. Survival data obtained at each step in the process would determine the number, type, and magnitude of the various protective measures needed to achieve the 95 percent juvenile dam passage survival standard. Actions would also be taken to improve survival and assure timely passage of adult salmonids through the project to meet the 91 percent project survival standard. The measures could include:

- designing, modeling, prototype testing, and installing spill gate modifications to provide surface spill to increase fish passage efficiency;
- testing and evaluating various spill configurations;
- continue implementing the existing spill program;
- designing, modeling, prototype testing, and installing a turbine bypass system consisting of a surface bypass collection system, with or without secondary collection from turbine intakes;
- possible replacement of turbine runners to improve survival of juvenile salmonids that pass through the units, and limiting use of the Powerhouse 1 turbines;
- testing a forebay guidance curtain to route juvenile anadromous salmonids into surface bypass collectors;
- maintaining effective predator control measures; and
- performing necessary studies to properly monitor and evaluate on-site mitigation measures.

Tributary Conservation Plan

Alternative 3 would create a Plan Species Account, to be used to collectively fund activities for the protection and restoration of Plan species habitat within the Columbia River watershed (from Chief Joseph tailrace to the Rock Island tailrace), and the Okanogan, Methow, Entiat and Wenatchee River watersheds, in order to compensate for 2 percent of the unavoidable project mortality. These habitat improvement projects could include, but not be limited to:

- providing access to currently blocked stream sections or oxbows,
- removing dams or other passage barriers on tributary streams,
- improving or increasing the hiding and resting cover habitat that is essential for these species during their relatively long adult holding period,
- improving in-stream flow conditions by correcting problematic water diversion or withdrawal structures, and
- purchasing important aquatic habitat shoreline areas for preservation or restoration.

Such tributary habitat conservation and restoration measures are expected to improve the migration and rearing conditions for all anadromous fish species. These measures are also expected to help decrease bank erosion, sedimentation, channel scouring and water quality problems. The improved conditions would increase the opportunities for successful spawning by facilitating the adult salmonids returning to their natal spawning areas at the proper time and in good health.

The funding levels for each project to the Plan Species Account are set in the HCPs. For the Wells project, the Douglas County PUD would make an initial contribution to the account of $991,000 (1998 dollars). If juvenile dam passage survival after three years of evaluations remains greater than or equal to 95 percent, the district will make annual payments of $88,089 (1998 dollars) throughout the HCP term or will pay $1,321,333 (equivalent to 15 years of annual payments), deducting the actual costs of bond issuance and interest. If juvenile dam passage survival is less than 95 percent, the Douglas County PUD shall contribute an additional $991,000 and increase the annual funding to $176,178, or make an up front contribution of $2,642,667 (equivalent to 15 years of annual payments in 1998 dollars), deducting the actual costs of bond issuance and interest.

For the Rocky Reach project, Chelan County PUD would fund the Plan Species Account at $229,800 annually (1998 dollars adjusted annually for inflation) for the term of the HCP.

For the Rock Island project, the Chelan County PUD would provide $485,200 annually (1998 dollars adjusted annually for inflation) to the Plan Species Account.

The Plan Species Account would be vested with the authority to expend money contributed by the PUDs for activities within the Columbia River watershed (from Chief Joseph Dam tailrace to the Rock Island tailrace), and including the Okanogan, Methow, Entiat and Wenatchee River watersheds to increase productivity of salmonids in the Mid-Columbia River area.

The identity, character, and magnitude of specific compensatory actions would be determined by the Tributary Committee, subject to the guidelines and standards of biological and economic efficiency and the financial resources available through the Plan Species Account.

The Tributary Committee would be composed of one representative of each of the signatory parties. The committee may select other expert entities, such as land and water trust/conservancy groups, to serve as additional, non-voting members of the Tributary Committee. The committee would be charged with the task of selecting projects and approving project budgets for the purposes of implementing the Tributary Conservation Plan.

The tributary habitat improvement projects would be determined on a case-by-case basis by the Tributary Committee, subject to the guidelines and standards of biological and economic efficiency and the financial resources of the Plan Species Account. The guidelines for tributary projects place the highest priority on maintaining and improving stream channel diversity and floodplain function. The projects would seek to conserve and protect riparian habitat to improve incubation and rearing conditions in tributary streams.

Hatchery Compensation Plan

A Hatchery Coordinating Committee would consist of one representative of each HCP signatory party. This committee would direct the effort required of each PUD for meeting the 7 percent hatchery compensation level. The initial estimated HCP hatchery production capacities for Plan species would be based on the average adult returns of Plan species for a baseline period, the 7 percent compensation requirements, and baseline adult/smolt survival rates for existing Mid-Columbia River hatcheries. The estimated initial production capacity shall be adjusted periodically, excepting for original inundation mitigation, to achieve and maintain no net impact to the Plan species. Adjustments to the hatchery compensation level may include reduction of production to conform with actual project mortality, as determined from monitoring and evaluation, or increases in production as the base population level increases in the recovering anadromous fish populations. Hatchery compensation may be increased either by increasing the number of fish produced or by increasing the survival of fish produced at the initial production levels.

Naturally produced coho, progeny of the reintroduction efforts, will be afforded the same protection levels (no net impact standard and 91 percent project passage survival) as for other plan species. However, until successfully reproducing populations are reestablished, there are no hatchery compensation programs required in the HCPs.

S.5.3.9 Provisions for Unknown Impacts on Other Aquatic Species

The HCPs do not include mitigation measures for non-Plan species. However, species that actively or passively pass the project, bull trout for example, may benefit from improvements at the dams (through improved fish passage conditions). Bull trout are a threatened species in the Columbia River basin, and although they occur in the project area, the extent of their occurrence and the project-related impacts are unknown. The PUDs and FERC are currently conducting informal consultation with the USFWS to assess the potential effect of project operations on bull trout.

Aquatic species that are expected to benefit from the tributary habitat improvement projects conducted under the HCPs are Pacific lamprey and resident trout species (including bull trout) that occupy the same habitats as the Plan species. However, there are no specific provisions for enhancing or protecting these species under the HCPs.

In addition to the resident fish that typically occur in the tributaries, there are no provisions in the HCPs to enhance or protect fish species that typically occur in the reservoir areas

Terrestrial wildlife species that use riparian, wetland, and floodplain habitats are expected to benefit from implementation of aquatic habitat improvements in the tributaries. These improvements should increase their food supply, cover, and overall habitat area.

S.5.3.10 Monitoring and Evaluation

All three HCPs propose monitoring and evaluation of on-site measures to determine if the 95 percent juvenile dam passage survival standard and 91 percent project survival standard have been achieved. In addition, monitoring and evaluation of tributary habitat improvements funded by the Plan Species Account and the number of fish produced by the hatchery program would also be monitored.

