Endangered Species Act - Section 7 Consultation

BIOLOGICAL OPINION,

UNLISTED SPECIES ANALYSIS,

and

MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT CONSULTATION

for Proposed Issuance of a Section 10 Incidental Take Permit to Public Utility District No. 1 of Douglas County for the Wells Hydroelectric Project (FERC No. 2149) Anadromous Fish Agreement and Habitat Conservation Plan

Action Agency:	NOAA Fisheries
Log Number:	F/NWR/2002/01896
Consultation Conducted By:	NOAA Fisheries Northwest Region Hydropower Division
Approved By:	D. Robert Lohn Regional Administrator
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TERMS AND ABBREVIATIONS

acoustic tag	Tag composed of a small transmitter and battery used in juvenile and adult fish behavior and survival studies
Additional Tools	Tools in addition to those initially proposed - see Tools, below
BA	Biological Assessment
cfs	cubic feet per second
Chelan PUD	Public Utility District No. 1 of Chelan County
Colville Tribe	Confederated Tribes of the Colville Reservation
CAJPS	Combined Adult and Juvenile Project Survival (reservoir, forebay, dam, and tailrace)
conversion rate	Ratio of adult fish detected at a downstream detection site (denominator) and redetected at an upstream detection site (numerator) that may be used as a conservative estimate of adult survival between the two sites
dam	The concrete structure impounding the Columbia River (as defined in the HCP).
Douglas PUD	Public Utility District No. 1 of Douglas County
EA	environmental assessment
Effective Date	Effective Date of the HCP agreement is the later of 1) FERC's license order approving the HCP and modifying the Project license, 2) NOAA Fisheries' issuance of an incidental take statement, or 3) USFWS completion of the necessary consultations under the ESA.
EFH	Essential Fish Habitat
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FCRPS	Federal Columbia River Power System
FEIS	Anadromous Fish Agreements and Habitat Conservation Plans - Final Environmental Impact Statement for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects, December 2002
FERC	Federal Energy Regulatory Commission
forebay	The body of water from the dam upstream approximately 500 feet (as defined by the HCP).
GBT	Gas Bubble Trauma
GCFMP	Grand Coulee Fish Maintenance Project
HCP	Anadromous Fish Agreement and Habitat Conservation Plan for the Wells Hydroelectric Project and supporting documents
HCP Reach	The distance from the tailrace of Chief Joseph Dam to the tailrace of Rock Island Dam, approximately 147.6 km and includes the three HCP projects.
JBS	Juvenile Bypass System
JDPS	Juvenile Dam Passage Survival (forebay, dam, and tailrace)
JPS	Juvenile Project Survival (reservoir, forebay, dam, and tailrace)
ITP	Incidental Take Permit

kcfs	1,000 cubic feet per second
kelt	An adult steelhead that has spawned and is migrating downstream to the ocean, where it will feed before attempting to migrate upstream and spawn again.
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NEPA	National Environmental Policy Act
NOAA Fisheries	National Marine Fisheries Service (NMFS)
NNI	No Net Impact
Opinion	This Biological Opinion
Permit Species	UCR steelhead, UCR spring-run chinook salmon, UCR summer/fall-run chinook salmon, and Okanogan River sockeye salmon
PIT-tag	Passive Integrated Transponder tag commonly used in juvenile and adult fish migration rate and survival studies
Plan Species	Permit Species and reintroduced coho salmon
Project	Wells Hydroelectric Project (FERC No. 2149) - the geographical boundaries of the Project include the reservoir, forebay, dam, and tailrace (as defined in the HCP).
PUD	Public Utility District
QAR	Quantitative Analysis Report
radio-tag	Tag composed of a small transmitter, battery, and whip antenna, commonly used in juvenile and adult fish behavior and survival studies
reservoir	The body of water impounded by the dam extending to the tailrace of the next upstream dam.
RM	river mile
RPA	reasonable and prudent alternative
Signatory Parties	The agencies and tribes which have, to date, conditionally signed the HCP agreement.
tailrace	The body of water from the base of the dam to a point approximately 1,000 feet downstream (as defined in the HCP).
TDG	total dissolved gas
Tools	Any action, structure, facility, or program (on-site only) at the Project (except those prohibited in section 9.7 of the HCP) intended to improve the survival of Permit Species migrating through the Project.
UCR	Upper Columbia River
Umatilla Tribe	Confederated Tribes of the Umatilla Indian Reservation
USFWS	United States Fish and Wildlife Service
WDFW	Washington Department of Fish and Wildlife
Yakama Tribe	Confederated Tribes and Bands of the Yakama Indian Nation

1. OBJECTIVES

This document constitutes the National Marine Fisheries Service's (NOAA Fisheries) consultation in accordance with Section 7(a)(2) of the Endangered Species Act (ESA) of 1973 (16 USC 1531-1544), as amended on the issuance of an Incidental Take Permit (ITP) and unlisted species agreement to Public Utility District No. 1 of Douglas County (Douglas PUD) based upon its Anadromous Fish Agreement and Habitat Conservation Plan for the Wells Hydroelectric Project (Douglas PUD 2002). This document also analyzes the effects of these actions with respect to fulfilling essential fish habitat (EFH) requirements under the Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267). The MSA requires the inclusions of EFH descriptions in Federal fishery management plans and requires Federal agencies to consult with NOAA Fisheries on activities that may adversely affect EFH. This document shall hereinafter be referred to as the Opinion.

NOAA Fisheries has proposed and evaluated this ITP and HCP in conjunction with proposed ITPs and HCPs for the Rocky Reach and Rock Island hydroelectric projects (owned by Public Utility District No. 1 of Chelan County [Chelan PUD]) as NOAA Fisheries' preferred alternative in the Anadromous Fish Agreements and Habitat Conservation Plans Final Environmental Impact Statement for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects (NMFS 2002a), hereinafter referred to as the FEIS. For the purpose of formal ESA consultation, the FEIS serves as the agency's biological assessment (BA).

Contemporaneously with this consultation, NOAA Fisheries is conducting ESA Section 7(a)(2) consultations for the Rocky Reach and Rock Island hydroelectric projects, for which NOAA Fisheries will prepare separate biological opinions on the issuance of separate ITPs for each of the HCPs covering each project. Analysis of the proposed action in this Opinion will therefore consider the individual effect of the proposed action for the Wells Hydroelectric Project, hereinafter referred to as the Project. Regulations governing ESA Section 7(a)(2) consultations restrict consideration of future Federal actions that have yet to undergo their own ESA consultations (see 50 CFR §402.02, Effect of the Action). However, the cumulative effect of issuing these three ITPs has been considered for the purposes of the National Environmental Policy Act (NEPA) in the FEIS. Also, NOAA Fisheries will consider for the record in this Opinion, as an alternate conclusion in Section 8, whether its ESA Section 7(a)(2) determinations for the Wells Hydroelectric Project would be affected if it had considered the effects of the Rocky Reach and Rock Island hydroelectric projects' ITPs at the same time.

The objective of this Opinion is to 1) determine whether or not issuing the ITP will jeopardize the continued existence of currently listed Upper Columbia River (UCR) steelhead (*Oncorhynchus mykiss*) or UCR spring-run chinook salmon (*O. tshawytscha*) or the presently unlisted UCR summer/fall-run chinook salmon (*O. tshawytscha*) or Okanogan River sockeye salmon (*O. nerka*) (hereinafter all four species will be referred to as the Permit Species[1]), and 2) determine whether or not the proposed action would adversely affect designated EFH.

Only two species of the anadromous salmonids that are addressed in the HCP are currently listed for protection under the ESA: UCR steelhead and UCR spring-run chinook salmon.[2] For the two other species of anadromous salmonids that are currently unlisted, and thus are neither protected under the ESA nor subject to the provisions of Sections 7 and 10, NOAA Fisheries has agreed, pursuant to the unlisted species provisions of the HCP, to include these species in the ITP as covered species.[3] This document, in addition to being a biological opinion for the proposed action of issuing an ITP for UCR steelhead and UCR spring-run chinook salmon, also provides the rationale and biological basis for making the decision whether to add (to the ITP) the two unlisted species, within the administrative requirements of Sections 7 and 10, and subject to a subsequent determination by NOAA Fisheries according to the HCP (section 10.1.3). Note that all of the anadromous fish were addressed during development of HCP conservation measures as if they were already ESA protected.

NOAA Fisheries has already consulted or is currently consulting on the operations of all artificial production facilities in the middle reach of the Columbia River and its tributaries. These consultations include production of juveniles to mitigate for inundation as well as production of juvenile Permit Species as part of the HCP's Hatchery Compensation Plan. Thus this Opinion will only evaluate the likely effects of the adaptive management process which would govern the
operation of these facilities under the HCP for the term of the ITP and the general effects of hatchery mitigation of up to 7% - which are both integral to the HCP - as part of the proposed action.

Critical habitat had been designated for the two ESA-listed species under consideration in this Opinion. On April 30, 2002, however, the United States District Court for the District of Columbia adopted a consent decree resolving the claims in National Association of Homebuilders, et al. v. Evans, Civil Action No. 00-2799 (CKK)(D.D.C., April 30, 2002). Pursuant to that consent decree, the court issued an order vacating critical habitat designations for a number of listed salmonid species, including the UCR steelhead and UCR spring-run

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[1]Because the Wenatchee River enters the Columbia River downstream of the Rocky Reach and Wells projects, Lake Wenatchee sockeye salmon (*O. nerka*) are not included in the HCPs for these projects. However, Lake Wenatchee sockeye salmon are included as a Permit Species in the Rock Island Hydroelectric Project HCP.

[2]For Pacific salmon, NOAA Fisheries has defined "species" as Evolutionarily Significant Units (ESU). Species and ESUs are thus used interchangeably throughout this rest of this Opinion.

[3]While the HCP includes coho salmon (*O. kisutch*) as a "Plan Species," they are not included as a "Permit Species" since wild coho salmon are extirpated from this reach of the Columbia River and are therefore not protected by the ESA (HCP sections 13.19 and 13.20).

chinook salmon. For this reason, this action will not affect designated critical habitat and thus this Opinion will not determine whether the proposed action is likely to result in the destruction or adverse modification of any critical habitat, a separate substantive standard of ESA Section 7(a)(2).

1.1 Application of ESA Section 7(a)(2) Standards - Analysis Framework

This section reviews the approach used in this Opinion in order to apply the standards for determining jeopardy and destruction or adverse modification of critical habitat as set forth in Section 7(a)(2) of the ESA and as defined by 50 CFR §402.02 (the consultation regulations). Additional guidance for this analysis is provided by the Endangered Species Consultation Handbook, March 1998, issued jointly by NOAA Fisheries and the U.S. Fish and Wildlife Service (USFWS). In conducting analyses of actions under Section 7 of the ESA, NOAA Fisheries uses the following steps of the consultation regulations:

1. Evaluate biological requirements and current status of the species at the ESU level and within the particular action area (Section 4).

2. Evaluate the relevance of the environmental baseline in the action area to action-area biological requirements and the species' current rangewide and action-area status (Section 5).

3. Determine the effects of the proposed or continuing action on the species and on any designated critical habitat (Section 6).

4. Determine and evaluate any cumulative effects within the action area (Section 7).

5. Evaluate whether the effects of the proposed action, taken together with any cumulative effects and added to the environmental baseline, can be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of the affected species, or is likely to destroy or adversely affect their designated critical habitat (Section 8). (See CFR §402.14(g).)