S.5.3.11 Project Cumulative Effects

The PUDs would notify and consider comments from the signatory parties regarding land use permit applications on project-owned lands. The PUDs would also notify applicants seeking permits to use or occupy project lands or water that such use or occupancy may result in an incidental take of species listed under the Endangered Species Act.

S.5.3.12 Costs and Funding

Funding of all on-site measures, including studies necessary to evaluate and monitor the effectiveness of those measures, would be provided directly by the PUDs from power sale revenues. It is anticipated that bonds secured by those revenues would be issued for major capital costs, such as bypass construction. Money for the Plan Species Account would also come from project revenues, with the initial contribution possibly obtained from a bond issue.

S.5.3.13 Issuance of the Incidental Take Permit

According to Section 10 (a)(2)(B) of the Endangered Species Act, after the HCPs undergo public review and comment, Section 10 incidental take permits may be issued if the agency finds that:

- any takings would be incidental;

- the PUDs would, to the maximum extent practicable, minimize and mitigate the impacts of such takings;
- the PUDs would ensure adequate funding of the HCPs;
- any takings would not appreciably reduce the likelihood of the survival and recovery of the species in the wild; and
- that other measures required by the agency through its biological opinion would be met.

S.3.5.14 Clarification of HCP Issues

The HCPs were provided to NMFS in 1998 at which time some of the preliminary provisions were implemented pending Endangered Species Act and NEPA reviews. For example, since 1998, the PUDs have had ultimate decision on pursuit and implementation of tools to achieve the juvenile dam passage survival standard. As a result, Phase I should be completed by 2003. For Douglas County PUD, evaluation to determine whether standards have been achieved at the Wells Dam occurred during Phase I. For the Chelan County PUD, the evaluation period will likely follow Phase I for the Rocky Reach and Rock Island dams. Several inconsistencies have resulted from this phased implementation approach, and a number of technical issues have arisen during the initial implementation efforts. The following sections attempt to clarify these inconsistencies and issues. The terms of the HCPs are expected to be modified as necessary to reflect these clarifications.

Term of the HCPs

Phase I would continue through 2003, although the 50-year term of the HCPs would not begin until the incidental take permits are issued. Based on the current schedule, the terms of the HCPs should be from April 2002 through March 2052. Payments to the Plan Species Account would be initiated when the incidental take permits are issued, and adjusted for inflation from 1998.

Transition Period

Because measures common to Phase 1 of the HCPs have been conditionally implemented by the PUDs (even though the HCPs have not been agreed to by all parties at this time), the PUDs have had the ultimate authority on pursuit and implementation of specific bypass measures since 1998. However, the existing FERC license articles, settlement agreements and stipulations remain in effect to address dispute resolution proceedings, spill volumes, and hatchery compensation levels. Components of the HCPs that address each of these issues would not be implemented until the agreements have been ratified. In order to address ongoing Endangered Species Act issues, FERC and NMFS have been consulting over interim protection plans that would remain in affect until April 2002, or until the HCPs are ratified (whichever comes first). If the agreements have not been ratified by April 2002, FERC would be required to reinitiate consultation with NMFS under Section 7 of the Endangered Species Act at which time additional measures may be required.

Verification of Standards

In order to determine if the HCPs survival standards are being met, specific biological and statistical standards have been established in the HCPs. These standards apply to all of the evaluations to be conducted. Because the available technology is not sufficient to adequately conduct all of the evaluations proposed in the HCPs for each of the Plan species, representative survival studies would be conducted for yearling chinook salmon and steelhead. Indirect methods of measuring compliance would be developed for each of the remaining plan species. The results would be utilized to support decisions made under Phase I of the HCPs and efforts to determine more direct compliance with the standards for all species would continue during phases II and III. Survival studies of yearling chinook salmon and steelhead were initiated at the Wells Project in 1998 and will be initiated at the Rocky Reach and Rock Island projects by no later than 2003. Initial verification of the 95 percent juvenile dam passage survival standard is expected to take 3 years.

Currently, the 95 percent juvenile dam passage survival standard cannot be verified for subyearling chinook (summer/fall chinook) or for sockeye salmon and the 91 percent total project survival standard (which includes the survival of the adult life stages) cannot be verified for any of the Plan species. There is currently no methodology that all parties support for determining the survival of adult fish through the projects. Therefore, information pertaining to the juvenile life stages and compliance with the juvenile dam passage survival standards will be the basis for determining if the standards have been met.

The HCPs provide a mechanism for future verification of the 91 percent total project survival standards for each of the Plan species, as the appropriate technology is developed and supported by the Coordinating Committees.

Wells Project

Because the Wells Project has an existing bypass system, juvenile survival studies were initiated before the end of the Phase I time frame. Douglas County PUD conducted juvenile survival studies in 1998 using yearling chinook salmon, and in 1999 and 2000 using yearling steelhead. Although not required under Phase I of the HCP, it is anticipated that a fourth year of juvenile survival studies will be conducted in 2001, using yearling chinook salmon. Additionally, the Douglas County PUD conducted 3 years of fish passage efficiency evaluations (an estimate of the number of juvenile fish bypassing the project through the surface bypass system) for the Wells project bypass system. These studies indicated that 92 percent of the spring-run migrants (yearling chinook, steelhead, and sockeye) and 96 percent of the summer-run migrants (summer/fall chinook) use the bypass system. Based on the best estimate of turbine and bypass survival (91.2 and 98 percent, respectively), spring-run migrants are expected to have a juvenile dam passage survival rate of 97.5 percent and summer-run migrants are expected to have a 97.7 percent juvenile dam passage survival rate.

The determination of whether the Wells project is meeting the HCP survival standards will initially be based upon the results of the project survival studies conducted for yearling chinook salmon and steelhead, and an indirect assessment of juvenile survival for each of the remaining Plan species. Throughout the term of the HCP, the 95 percent juvenile dam passage survival standard and the 91 percent total project survival standard would be re-evaluated from time to time as determined necessary by the Coordinating Committee. It is anticipated that, as technology is developed; sockeye and subyearling chinook salmon, as well as adult salmon, and steelhead survival studies would be conducted.

Funding for the Tributary Conservation Plan for the Wells project is tied directly to the survival standards. If it is determined that the Wells total project survival standard is equal to or more than 95 percent, Douglas County PUD's contribution to the tributary fund will be one-half of the expected contribution. If the total project survival standard is determined to fall below 95 percent, Douglas County PUD will contribute prospectively, for the remaining time of the HCP, the equivalent of a full 2 percent credit to the tributary fund. Until the Coordinating Committee develops methodologies to evaluate the adult project passage survival component of the total project survival standard, the results of the juvenile survival studies (including both the direct and indirect effects of dam and reservoir related survival) will singularly determine Douglas County PUD's contribution to the Plan Species Account. Therefore, if 95 percent juvenile project survival is met, the fund will be one-half of the expected contribution.