In completing step 5, NOAA Fisheries determines whether the action under consultation, together with all cumulative effects when added to the environmental baseline, is likely to jeopardize the ESA-listed species or adversely modify critical habitat. If so, NOAA Fisheries must identify any reasonable and prudent alternatives (RPAs) for the action that avoid jeopardy or adverse modification of critical habitat and meet the other regulatory requirements for RPAs. (See CFR §402.02.)

1.1.1 Evaluate Rangewide Biological Requirements and Current Status

The first step NOAA Fisheries takes when applying ESA Section 7(a)(2) to the listed ESUs considered in this Opinion is to define the species' rangewide biological requirements and evaluate the rangewide status relative to those requirements.

ESU biological requirements are met when a sufficient number and distribution of populations comprising the ESU are meeting their biological requirements. NOAA Fisheries has established Technical Recovery Teams (TRT) to identify the component populations of each ESU, to define viability criteria for each population, and to describe the number and distribution of populations that must be viable before the ESU can be considered viable. The Interior Columbia TRT will provide these guidelines for UCR steelhead and UCR spring-run chinook ESUs, but these guidelines are not yet complete. In the interim, and until superceded by determinations of the Interior Columbia TRT, NOAA Fisheries conservatively assumes that all populations within these ESUs must meet viability criteria in order to conclude that the ESU is meeting its biological requirements. For purposes of this Opinion, NOAA Fisheries applies the same criterion to the two unlisted Permit Species.

Biological requirements of populations may be considered over the entire range of the population or within the action area. Biological requirements within the action area are a subset of the rangewide biological requirements of the populations comprising the ESU. Identification of the rangewide biological requirements provides context for subsequent evaluation of biological requirements within the action area.

Rangewide biological requirements are met when populations are large enough to safeguard the genetic diversity of the listed ESUs, enhance their capacity to adapt to various environmental conditions, and allow them to become self-sustaining in the natural environment. McElhany et al. (2000) describe viable salmonid populations as having a negligible risk of extinction due to threats from demographic variation (random or directional), local environmental variation, and genetic diversity changes (random or directional) over a 100-year time frame. The attributes associated with viable salmonid populations include adequate abundance, productivity (population growth rate), spatial scale, and diversity. These attributes are influenced by survival, behavior, and experiences throughout the entire life cycle. These factors, in turn, are influenced by the habitat and environmental conditions encountered by individuals within the population.

Consistent with their listing, most populations comprising listed ESUs are not viable. Listed ESUs will be considered recovered when, among other things, factors for decline have been ameliorated and when a sufficient number of populations within the ESU have become viable. For the purpose of assessing the effects of the proposed actions while listed ESUs and their component populations are moving towards recovery, NOAA Fisheries, in its 1995 Federal Columbia River Power System (FCRPS) biological opinion, defined the degree to which species-level biological requirements must be met primarily in terms of abundance:

> "At the species level, NMFS considers that the biological requirements for survival, with an adequate potential for recovery, are met when there is a high likelihood that the species' population will remain above critical escapement thresholds over a sufficiently long period of time. Additionally, the species must have a moderate-to-high likelihood that its population will achieve its recovery level within an adequate period of time. The particular thresholds, recovery levels, and time periods must be selected depending upon the characteristics and circumstances of each salmon species under consultation" (NMFS 1995).

This definition implicitly addresses the productivity criterion for viable populations, because population growth rates must increase to reach critical threshold or recovery abundance levels from current low abundance levels, within an adequate time period. For ESUs with multiple populations, the spatial scale and diversity criteria for viable populations are addressed primarily by specifying the number and distribution of populations that must meet species-level biological requirements, as defined above.

<u>Rangewide status</u>. NOAA Fisheries considers the current status of the listed species, taking into account viability criteria (population size, productivity, population spatial structure, and diversity) and, if available, an assessment of population projections relative to survival and recovery criteria. To assess the current rangewide status of the listed species, NOAA Fisheries starts with the determinations made in its decision to list for ESA protection the ESUs considered in this Opinion and also considers any new data that is relevant to the determination. The listing status, general life history, and population dynamics of each species are described in Section 4.

1.1.2 Evaluate Relevance of the Environmental Baseline in the Action Area to Action-Area Biological Requirements and the Species' Current Rangewide and Action-Area Status

<u>Action area</u>. The action area includes all areas affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR §402.02). The action area is not delineated by the migratory range of the species affected by the project. The action area for this consultation is defined in Section 3.

<u>Action-area biological requirements</u> are those factors, appropriate to the scale of the action area, that support and are necessary for attainment of the rangewide biological requirements of a population. If the action area is sufficiently large, there is no distinction between the rangewide and action-area biological requirements of a population. However, biological requirements for action areas that encompass a limited portion of the population's range may be expressed in terms such as 1) adequate survival rates through particular life history stages and/or 2) habitat characteristics that are expected to result in adequate survival and distribution of individuals within a population. This consultation includes elements of both approaches.

For the first approach, NOAA Fisheries has considered two methods of defining action-area biological requirements in terms of survival rates. The most basic method defines the biological requirements as the survival rates observed for healthy populations of the same or similar species during the same life history stage(s). Generally, these survival rates will be associated with environmental conditions similar to those under which the species evolved (i.e., relatively "natural" conditions). This approach is used in this Opinion (Sections 5 and 6) to evaluate biological requirements in the mainstem reaches of the action area. A second method, which can be applied only in limited circumstances, such as when the action area includes a substantial portion of the population's range, is to determine a suite of survival rates in every life history stage which, when combined, result in a population growth rate that will meet the rangewide biological requirements of the population. The survival rate(s) in this suite that apply in the action area then define the biological requirements. This second method is not used to define action-area biological requirements in this Opinion.

The second approach defines action-area biological requirements in terms of habitat requirements. As described in NOAA Fisheries (1999, Habitat Approach), there is a strong causal link between habitat modification and the response of salmonid populations. Those links are often difficult to quantify. In many cases, NOAA Fisheries must describe biological requirements in terms of habitat conditions in order to infer the populations' responses to the effects of the action. To survive and recover, a wide-ranging salmonid ESU must have adequate habitat available to support life stage-specific survival rates.

Properly functioning habitat would support adequate survival and distribution of salmon and steelhead throughout their ranges and life history stages. NOAA Fisheries typically considers the status of habitat variables in a matrix of pathways and indicators (NMFS 1996), which was developed to describe properly functioning condition in forested montane watersheds. In this consultation, a more generalized evaluation of habitat characteristics is employed in Sections 5 and 6. This method is primarily used to evaluate biological requirements in tributary portions of the action area. It is also used to qualitatively evaluate biological requirements in mainstem reaches, but, in general, NOAA Fisheries considers reach survival rates the more appropriate characterization of mainstem biological requirements since that measure integrates most of the habitat effects.

Action area status. If relevant and available, detailed and site-specific information regarding the status of the relevant populations comprising the ESU, within the action area, should be described. This information is provided in Section 4 of this Opinion.

Environmental baseline. The environmental baseline includes "the past and present impacts of all Federal, State, or private actions and other human activities in the action area, including the anticipated impacts of all proposed Federal projects in the action area that have undergone Section 7 consultation and the impacts of state and private actions that are contemporaneous with the consultation in progress" (50 CFR §402.02).

In step 2 of the analysis, which is included in Section 5, NOAA Fisheries evaluates the relevance of the environmental baseline's continuing and future effects in the action area on the species' biological requirements and current status. In describing the environmental baseline, NOAA Fisheries compares existing habitat conditions and their continuing effects, as well as the effects of qualifying future Federal projects and contemporaneous State and private actions, to the action-area biological requirements described above for the listed salmonid ESUs affected by the proposed action. The extent to which the conditions under the environmental baseline fall short of the species' biological requirements indicates, for the action area, the current status of the species. The species' status is important for the ESA Section 7(a)(2) determinations in step 5 because it is more likely that any additional adverse effects caused by the proposed action will be significant if the species status is poor and the baseline is degraded at the time of the consultation.

1.1.3 Analysis of Effects of the Proposed Action

Effects of the action, which are evaluated in step 3, are defined as "the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with the action, that will be added to the environmental baseline" (50 CFR §402.02). Direct effects occur at a project site and may extend upstream or downstream based on the potential for reducing survival or impairing important habitat elements. Indirect effects are defined in 50 CFR §402.02 as "those that are caused by the proposed action and are later in time, but still are reasonably certain to occur." They include the effects on listed species of future activities that are induced by the proposed action and that occur after the action is completed. "Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration" (50 CFR §402.02).

Effects of the proposed action are described, with respect to their impact on action-area biological requirements, in Section 6. In this Opinion, two key questions are addressed relative to the NOAA Fisheries action of issuing an ITP for the HCP:

1. If the HCP survival goals are met, what effect will the associated incidental take authorized by the ITP have on action-area biological requirements?

2. Are the specific steps identified by the Applicant likely to result in the achievement of the HCP survival goals?

1.1.4 Cumulative Effects

The cumulative effects analysis in step 4, which is described in Section 7, takes into consideration the effect of future actions on the listed species' ability to survive and recover, as with the effects of the environmental baseline, by focusing on the likely resulting conditions for the species in the action area relative to the biological requirements. Cumulative effects include effects of future State or private activities, not involving a Federal action, that are reasonably certain to occur within the action area under consideration. Past and present effects of non-Federal actions are part of the environmental baseline. Indicators of actions "reasonably certain to occur" may include, but are not limited to: approval of the action by State, tribal, or local agencies or governments (e.g., permits, grants); indications by State, tribal, or local agencies or governments that granting authority for the action is imminent; a project sponsor's assurance that the action will proceed; obligation of venture capital; or initiation of contracts (USFWS and NMFS 1998). The more State, tribal, or local administrative discretion remaining to be exercised before a proposed non-Federal action can proceed, the less reasonable certainty the project will be authorized. Speculative non-Federal actions that may never be implemented are not factored into the "cumulative effects" analysis. At the same time, "reasonably certain to occur" does not require a guarantee the action will occur. There may be economic, administrative, and legal hurdles remaining before the action proceeds.

1.1.5 Conclusion

The conclusion section presents NOAA Fisheries' opinion regarding whether the aggregate effects of the action when added to the effects of the "environmental baseline," and "cumulative effects" in the action area (when viewed against the rangewide status of the species or the status of critical habitat) reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of the listed species or would likely result in the destruction or adverse modification of critical habitat. As described above, the biological requirements and current status are the relevant factors indicative of the likelihood of survival and recovery.

If NOAA Fisheries determines that the proposed action is likely to jeopardize listed species or adversely modify critical habitat (the latter is not considered in this Opinion because critical habitat designations have been vacated for UCR steelhead and UCR spring-run chinook salmon), it must identify RPAs for the action that avoid these effects and satisfy the species' biological requirements.

2. BACKGROUND

2.1 Previous Consultations

On June 19, 2000, NOAA Fisheries issued a biological opinion to the Federal Energy Regulatory Commission (FERC) titled "Interim Protection Plan for Operation of the Wells Hydroelectric Project (FERC Project Number 2149)" (NMFS 2000b). The 2000 biological opinion analyzed the effect of the actions at the Project on UCR steelhead, UCR spring-run chinook salmon, and Middle Columbia River steelhead.[4] The 2000 biological opinion concluded that the proposed action, through April 1, 2002, was not likely to jeopardize the continued existence of these species or result in the adverse modification of their critical habitat. The 2000 biological opinion also noted NOAA Fisheries' expectation that the proposed action would be superceded by a habitat conservation plan or the issuance of a new 5-year biological opinion for the Project. On May 17, 2002, NOAA Fisheries informed FERC that the 2000 biological opinion had expired and that NOAA Fisheries was ready to expedite the consultation process so as to provide Douglas PUD continued coverage for the take of ESA-listed species (NMFS 2002b). However, FERC did not respond to this letter and ESA coverage for the Project lapsed.