Rocky Reach Project

The Chelan County PUD is developing a surface bypass collector system for the Rocky Reach project. At the conclusion of Phase I, or earlier if the Coordinating Committee concurs, Chelan County PUD will initiate 3 years of survival studies for yearling chinook salmon and steelhead to verify that the 95 percent juvenile dam passage survival standard is being met. As is the case with the Wells

Project, the best available information will be used to determine whether the juvenile dam passage survival standard has been met for each of the remaining Plan species (e.g., survival information from surrogate species combined with measurements of fish passage through non turbine routes). Throughout the term of the HCP, the 95 percent juvenile dam passage survival standard and the 91 percent total project survival standard will be re-evaluated from time to time as determined necessary by the Coordinating Committee.

Rock Island Project

Spill is currently the preferred juvenile bypass measure at Rock Island Dam. At the end of Phase I (or earlier if the Coordinating Committee concurs) Chelan County PUD will initiate 3 years of survival studies for yearling chinook salmon and steelhead to verify that the 95 percent juvenile dam passage survival standard is being met. As is the case with the Wells and Rocky Reach projects, the best available information will be used to determine whether the juvenile dam passage survival standard has been met for each of the remaining Plan species (e.g., survival information from surrogate species combined with measurements of fish passage through non turbine routes). Throughout the term of the HCP, the 95 percent juvenile dam passage survival standard and the 91 percent project survival standard will be re-evaluated from time to time as determined necessary by the Coordinating Committee.

Compensation for Unavoidable Project Mortality

During the development of this EIS, certain sections of the HCPs required clarification to allow for accurate analysis of the potential affects of the actions on Endangered Species Act-listed species and on other natural resources. Most of the clarifications related specifically to modification of the standards to ensure no net impact. It should be noted that HCP survival standards are fixed and compensation will not vary if the standards are not being met. Hatchery compensation would not be increased to 9 percent; for example, if dam passage survival is only 93 percent for a given species. The 2 percent shortcoming in the juvenile dam passage survival standard would be addressed through improvements in dam passage survival. Likewise, if the 7 percent hatchery compensation level is not met due to NMFS Endangered Species Act concerns, neither the dam passage survival standard, the project survival standard, nor the habitat compensation standard would be adjusted.

Hatchery Compensation Plan Issue

During the development of the HCPs, NMFS determined that the 7 percent hatchery compensation levels may adversely affect wild salmon populations under certain conditions. For example, it may be necessary to use adult salmon and steelhead that are not adapted to the local habitat conditions in order to produce enough juvenile fish to meet the 7 percent compensation level. In order to ensure that these compensation levels do not affect the long-term health of the wild populations, all fish produced under this program must be from local stocks. Therefore, until the specific details of the compensation programs are developed, including identification of appropriate broodstock, maximum percentages of the wild populations that can be trapped for broodstock, and the total number of fish produced through artificial means, NMFS can not guarantee that the 7 percent compensation level will satisfy Endangered Species Act requirements and no net impact would not be achieved.

Although several of the affected Columbia basin treaty Tribes made significant comments during the scoping process associated with this EIS, a major concern was NMFS' reluctance to guarantee the 7 percent compensation levels. These levels were a key component of achieving and maintaining no net impact and a crucial portion of tribal consideration for the HCPs. Without a guarantee from NMFS that the 7 percent compensation levels would be attained, the Tribes will not endorse the HCPs.

S.5.3.15 Recent HCP Revisions

On June 1, 2000, the USFWS and NMFS published a final addendum to the Handbook for Habitat Conservation Planning and Incidental Take

Permitting Process. This addendum, which is also known as the five-point policy guidance, provides clarifying direction on five issues brought forth from recent HCPs implemented throughout the United States. Described below is how the applicant HCPs meet the HCP addendum.

Biological Goals and Objectives

The addendum recommends that biological goals and objectives be incorporated in HCPs. These goals may be either habitat or species based. Species-based goals are expressed in terms specific to individuals or populations of that species. The performance standards identified in Section S.5.3.5 represent the biological goals and objectives for the HCPs (i.e., the HCP standards). These standards require specific survival goals based on the population passing through each project. In addition, incidental mortality is mitigated through hatchery production and habitat improvements to achieve an overall no net impact standard.

Adaptive Management

The use of an adaptive management strategy is recommended to: (1) identify the uncertainties related to quantifying the achievement of goals and objectives of the HCPs as well as the questions that need to be addressed to resolve these uncertainties; (2) develop alternative strategies and determine which experimental strategies to implement; (3) integrate a monitoring program that is able to detect the necessary information for strategy evaluation; and (4) incorporate feedback loops that link implementation and monitoring to a decision-making process that results in appropriate changes in management. Adaptive management would be incorporated into the HCP monitoring programs that provide the feedback necessary to determine the effectiveness of various approaches being implemented to increase fish survival. Throughout the term of the HCP, what is learned would be used to adjust conservation measures.

Monitoring

HCP handbook guidance on monitoring recommends that the monitoring program reflect the measurable biological standards and objectives. The monitoring programs developed under the HCPs are two-fold: (1) to confirm fish survival through the dams, and (2) evaluate the effectiveness of on-site mitigation measures implemented to improve fish survival.

Permit Duration

Factors to be evaluated when determining permit duration include the time line of the proposed activities and the expected positive and negative effects on covered species associated with the proposed duration. The HCP terms generally compliment the term of a project operating license, but more importantly reflect a desire to provide long-term protection assurances for the Plan species that also account for oceanic condition changes that may occur over a longer period of time.

Public Participation

The HCP handbook amendment recommends a 90-day public comment period for large-scale, regional, or complex HCPs. The public review period for the Wells, Rocky Reach, and Rock Island HCPs will occur over a 90-day period.

S.6 ACTIONS COMMON TO ALL ALTERNATIVES

Only those project operations that affect fish passage would be altered, if necessary, to assist in increasing the overall salmon and steelhead survival rates. Studies to evaluate and improve fish passage have been ongoing since the dams were constructed. As a result, the key factors influencing fish passage have already been identified. Project operations that are included under all of the alternatives are:

- fishways,
- fishladders,
- fish bypass,
- turbine operations,
- predator removal,
- hatcheries, and
- spill.