2.2 HCP Development

The HCP for the Project is the result of over nine years of planning and negotiations between NOAA Fisheries, Douglas PUD, and other participants in the HCP process, including USFWS, Washington Department of Fish and Wildlife (WDFW), the Confederated Tribes and Bands of the Yakama Indian Nation (Yakama Tribe), the Confederated Tribes of the Colville Reservation (Colville Tribe), the Confederated Tribes of the Umatilla Indian Reservation (Umatilla Tribe), American Rivers, and representatives of the major wholesale purchasers of Douglas PUD's electricity.[5] This effort culminated in the completion of three proposed anadromous fish agreements and habitat conservation plans (one each for Wells, Rocky Reach, and Rock Island hydroelectric projects) offered for signing on March 26, 2002.[6] All of the participants, with the exception of the Yakama and Umatilla Tribes and American Rivers, indicated their support of the Wells HCP, pending the outcome of regulatory review, by signing the HCP document in the spring of 2002. In this Opinion, Douglas PUD, NOAA Fisheries, USFWS, WDFW, the Colville Tribe, and Douglas PUD's power purchasers are hereinafter referred to as the Signatory Parties.

[4]NOAA Fisheries has concluded in this consultation that, because migrating Middle Columbia River steelhead enter and exit at the Columbia River downstream of the action area (as defined in Section 3), the Project likely has no effect or only a negligible effect on this ESU.

[5]The Bureau of Indian Affairs also participated in the HCP negotiations on behalf of the Indian tribes.

[6]The Wells Hydroelectric Project (FERC No. 2149) is owned by Douglas PUD. The Rocky Reach (FERC No. 2145) and Rock Island (FERC No. 943) hydroelectric projects are owned by Chelan PUD.

NOAA Fisheries noticed receiving completed ITP applications and HCPs in the Federal Register on June 25, 2002, (67 FR 42755) and received public comments through July 29, 2002.[7] The Environmental Protection Agency (EPA) noticed NOAA Fisheries' FEIS in the Federal Register on December 27, 2002 (67 FR 79081), initiating a 30-day cooling-off period during which NOAA Fisheries invited comments on or questions about the FEIS. NOAA Fisheries received comments through February 10, 2003.[8] Alternative 3 of the FEIS (Proposed Action - Project HCPs) describes the proposed action (issuing the proposed ITPs to Douglas and Chelan PUDs for a period of up to 50 years) and its likely effects on salmon and steelhead.

2.3 Tribal Consultation

The Colville, Yakama, and Umatilla Tribes actively participated in the preparation of the Wells, Rocky Reach, and Rock Island HCPs and supporting documents. Following over nine years of planning and negotiation, the Colville Tribe indicated its support by signing the HCPs. To date, the Yakama and Umatilla Tribes have chosen to not sign the HCPs.

Because the proposed action would affect Tribal resources, and because NOAA Fisheries wished to ensure that the Yakama and Umatilla Tribes had all the information at their disposal necessary to make an informed decision, NOAA Fisheries technical staff contacted their Tribal counterparts to offer additional discussions pertinent to the HCPs and this Opinion. Umatilla Tribal staff indicated that it was unlikely policy or technical staff would be available for such discussions.

Yakama Tribal staff indicated they would be interested in additional discussions regarding the technical and policy issues related to the HCPs and this Opinion. NOAA Fisheries staff met with Yakama Tribal Fish, Wildlife, and Law Enforcement Committee members and staff on March 27, 2003, and April 15, 2003, and with Yakama Tribal staff via conference call on April 8, 2003. The Colville Tribe was not contacted, as it is a Signatory Party to the HCP.

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[7]The Federal Register Notice indicated that comments must be received no later than 5 p.m. on July 25. However, several parties requested a brief extension (2 business days) of the comment period, which was granted.

[8]The initial comment period was through January 27, 2003. However, several parties requested up to a 30-day extension. In response, NOAA Fisheries granted a two-week extension through February 10, 2003.

3. PROPOSED ACTION

The proposed action is 1) NOAA Fisheries' issuance of an ITP to Douglas PUD for the HCP for the operation of the Wells Hydroelectric Project (FERC No. 2149), and the establishment of the Tributary Conservation Plan and the Hatchery Compensation Plan, in accordance with the HCP. NOAA Fisheries is simultaneously writing the ITP and this Opinion. However, with few exceptions, the information that will be incorporated into the ITP is fully described in both the HCP and in section 2.3.4 of the FEIS.

The Hatchery Compensation Plan in the HCP establishes a Hatchery Committee and commits Douglas PUD to fund certain production levels for the term of the HCP. Production levels, including those initially specified in the HCP, will most likely be stable for the next 10 years. Artificial production of Permit Species to mitigate for inundation and for up to 7% of unavoidable project mortality (i.e., the hatchery mitigation component of the HCP) is presently undergoing separate consultation as discussed in Section 1. Current hatchery production levels have been analyzed in ESA Section 7 consultations on the issuance of Section 10(a)(1)(A) permits for UCR steelhead (#1094) and UCR spring-run chinook salmon (#1196) artificial propagation programs. Continued hatchery mitigation activities proposed as part of the HCP will undergo separate ESA Section 7 consultations at 10-year intervals pursuant to which NOAA Fisheries will consider the potential for both beneficial and adverse effects to listed species. However, to the extent that the hatchery mitigation activities are "interrelated" to the proposed action, the programmatic effects of the HCP's hatchery component are considered in Section 6.2.7.

The remainder of this section describes in more detail the HCP (which is the basis for Douglas PUD's application for the ITP that NOAA Fisheries is proposing to issue). Additional details may be found in the HCP and in section 2.3.4 of the FEIS.

3.1 Description of the Action Area

The action area includes all areas affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR §402.02). Direct effects of the Project on anadromous salmon and steelhead are confined to the reservoir, forebay, dam, and tailrace (approximately 1,000 feet downstream of the dam to 1,000 feet downstream of the next dam upstream), a distance of approximately 29.3 miles. However, water quality impacts (in this case, elevated levels of total dissolved gas (TDG) resulting from either voluntary or involuntary spill at the Project) can indirectly or cumulatively affect Permit Species through interactions with the effects of both upstream and downstream mainstem hydroelectric projects on TDG, and thus may affect migrating and rearing anadromous salmonids far upstream or downstream of the Project.

In addition, habitat protection and enhancement projects resulting from implementation of the HCP's Tributary Enhancement Plan (section 7 of the HCP) and hatchery production resulting from implementation of the HCP's Hatchery Compensation Plan (section 8 of the HCP) would affect Permit Species in tributary river systems upstream of the Project (as well as in the mainstem migration corridor).

Based on these considerations, the action area is best defined as the mainstem Columbia River between river mile (RM) 544.9 (approximately 1,000 feet downstream of Chief Joseph Dam) and RM 356.0,[9] a distance of nearly 190 miles, as well as the Okanogan and Methow river systems.

3.2 Project Description

The Wells Hydroelectric Project (FERC Project No. 2149) includes the reservoir, forebay, dam, and tailrace. As defined, the Project boundary is approximately 1,000 feet downstream of the Wells Dam (tailrace) to 1,000 feet downstream of the next dam upstream (reservoir), a distance of approximately 29.3 miles (see FEIS figure 1-2). The 185-foot-high concrete gravity dam was completed in 1967 and is located approximately 12 miles north of Chelan, Washington, on the mainstem Columbia River at RM 515.8 (see FEIS figure 1-1). The reservoir formed by the Project extends upstream to the U.S. Army Corps of Engineers' Chief Joseph Dam (see FEIS figure 1-2), contains 331,200 acre feet of water, and has a surface area of 9,740 acres at the normal pool elevation of 781 feet above mean sea level (msl). Based on a draft limit of 10 feet, usable storage is 98,000 acre-feet. The annual median flow is 109 thousand cubic feet per second (kcfs) (see FEIS table 2-1).

The Project includes a spillway, a powerhouse, earthen embankment sections, a highly efficient juvenile bypass system (JBS), and two adult fishways (see FEIS figure 2-1). The spillway consists of 11 spillway gates with a combined capacity of 1,180 kcfs. The powerhouse has 10 Kaplan turbine units, with a combined hydraulic capacity of 205 kcfs, producing about 840 MW of electricity (see FEIS table 2-2, FEIS section 2.2.1.1, and NMFS 2000b). The two adult fishways are mirror image left and right bank fishway facilities. Each of the two fishways contains a single main entrance, a collection gallery, a fish ladder, an adult counting station, trapping facilities, and an exit in the forebay adjacent to the earthen embankment section of the Project. The JBS consists of five evenly spaced surface collector entrances that guide fish into and through the juvenile bypass system and into the tailrace of the dam. A detailed description of these structures and their operation is provided in the FEIS and the 2000 biological opinion (NMFS 2000b).

3.3 Term of the Permit and Species Covered

[9]RM 356.0 is the upper end of the reservoir created by McNary Dam, approximately 21 miles upstream of the confluence of the Yakima and Columbia rivers.

NOAA Fisheries proposes to issue an ITP to Douglas PUD for a term of 50 years, unless the HCP terminates early, for the incidental take of Permit Species resulting from the otherwise lawful operation and maintenance of the Project or tributary enhancement activities, in accordance with the terms and conditions of the HCP. Under certain circumstances, NOAA Fisheries could withdraw from the HCP and/or revoke the ITP according to specific withdrawal and termination provisions. Most notably, any Signatory Party may withdraw from the HCP after March 1, 2018, subject to the following conditions: 1) No Net Impact (NNI) has not been achieved or has been achieved but has not been maintained, or (2) the Project has achieved and maintained NNI, but the Plan Species are not rebuilding and the Project is a significant factor in the failure to rebuild. Withdrawal conditions are fully described in the FEIS (section 2.3.4.2) and in the HCP (sections 1 and 2).

The HCP is designed to minimize to the extent practical project impacts to all Plan Species. Because native populations of coho salmon were extirpated from this reach of the Columbia River, coho salmon in this area are not protected under the ESA nor subject to provisions of ESA Sections 7 or 10. Thus coho salmon are not counted among the Permit Species included in the ITP. Table 1 summarizes the status of each Plan Species.

Table 1. Plan and Permit Species/Evolutionarily Significant Units and status under the ESA and HCP.

Species	Evolutionarily Significant Unit	ESA Status	HCP Status
Steelhead	Upper Columbia River	Endangered (August 1997)	Plan and Permit Species
Spring-Run Chinook Salmon	Upper Columbia River	Endangered (March 1999)	Plan and Permit Species
Summer/Fall-Run Chinook Salmon	Upper Columbia River	Not Warranted (March 1998)	Plan and Permit Species
Sockeye Salmon	Okanogan River	Not Warranted (March 1998)	Plan and Permit Species
Coho Salmon	Not Applicable	Extirpated	Plan Species

Two of the Permit Species are currently listed for protection under the ESA: UCR steelhead and UCR spring-run chinook salmon. Upon the Effective Date of the HCP, the ITP would be immediately effective for these species. For unlisted Permit Species, which are not presently protected under the ESA nor subject to provisions of ESA Sections 7 or 10, the ITP would be effective upon any future listing of these species under the ESA per the unlisted species agreement in the HCP.