The four tributaries where funds for the Plan Species Account would be directed under the HCP (Wenatchee, Entiat, Methow, and Okanogan) have threatened (bull trout) and endangered (spring-run chinook and steelhead) species. Numerous efforts are being, or will be, implemented to improve fish survival and breeding opportunities in the streams that are unrelated to the operation of the Wells, Rocky Reach, and Rock Island dams or the HCPs. These improvement activities would continue under all alternatives.

S.7 ALTERNATIVE COMPARISON

Because each of the alternatives strive to improve fish survival at the dams, environmental differences among the alternatives at the project site are somewhat less significant than the procedural differences between Endangered Species Act Section 7 consultations (Alternative 2) and Section 10 permit processes (Alternative 3) as shown in Table S-2 and described below.

The most significant differences among the alternatives are the scope of the species covered, the statutory obligations covered, the parties that support each alternatives, and the speed at which each alternative could be implemented. Alternative 1, current FERC license requirements, addresses all species but may or may not address the additional requirements of the Endangered Species Act. Alternative 2 creates a long-term protection plan between FERC and NMFS only for listed upper Columbia River steelhead and spring-run chinook salmon and requires a new consultation at the time each project is re-licensed. Measures under Alternative 2 are not currently supported by FERC or the licensees, which may lead to a delay in implementing actions. Alternative 3, the HCPs, are long-term settlements of salmon and steelhead issues at each project under the current license and at relicensing. The settlements cover statutory obligations in addition to the ESA, and apply to any party that signs the HCP agreements. The HCPs were initially developed by the PUDs along with NMFS; FERC; USFWS; the Yakama, Colville, and Umatilla Tribes; American Rivers, Inc.; and each project's wholesale power purchasers.

Table S-2 compares the alternatives, and the text in Sections S.7.1 through S.7.6 below describes the major differences between the alternatives. Note that the following information is not intended to identify every possible scenario that may result under each alternative, only to address the major procedural differences in the alternatives, and to highlight some of the fundamental protection differences.

S.7.1 AFFECTED SPECIES

S.7.1.1 Alternative 1 (No Action)

Protection for the listed and non-listed anadromous salmonid species would be provided through the existing FERC licenses (and future relicensing procedures). Existing measures however, may not prevent the extinction of listed species. Additional Federal laws, primarily the Federal Power Act, could be utilized to seek protection, mitigation, and enhancement measures for steelhead, spring-run chinook salmon, summer/fall chinook salmon, and sockeye salmon during project relicensings and through license re-opener clauses.

TABLE S-2. ALTERNATIVE COMPARISON

ACTION	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Endangered Species Act Compliance	None	Section 7 (a)(2)	Section 10 (a)(1)
Duration of each Alternative	Not applicable	Current license term, modified as needed based on new information – consultation reinitiated at relicensing	50 years subject to withdrawal and termination provisions
Species Covered	Anadromous fish in general	Upper Columbia spring-run chinook Upper Columbia steelhead (Permit species)	Spring-run, summer and fall chinook, summer steelhead, sockeye salmon, and coho salmon (Plan species)
Protection Measures	Limited spill and bypass measures, continued operation of adult fishways	Additional project operational and structural modifications for listed species only and habitat improvements if necessary to prevent the extinction of listed species	Additional project operational and structural modifications for all Plan species and immediate implementation of habitat improvement measures
Performance Standards	Currently based on fish passage efficiency for specific measures (no project or species level standards)	The species' persistence, as listed or as a recovery unit, beyond the conditions leading to its endangerment, with sufficient resilience to allow for the potential recovery from endangerment	No Net Impact - 91% overall fish passage survival (juvenile and adult) with an independent standard of 95% juvenile survival through the forebay, dam and tailrace. Compensation to obtain no net impact also includes 7% to hatchery programs and 2% to tributary programs
Project Lead for Identifying and Implementing Protection Measures	FERC	FERC in consultation with NMFS	HCP Coordinating Committees
Location of Fish Protection Measures	Area of project including reservoir, dam structures, tailrace, and hatcheries	Area of project including reservoir, dam structures, tailrace, and hatcheries. Tributary improvements may be proposed if necessary to prevent the extinction of listed species	Area of project including reservoir, dam structures, tailrace, and hatcheries and additionally includes Wenatchee, Entiat, Methow, and Okanogan rivers and tributaries, as well as associated hatcheries and agreement on the habitat improvement process
No Surprises Policy	Not applicable	Not applicable	Applicable
Continued Studies to Assess Survival	Yes for Wells, but only to verify fish passage measures at Rock Island and Rocky Reach	Yes	Yes

TABLE S-2. ALTERNATIVE COMPARISON (CONTINUED)

ACTION	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Monitoring Following Statement/Permit Issuance	Limited	As needed to ensure effectiveness of measures and status of listed species	Significant throughout the term of the agreement for all Plan species
Future Provisions for Other Aquatic Species	Would occur under relicensing or under existing license reopener clauses	Same as Alternative 1	Same as Alternative 1
Hatchery Compensation	Continued hatchery funding at present level, for inundation compensation levels and ongoing unavoidable losses (hatchery compensation can be adjusted for Wells base on actual losses)	Same as Alternative 1, although may be refined based on effects to listed species	Continued hatchery funding for inundation compensation levels. Hatchery funding for ongoing unavoidable losses would be set to achieve 7 percent compensation levels, unless reduced to prevent jeopardy to listed species
Tributary Improvements	No PUD-funded improvements	Potentially, if necessary to prevent the extinction of listed species (implemented in lieu of non-power measures)	PUD contributions to the Plan Species Account would pay for projects that improve salmon and steelhead habitat in the Wenatchee, Entiat, Methow, and Okanogan river basins, as well as the Mid-Columbia River mainstem. Monetary amount is specified in the HCPs
On-Site Protection Measures			
Wells	Adult Passage: Continue operation and maintenance of adult fishways, evaluate and improve fishway operations, conduct modeling and develop solutions for adult fish passage problems, use spillway flow configurations to optimize adult fishway attraction flows	Adult Passage: Same as Alternative 1 or as needed to prevent the extinction of listed species	Adult Passage: Meet 91% overall survival standards (including juvenile and adults) for all Plan species
	Juvenile Passage: Evaluate and control total dissolved gas, continue predator control program. Operate surface bypass system 24-hours/day to achieve 70-80% FPE	Juvenile Passage: In addition to measures in Alternative 1: Operate turbines at peak efficiency ratings, operate surface bypass system 24 hours/day for 95% of juvenile spring-run chinook and steelhead migrations, increase spill as needed to prevent the extinction of listed species	Juvenile Passage: Meet 95% dam passage survival for all Plan species by increasing effectiveness of juvenile bypass system, spill gates, predator control, and turbine usage. Applicant has opportunity of selecting options that, when combined, meet survival standards