3.4 Summary of HCP Actions

As previously noted, the objective of the HCP is to achieve and maintain an NNI standard for each Plan Species at the Project by March 1, 2018. NNI consists of two components: 1) 91% Combined Adult and Juvenile Project Survival (CAJPS) achieved by project improvement measures that are implemented within the geographic area of the Project, and 2) 9% compensation for unavoidable project mortality provided in the form of hatchery and tributary programs, with 7% compensation provided through hatchery programs and 2% compensation provided through implementing the Tributary Conservation Plan. However, as noted in Section 1, NOAA Fisheries has already consulted or is currently consulting on the operations of all artificial production facilities in the middle reach of the Columbia River and its tributaries. Thus this Opinion focuses specifically on those aspects of the HCP which relate to project effects (survival) or tributary enhancements activities, adaptive management (committees and study requirements), dispute resolution, and withdrawal/permit revocation provisions.

3.4.1 HCP Survival Standards

The HCP has specific performance standards relating to the survival of juveniles and adults migrating through the Project. The decision-making process for implementation of survival standards is depicted in figure 1 of the HCP (Wells HCP Survival Standard Decision Matrix). The primary survival standard of the HCP is to achieve and maintain the 91% CAJPS standard. This translates to approximately 98% adult survival and approximately 93% juvenile survival (0.98 X 0.93 = 0.91). However, the Signatory Parties agree that adult fish survival cannot be conclusively measured with existing technologies at this time.

Until technology is available to differentiate project-related mortality from natural adult losses, Douglas PUD will implement the adult passage plan (HCP section 4.4) and initiate studies, at the direction of the Coordinating Committee (HCP section 4) to assess juvenile fish survival at the Project. In order of precedence they are 1) measured Juvenile Project Survival (JPS), 93%; 2) measured Juvenile Dam Passage Survival (JDPS), 95%; and 3) calculated JDPS, 95%. The most appropriate standard for each species shall be determined by the Coordinating Committee, per guidelines established in the HCP. (For a brief discussion of the Coordinating Committee, see Section 3.4.3 below.) In the event that the Coordinating Committee determines that no current methodology is available for measuring a juvenile survival standard, the Coordinating Committee will use the best available information to calculate an estimate of JDPS. More detailed descriptions of the survival standards may be found in section 2.3.4.4 of the FEIS and in sections 3 and 4 of the HCP.

3.4.2 HCP Phase Implementation

The measurement of survival and actions implemented at the Project to increase fish survival shall be implemented in three phases (HCP section 4 and figure 1). Under Phase I, Douglas PUD shall implement the juvenile and adult operating plans and criteria to meet the pertinent survival standards identified in the HCP (HCP sections 4.3 and 4.4). Further, a monitoring and evaluation program to determine compliance with the standards will also be implemented. Following the completion of the three-year monitoring and evaluation program in Phase I, the Coordinating Committee will determine whether the pertinent survival standards have been achieved. Depending on the results of this determination, Douglas PUD will either proceed to Phase II (if the applicable survival standard has not been achieved) or Phase III (if the applicable survival standard has been achieved).

The Signatory Parties recognized that Douglas PUD has completed three years of valid JPS studies as documented in appendix B of the HCP agreement. The Signatory Parties further recognized that Douglas PUD has achieved the 93% JPS goal for UCR steelhead and yearling chinook salmon (UCR spring-run chinook salmon) and that following full regulatory approval of the HCP, Douglas PUD will enter Phase III (Standard Achieved) for these Plan Species (UCR steelhead and UCR spring-run chinook salmon).

Phase I studies for the remaining Plan Species will be overseen by the Coordinating Committee, as technology allows, to assess whether or not the most appropriate survival standard is being achieved for each Plan Species. Point estimates of survival measurements from three years of valid studies (meeting critical criteria identified in the HCP, see HCP section 4.1.4) for each species shall be averaged (arithmetic mean). The point estimate of the average will be used to compare against the pertinent survival standard. If the averaged point estimate equals or exceeds the survival standard, then the standard has been achieved. If the average is no more than 0.5% below the survival standard, the Coordinating Committee may decide whether an additional year of study is appropriate. If an additional year of study is undertaken, the study result (if valid) will be included in the calculation of the arithmetic mean.

Phase II will apply in the event that averaged point estimates from Phase I testing studies indicate that the survival standard being evaluated is not being met for a Plan Species. If this occurs, the Wells bypass flow will be increased to 4.4 kcfs per bypass at night (1 hour before sunset to sunrise) for the period during which 80% of the Plan Species not meeting the JDPS Standard pass the Wells Project or for 40 days, whichever is less. Douglas PUD, at the direction of the Coordinating Committee, would conduct survival studies (not to exceed three years) to determine if the appropriate survival standards are being achieved for each Plan Species. If these studies indicate that the appropriate survival standards are still not being achieved, the Coordinating Committee shall decide on Additional Tools (actions, structures, facilities, or programs in addition to those initially proposed) for Douglas PUD to implement in order to achieve the survival standard. Until the survival standard being evaluated is achieved, the Coordinating Committee shall continue to implement Additional Tools for the standard and for each Plan Species that is not meeting the pertinent survival standard, except as set forth in section 2.4 of the HCP. The Coordinating Committee will determine the number of valid studies (not to exceed three years) necessary to make a phase determination following the implementation of Additional Tools.

Phase III will apply in the event that the averaged point estimates from Phase I testing studies (or studies implemented following Phase II) indicate that the survival standard being evaluated has either been achieved or is likely to have been achieved and provides additional or periodic monitoring to ensure that survival of the Plan Species remains in compliance with the survival standards for the term of the HCP.

More detailed descriptions of the phase implementation may be found in the FEIS (section 2.3.4.5) and the HCP (section 4).

3.4.3 HCP Committees

To accomplish these objectives, the Wells HCP proposes to utilize three committees to adaptively manage the major components of the Wells HCP, and one committee to provide policy oversight in the event of disputes among the Signatory Parties. Each committee acts upon the unanimous vote of those members present. More detailed descriptions of these committees may be found in the FEIS (section 2.3.4.7) and HCP (sections 6, 7.3, 8.2, and 11.1).