TABLE S-2. ALTERNATIVE COMPARISON (CONTINUED)

ACTION	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Rocky Reach	Adult Passage: Continue to operate and maintain adult fishladders	Adult Passage: Continue operation and maintenance of adult fishways, evaluate and improve fishway operations, conduct modeling and develop solutions for adult fish passage problems, use spillway flow configurations to optimize adult fishway attraction flows	Adult Passage: Same as Wells (above)
	Juvenile Passage: Spill 15% of daily river flow for up to 30 days during spring migration period and 10% for 34 days during the summer migration, evaluate and construct a permanent bypass system and replace old turbine runners	Juvenile Passage: In addition to measures identified in Alternative 1, increase spill as necessary to prevent the extinction of listed species	Juvenile Passage: Same as Wells (above)
Rock Island	Adult Passage: Continue to operate and maintain adult fishladders	Adult Passage: Same as for Rocky Reach (above)	Adult Passage: Same as Wells (above)
	Juvenile Passage: Provide spill as requested by fish agencies and Tribes through the a Fish Conservation Account	Juvenile Passage: In addition to measures identified in Alternative 1, increase spill as necessary to prevent the extinction of listed species, enhance spillway passage efficiency, preferentially use Powerhouse 2 turbines, and minimize use of Nagler turbines	Juvenile Passage: Same as Wells (above)
Dispute Resolution	Disputes resolved by FERC and/or in court	Disputes are resolved by NMFS, FERC and/or in court	Disputes resolved by mediation and binding arbitration, and includes expedited dispute resolution procedures to resolve some disputes within 30 days
		Other measures as required by NMFS to ensure protection and recovery of the listed species	

S.7.1.2 Alternative 2

Authorities afforded to NMFS under the Endangered Species Act would apply to upper Columbia River steelhead, upper Columbia River spring-run chinook salmon, and Mid-Columbia River steelhead. Protection, mitigation, and enhancement measures for summer/fall chinook and sockeye salmon would be addressed as in Alternative 1.

S.7.1.3 Alternative 3

The HCP applies to: upper Columbia River steelhead, upper Columbia River spring-run chinook salmon, sockeye salmon, summer/fall chinook salmon, and coho salmon (although the wild population of coho salmon has been extirpated from the action area, the HCPs provide measures to protect reintroduced populations). Although the impacts to Mid-Columbia River steelhead are likely limited to water quality issues, this species is not specifically addressed in the HCP agreements.

S.7.2 PROCEDURAL DIFFERENCES

S.7.2.1 Alternative 1 (No Action)

Provisions of this alternative would be implemented through FERC proceedings, which currently include use of Coordinating Committees. The committees consist of members representing fishery agencies, Tribes, and PUDs. The protection measures implemented through this process require unanimous consent of all parties. This can, and has resulted in contested proceedings and legal debates among the parties that have significantly delayed implementation of fish protection measures. This alternative does not provide direct protection for listed species, and therefore may not necessarily satisfy Endangered Species Act requirements.

S.7.2.2 Alternative 2

Under Alternative 2 (Endangered Species Act Section 7 consultations for listed species), NMFS has the legal authority to determine the actions necessary to ensure the survival and recovery of listed species. This includes:

- determining the most appropriate measures to be taken at each project,
- determining the necessary level of survival at each project,
- determining the most appropriate data to be considered when evaluating survival,
- and modifying the measures as needed if species continue to decline.

The FERC, as the action agency, must comply with these actions in order to be exempt from the take prohibitions as described under Section 9 of the Endangered Species Act. Under Section 7, NMFS has a legal responsibility to provide the benefit of the doubt to listed species with respect to gaps in the information base.

If FERC or the PUDs disagree with NMFS' decisions under this process, lengthy legal proceedings may ensue. During these proceedings, measures in addition to those already included in the FERC-issued operating licenses and settlement agreements are not likely to be implemented.

Species not listed under the Endangered Species Act would be addressed as in Alternative 1.

S.7.2.3 Alternative 3

According to provisions in the HCPs, the authority to determine the appropriate protection measures for all of the Plan species, including the Endangered Species Act-listed species, fundamentally shifts away from NMFS under Alternative 3 (HCPs) once the incidental take permit has been issued. During Phase I of the HCPs, the PUDs would have the

ultimate authority to determine the measures necessary to achieve the survival standards. During Phase II, a Coordinating Committee (comprised of the PUD responsible for the HCP, NMFS, and each of the signatories to the agreement) jointly decides on the appropriate measures. If the Coordinating Committee cannot reach consensus, the PUDs may continue to determine the appropriate measures unless the matter is addressed through the dispute resolution process.

The party bringing an issue to dispute resolution must prove its case by a preponderance of the evidence. There is no requirement to provide the benefit of the doubt to the species of concern with respect to gaps in the information base and NMFS has no authority to determine what constitutes the best available information to be utilized in support of any decisions. The dispute resolution process is limited to under five months, ensuring that lengthy legal disputes would not occur, and decisions reached through the dispute resolution process are binding. As a result, specific measures are likely to be implemented more expeditiously than could be expected under Alternative 2. If the standards are achieved by 2003, they would be maintained by the PUDs throughout the term of the agreement.

Because the HCPs set out certain actions, responsibilities, and duties to be carried out by the PUDs, each of the signatories to the agreements agrees not to institute any action under the Endangered Species Act, the Federal Power Act, the Fish and Wildlife Coordination Act, or the Pacific Northwest Electric Power Planning Conservation Act. In addition, NMFS' no surprises policy (which ensures the PUDs that NMFS would not request additional measures during the term of this agreement) would be in effect.

S.7.3 TIME FRAME

S.7.3.1 Alternative 1 (No Action)

Fish protection measures included in this alternative would occur throughout the term of the FERC-issued operating licenses. They may not, however, represent sufficient protection for Endangered Species Act-listed species. In any case, project operations would continue as occurs presently regardless of future listings or delisting. FERC license periods are typically 30 to 50 years, although the three Wells, Rocky Reach, and Rock Island projects would be relicensed over the next 29 years. Additional fish protection measures would likely be implemented during relicensing.

S.7.3.2 Alternative 2

Specific measures required for Endangered Species Act-listed species would be in effect throughout the term of the FERC-issued operating licenses or until the species status warranted delisting. FERC would be required to reconsult under Section 7 of the Endangered Species Act prior to issuing any new project operating licenses or amendments (measures initiated under the Federal Power Act for unlisted species would be in effect through the FERC license period [typically 30 to 50 years]). Section 7 consultation would be reinitiated, and additional measures potentially required, as new information is developed under the research and monitoring programs.

S.7.3.3 Alternative 3

The HCPs would be in effect for a 50-year period beginning with the date that the agreements are legally ratified by each of the signatories (currently expected to be April 2002 through March 2052).

S.7.4 GOALS AND OBJECTIVES

S.7.4.1 Alternative 1 (No Action)

This alternative may not provide specific provisions to ensure the continued existence or recovery of Endangered Species Act-listed fish species. Protection measures would continue to be implemented in accordance with existing FERC license articles and settlement agreements. Goals and objectives tend to be specific for each measure

at each dam (i.e., no project or species level standards).

S.7.4.2 Alternative 2

The Endangered Species Act Section 7 process is specifically intended to ensure the continued existence of listed species with an adequate potential for recovery. The manner in which the projects are operated is based upon a biological opinion issued by NMFS to FERC, and a FERC order issued to the PUDs.

S.7.4.3 Alternative 3

The HCPs guarantee 100 percent no net impact for all of the Plan species.

S.7.5 ADDITIONAL MEASURES

S.7.5.1 Alternative 1 (No Action)

This alternative does not provide a procedure to force implementation of mitigation measures beyond the project's boundaries (i.e., tributary habitat improvements). Under Alternative 1, hatchery supplementation is addressed through the existing settlement agreements between FERC and the PUDs, the existing license articles, or through the relicensing procedures.

S.7.5.2 Alternative 2

The Endangered Species Act Section 7 process typically does not address off site mitigation (i.e., habitat improvement) that has not been affected by the proposed action. However, NMFS would likely propose offsite actions prior to investigating any non-power measures, if protection measures implemented at the projects have been fully utilized and the species continue to decline. Under Alternative 2, supplementation is addressed through the existing settlement agreements between FERC and the PUDs or during relicensing. If NMFS determines that the current hatchery production levels will compromise the genetic integrity of wild fish, the production levels would be reduced.

S.7.5.3 Alternative 3

The HCPs include a funding process for the protection and restoration of Plan species' habitat within the Columbia River watershed (from the Chief Joseph Project tailrace to the Rock Island Project tailrace) and in the Okanogan, Methow, Entiat, and Wenatchee River watersheds. In addition, hatchery compensation plans guarantee funding and capacity to meet the 7 percent compensation level necessary to achieve no net impact.

S.7.6 OTHER ENVIRONMENTAL MEASURES

Table S-3 provides a summary comparison of how the proposed fish protection measures affect other environmental resources in the project area.

S.8 DECISION TO BE MADE

The proposed action (Alternative 3) is the preferred alternative by the project proponents (Douglas County and Chelan County PUDs). NMFS will select the Federal agency's preferred alternative in a Record of Decision (ROD) that will be issued by NMFS after the completion of this EIS and following the subsequent public review and comment period. There are several key steps that NMFS must also take before deciding on the applicants' request for a Section 10 incidental take permit. The actions by NMFS will be guided by both the Endangered Species Act and NEPA requirements. The major NEPA-related issues that NMFS must consider in making its decision are:

- Was the environmental review process adequate?

- Were the impacts adequately discussed, and will significant adverse impacts be mitigated?
- Were all reasonable and appropriate alternatives to the proposed action considered?
- Are there significant unavoidable adverse impacts?
- What were the values that were considered, and what is the basis for the decision?
- Are there any outstanding unresolved issue?
- Will the proposed action result in the irrevocable commitment of Federal resources?

The major Endangered Species Act issues that NMFS must consider are related to the overall protection and recovery of the salmon and steelhead species that would be covered by the incidental take permit. To document its analysis and decision making, NMFS will prepare a biological opinion to determine if the implementation of the HCPs is likely to jeopardize the continued existence of listed species that are likely to occur in the Plan area. The analysis by NMFS will involve:

- defining the species-level biological requirements,
- evaluating the species status with respect to the species-level biological requirements,
- determining the biological requirements within the proposed action area,
- determining the status of the species within the action area,
- determining the factors affecting the species environment within the action area,
- determining the effects of the proposed action on species-level biological requirements,
- evaluating the cumulative effects associated with the proposed action,
- identifying critical habitat for the species,
- determining whether the species can be expected to survive with an adequate potential for recovery under the proposed action, and
- identifying reasonable alternatives to the proposed action if it is likely to jeopardize listed species.

If the NMFS' biological opinion finds that the proposed actions are not likely to jeopardize the continued existence of the listed species and not likely to result in the destruction or adverse modification of critical habitat, the permits can be approved. Any additional measures that NMFS deems necessary for the permit would be detailed in the biological opinion. The ROD can include the decision on the EIS, concurrent with the notice of the biological opinion and the notice of permit approval. It will certify the adequacy of the HCPs environmental review process, and it will incorporate the requirements of the permit, including the requirements in the biological opinion and the mitigation commitments of the applicants. It will also include a summary of the responses to comments on the EIS.

Alternatively, if incidental take permits are not authorized under Section 10 (a)(1)(B) of the Endangered Species Act, the FERC may seek coverage from Section 9 take prohibitions through consultation with NMFS or the PUDs may challenge NMFS' decision or file new Section 10 permit applications.

TABLE S-3. ENVIRONMENTAL COMPARISONS OF THE ALTERNATIVES (PAGE 1 OF 8)

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Land Features, Geology, and Soils			
Project Area Soils	Same as existing conditions	Same as Alternative 1. If reservoir drawdown occurs, river cross sectional areas would decrease to the original size of reservoirs	Same as Alternative 2
Reservoir Erosion and Sedimentation	Same as existing conditions	Same as Alternative 1. If reservoir drawdown occurs, erosion and reservoir turbidity would initially increase over the short term and damage aquatic habitat conditions with the greatest damage occurring the first 4 to 7 years. Turbidity would decrease over time and habitat conditions would improve	Same as Alternative 2
Tributary Channel and Watershed Conditions	Geologic conditions conducive to fish habitat are expected to improve from independent local and State funded fish habitat enhancement projects	Same as Alternative 1. If reservoir drawdown occurs, tributary channel mouths would erode each year, over the first 7 years	Same as Alternative 2 with additional improvements to stream geomorphic conditions through the PUD-funded programs
Columbia River System	Same as existing conditions	Same as Alternative 1. If reservoir drawdown occurs, increased sediment and turbidity over the short term	Same as Alternative 2
Fisheries Resources: Threatened and Endangered Species (spring-run chinook, steelhead, and bull trout)			
Juvenile Migration/Survival Standards	Project specific standards, no specific protection measures for threatened or endangered species **Wells Dam**: Provide a non-turbine passage route (juvenile bypass system) to pass at least 80% of spring-run outmigrants and 70% of summer outmigrants **Rocky Reach Dam:** Provide safe (less than 2 percent mortality) non-turbine passage route (juvenile bypass or spillway passage) for 80% of juvenile migrants over 90% of the migration period	As required to recover the listed species	No Net Impact - 91% overall fish passage survival (juvenile and adult) with an independent standard of 95% juvenile survival through the forebay, dam and tailrace. Compensation to obtain no net impact also includes 7% to hatchery programs and 2% to tributary programs

TABLE S-3. ENVIRONMENTAL COMPARISONS OF THE ALTERNATIVES (PAGE 2 OF 8)

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Juvenile Migration/Survival Standards (continued)	**Rock Island Dam:** Fund an account to purchase spill at the requested by fish agencies and Tribes to an annual revenue loss of $2.05 million		
Adult Migration/ Survival Standards	Maintain and operate fishladders according to criteria established by the fishery agencies	As required to recover the listed species	No Net Impact - 91% overall fish passage survival (juvenile and adult) with an independent standard of 95% juvenile survival through the forebay, dam and tailrace. Compensation to obtain No Net Impact also includes 7% to hatchery programs and 2% to tributary programs
Hatchery Production	Hatchery for initial loss of habitat when dams were constructed would continue over the long term. Hatchery funding for unavoidable continuing losses from fish passage would be refined and based on ongoing survival studies.	Same as Alternative 1, provided there are no impacts to listed species	Same as Alternative 1, except the production levels would be based on compensating for 7% of unavoidable project passage mortality. Exact amounts of fish produced are based upon the actual numbers of returning adults. Hatchery production would not be less than that specified to address project inundation
Tributary Habitat Improvements	Habitat improvements would occur through the implementation of non-PUD funded projects through Federal, State and local agency funding	Same as Alternative 1, although programs may be proposed in lieu of non-power measures if necessary to prevent the extinction of listed species	Same as Alternative 1 and additional funding provided through the HCPs to compensate for 2% of the unavoidable project mortality
Monitoring	At Wells, run timing and system efficiency monitoring would occur. At Rocky Reach and Rock Island, only monitoring to ensure facility modifications are achieving criteria identified in license articles, settlements, and stipulations	Survival studies for Endangered Species Act- listed juveniles and adults, total dissolved gas monitoring, facility evaluations and modifications	Studies necessary to ensure standards are being met for all species during phase I, periodic monitoring to ensure standards continue to be met during phase III
Drawdown	Drawdown can not be required under existing licenses	Drawdown is expected to increase survival rates of migrating juvenile fish over the long-term. However, lower water levels could initially increase predator density and predator/prey encounters. Over the short term, drawdown would decrease water quality, fish habitat, and foraging opportunities; and likely affect survival rates. Only an option at relicensing	Same as Alternative 2, although could be implemented by the PUDs anytime during the term of the agreement

TABLE S-3. ENVIRONMENTAL COMPARISONS OF THE ALTERNATIVES (PAGE 3 OF 8)

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Bull trout	Bull trout could benefit from dam protection measures and tributary habitat improvements but no studies have been conducted to date to confirm effects of existing project operations	Same as Alternative 1	Same as Alternative 1
QAR RESULTS	Based on run reconstructions from the late 1970s through the mid 1990s, the return rates for upper Columbia River spring-run chinook salmon have been trending down at a loss rate of 5 to 10 percent per year. Although complicated by hatchery influences, wild steelhead return rates on the Wenatchee and Entiat Rivers are comparable to those identified for spring-run chinook salmon, but are trending downward at a faster rate on the Methow	Although maximizing survival at each of the PUD dams will increase the return rates of spring-run chinook salmon and steelhead, populations will continue to decline without reductions in non-hydro system related impacts, although at a slower rate than Alternative 1. Under the best case scenario, (i.e., maximizing survival through the hydro system [to levels at or above those defined in the HCPs] with high survival during the ocean life stages of salmon and steelhead) the risk of extinction would be reduced to acceptable levels	Achieving the project survival and habitat improvement standards identified in the proposed HCPs will increase Mid-Columbia River reach survival by approximately 22-35 percent for steelhead and 27-45 percent for spring-run chinook salmon. Under these survival rates, populations will continue to decline without reductions in non-hydro system related impacts. Commitments to habitat productivity, in addition to dam passage survival increases, will increase survival rates by approximately 6-10 percent over Alternative 2. Under the best case scenario, achieving the survival standards in the HCPs alone would reduce the risk of extinction to acceptable levels. (The effects of long-term supplementation have not been analyzed.)
Fisheries Resources: Other Plan Species (summer and fall chinook sockeye, and coho)			
Juvenile Migration/Survival	Same as discussed for threatened and endangered species above	Same as Alternative 1	Same as discussed for threatened and endangered species
Adult Migration/Survival	Same as discussed for threatened and endangered species above	Same as Alternative 1	Same as discussed for threatened and endangered species
Adult Reservoir Spawning	Same as discussed for threatened and endangered species above	Same as Alternative 1, unless reservoir drawdown occurs	Same as Alternative 2
Hatchery Production	Same as discussed for threatened and endangered species above	Same as Alternative 1	Same as discussed for threatened and endangered species

TABLE S-3. ENVIRONMENTAL COMPARISONS OF THE ALTERNATIVES (PAGE 4 OF 8)

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Tributary Habitat Improvements	Habitat improvements would occur through the implementation of non-PUD funded projects through Federal, State and local agency funding	Same as Alternative 1	Same as Alternative 1 and additional funding provided through the HCPs to compensate for 2% of the unavoidable project mortality
Monitoring	Same as discussed for threatened and endangered species above	Same as Alternative 1	Survival studies would occur for all Plan species
Drawdown	Drawdown not proposed	Drawdown would increase spawning opportunities for fall chinook and increase migrating juvenile salmonid survival rates over the long term. However, lower water levels could increase predator density and predator/prey encounters. Over the short term, the resulting decreased water quality would affect fish habitat and foraging opportunities which would likely affect survival rates	Same as Alternative 2
Water Quantity			
Project Area Flows	No change in flows	Amount of spill could increase if necessary to prevent the extinction of listed species	Amount of spill could change dependent on efficiency of juvenile bypass systems and/or meeting the survival standards. However, water quantities would not be substantially altered
Reservoir Drawdown	Drawdown not proposed	Drawdown would increase water velocity	Same as Alternative 2
Tributary Flows	No effect	Same as Alternative 1, unless off site measures occurred to prevent the extinction of listed species	Same as Alternative 2, although additional funding would likely provide for more water conservation projects and more improvements in tributary flows
Columbia River System	No changes expected over existing conditions	Same as Alternative 1	Same as Alternative 1

TABLE S-3. ENVIRONMENTAL COMPARISONS OF THE ALTERNATIVES (PAGE 5 OF 8)

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Water Quality			
Project Area Total Dissolved Gas	Some improvement expected as the Washington Department of Ecology (WDOE) imposes total maximum daily load limits for Clean Water Act compliance and other measures (e.g., spill deflectors) are implemented	Same as Alternative 1 although spill could increase if needed to prevent the extinction of listed species	Same as Alternative 1, although spill could increase as needed to meet survival standards resulting in an increase in total dissolved gas levels. However, the PUDs agreed to take measures to maintaining total gas levels at or below legal maximum levels
Tributary Water Quality	There is potential for incremental water quality improvements (e.g., higher dissolved oxygen, lower turbidity and sedimentation) as total maximum daily load program and other ongoing watershed restoration efforts proceed, and benefits from improved riparian protections are seen (no change from existing conditions)	Same as Alternative 1, although if proposed in lieu of non-power operations to prevent the extinction of listed species, restoration projects may improve tributary water quality	Same as Alternative 1, although guaranteed PUD funding would provide for more restoration projects and improvements in tributary water quality
Columbia River System Total Dissolved Gas	May be some marginal reduction in downstream total dissolved gas levels with improvements in project area total dissolved gas	Same as Alternative 1	Same as Alternative 1
Vegetation			
Project Area	No change from existing conditions	Same as Alternative 1. If reservoir drawdown occurs, it could impact shoreline and aquatic vegetation. One threatened plant species (giant hellborine) could potentially be affected by a drawdown and may require additional Endangered Species Act consultation	Same as Alternative 2
Associated Tributaries	Local and State fish habitat improvement projects are expected to improve riparian vegetation – no change from existing conditions	Same as Alternative 1	Same as Alternative 1, and HCP funding for tributary improvements would potentially benefit vegetation by removing invasive non-native plant species, adding or enhancing soils, and establishing buffer areas along tributary streams

TABLE S-3. ENVIRONMENTAL COMPARISONS OF THE ALTERNATIVES (PAGE 6 OF 8)

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Columbia River System	No change from existing conditions	Same as Alternative 1	Same as Alternative 1
Wildlife			
Threatened and Endangered Species	**Dams:** No change from existing conditions	**Dams:** No effect anticipated. If drawdown occurs, bald eagle abundance may decline due to declines in waterfowl prey	**Dams:** Same as Alternative 2
	Tributaries: Possible short-term disturbance to bald eagles from tributary habitat improvement projects conducted by other agencies. Possible benefits to bald eagles if projects improve riparian habitat and waterfowl prey base	**Tributaries:** Same as Alternative 1	**Tributaries:** Same as Alternative 1. HCP funding for tributary improvements could enhance habitat
	No effects on northern spotted owls, gray wolves, or grizzly bears		
	No change from existing conditions		
	Columbia River System: No effect	**Columbia River System:** Same as Alternative 1	**Columbia River System:** Same as Alternative 1
Other Wildlife	**Dams:** Possible decline in gull abundance. No effect to other wildlife. No change from existing conditions	**Dams:** Same as Alternative 1. If drawdown occurs, declines in abundance of waterfowl, aquatic furbearers, amphibians, and other riparian-associated wildlife may result	**Dams:** Same as Alternative 2. In addition, HCP funding for tributary improvements could enhance habitat
	Tributaries: Possible short-term disturbance to wildlife from tributary habitat improvement projects conducted by other agencies. Possible benefits to waterfowl, aquatic furbearers, and other riparian associated wildlife, if projects improve riparian habitat	**Tributaries:** Same as Alternative 1	**Tributaries:** Same effects from PUD and other agency habitat improvement projects as Alternatives 1 and 2
	Columbia River System: No effect	**Columbia River System:** Same as Alternative 1	**Columbia River System:** Same as Alternative 1
Land Use			
Project Area	No changes from existing conditions	May be modified if listed species are affected	The PUD will consider land use when implementing measures under the HCPs

TABLE S-3. ENVIRONMENTAL COMPARISONS OF THE ALTERNATIVES (PAGE 7 OF 8)

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Associated Tributaries	Local and State aquatic habitat enhancement projects may alter floodplains and result in land exchanges. Less development would be allowed at river shorelines. No change from existing conditions	Same as Alternative 1 unless the acquisition and conversion of existing land uses, such as agriculture commercial and residential to stream buffer habitat corridors, is necessary to prevent the extinction of listed species	Same as Alternative 2, although measures may result from actions taken for any of the plan species
Columbia River System	No change from existing conditions	Same as Alternative 1	Same as Alternative 1
Economics			
Project Area	No changes from existing conditions	Same as Alternative 1. If drawdown is proposed, a detailed economic analysis would be conducted	Same as Alternative 2
Tributary Habitat Improvement	Short-term local jobs in tributary habitat improvements. No change from existing conditions	Same as Alternative 1, If drawdown is proposed, a detailed economic analysis would be conducted	Same as Alternative 2 and Plan Species Account will provide some additional jobs and service related income
Columbia River System	No changes from existing conditions	Same as Alternative 1	Same as Alternative 1
Recreation			
Facility Operation and Maintenance	No changes from existing conditions	Same as Alternative 1. If drawdown occurs, reduced pool levels would make boat ramps and beaches unusable and substantially impact recreational facilities	Same as Alternative 2
Tributary Habitat Improvement	Short-term access may be affected as local and State aquatic habitat improvements occur. No change from existing conditions	Short-term access may be affected if tributary habitats were implemented to prevent the extinction of endangered species	Same as Alternative 2, although for all plan species. Same effects from PUD and other agency habitat improvement projects as Alternatives 1 and 2

TABLE S-3. ENVIRONMENTAL COMPARISONS OF THE ALTERNATIVES (PAGE 8 OF 8)

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Columbia River System	No changes from existing conditions	Same as Alternative 1. If drawdown occurs, increased fishing upstream and downstream of the projects may result	Same as Alternative 2
Cultural Resources			
Project Area	No change from existing conditions	Same as Alternative 1. If drawdown occurs, substantial impacts could occur to cultural resources	Same as Alternative 2
Tributaries	Tributary habitat improvements could affect some cultural resources unless surveys and mitigation (if needed) are conducted prior to earth moving activities. No change from existing conditions	Same as Alternative 1	Same as Alternative 1
Columbia River System	No change from existing conditions	No change would occur. If drawdown occurs, impacts could occur to cultural resources at downstream dams	Same as Alternative 2