The Coordinating Committee would be composed of one voting representative of each Signatory Party, in addition to a non-voting observer representing Douglas PUD's power purchasers. The Coordinating Committee serves as the primary means of consultation and coordination between Douglas PUD and the other Signatory Parties, in connection with the conduct of studies and implementation of the measures set forth in the HCP and for dispute resolution.

The Tributary Committee would be composed of one voting representative of each Signatory Party choosing to appoint a representative to the committee. In addition to non-voting representatives of USFWS and a single non-voting observer representing Douglas PUD's power purchasers, the Tributary Committee may select other expert entities, such as land and water trusts/conservancy groups, to serve as non-voting members of the committee. The Tributary Committee is charged with the task of selecting projects and approving project budgets from the Plan Species Account for the purposes of implementing the Tributary Plan.

The Hatchery Committee would be composed of one voting representative of each Signatory Party choosing to appoint a representative to the committee and a single non-voting observer representing Douglas PUD's power purchasers. The Hatchery Committee is responsible for developing recommendations and implementing the hatchery elements of the HCP that Douglas PUD is responsible for funding. The Hatchery Committee's responsibilities include overseeing the implementation of improvements, as well as monitoring and evaluation relevant to Douglas PUD's hatchery programs.

The Policy Committee would also be comprised of one designated representative of each Signatory Party. The primary function of the Policy Committee would be to resolve disputes among the Signatory Parties. The Signatory Parties shall choose and Douglas PUD shall fund a neutral third party to act as the chair of each committee, excepting that the chair of the Coordinating Committee shall also serve as the chair of the Policy Committee. The committee chairs would prepare annual lists of understandings based on the results of studies, progress reports, and meeting minutes; facilitate and mediate the meetings; and assist the members of the respective committees in making decisions.

3.4.4 HCP Dispute Resolution

The HCP provides a non-binding dispute resolution process. Disputes which cannot be unanimously resolved within 20 days by the Tributary or Hatchery committees may be raised with the Coordinating Committee. If, at the end of an additional 20 days, the Coordinating Committee is unable to reach unanimous agreement on the dispute, then the chair of the Coordinating Committee or any Party may request that the Policy Committee convene to resolve the dispute. Upon referral, the Policy Committee would have 30 days to convene and consider the dispute.

If the Policy Committee successfully resolves the dispute, then the Signatory Parties shall implement all aspects of the settlement that can lawfully be implemented without FERC approval, or the approval of another Federal agency. If FERC or other Federal agency approval is needed, all Signatory Parties shall jointly present the resolution of the dispute to FERC or the appropriate Federal agency for approval. If the Policy Committee is unable to unanimously resolve the dispute, then any Signatory Party may pursue any other right they might otherwise have. More detailed descriptions of the dispute resolution process may be found in the FEIS (section 2.3.4.6) and HCP (section 11).

3.4.5 HCP Project Operations and Measures

To achieve the applicable survival standards (see Section 3.4.1 above and figure 1 of the HCP), a combination of measures identified in the juvenile and adult fish passage plans, including predator control measures, would be utilized at the Project. The appropriate mix of measures would vary depending upon the results of survival studies. Initial operations are described below.

Adult Fishway Operations

Douglas PUD has included detailed fishway operating plans (see HCP appendix A). The adult fish passage plan includes requirements to have both fishway facilities in operation from March 1 to December 1 of each year, although for operation and maintenance purposes, the primary fish passage season is considered to be April through November. From May 1 to November 15, the fishway is monitored 24 hours per day via digital recording equipment. Fish counters read the recordings from the previous day and report counts to the U.S. Army Corps of Engineers. The two adult fishways are mirror image left and right bank fishway facilities. Each of the two fishways contains a single main entrance, a collection gallery, a fish ladder, an adult count station, trapping facilities, and an exit in the forebay adjacent to the earthen embankment section of the Project. Each fishway will be operated to maintain a minimum of 1 to 1.5 feet of hydraulic drop from the entrance pool to the tailwater to attract adult salmonids to the fishway entrances, and transport channels are designed to maintain velocities from 1.5 to 4 feet per second to facilitate adult fish passage. The ladder will be operated such that water depths over weirs in the ladder will be maintained at 1.0 to 1.2 feet. During the migration season, the adult fishway will be inspected once each day. WDFW personnel will inspect the facilities on a monthly basis and provide monthly inspection reports to the Fish Passage Center.

Measures to enhance safe passage of all Plan Species adults will be emphasized in order to give high priority to adult survival in the achievement of 91% CAJPS as described in the FEIS and HCP. The Coordinating Committee may agree to implement additional measures to meet or achieve and maintain the 91% CAJPS standard.

More detailed descriptions may be found in the HCP (section 5.4.2 and appendix A) and in section 2.3.4.8 of the FEIS.

Juvenile Bypass, Spillway, and Turbine Operations
Douglas PUD will operate the JBS each year in order to provide a non-turbine passage route through the dam for 95% of the spring-run and summer-run juvenile Permit Species outmigrations. This system includes five surface bypass entrances that convey fish into five modified spillways. The procedures set forth in the Wells HCP are intended to guide the operating criteria for the Wells JBS. This plan also includes specific operating criteria for the turbines and spillways sufficient to maximize fish use and survival through the JBS. The Coordinating Committee may either approve or amend this document in future years.

More detailed descriptions may be found in section 4.3 and appendix A of the HCP, and in section 2.3.4.8 of the FEIS.

Turbines will be operated at peak efficiency to the extent practicable during the juvenile fish passage season or as otherwise agreed to by the Coordinating Committee to support attainment of HCP objectives.

Predator Control Measures
Douglas PUD, in cooperation with the Coordinating Committee, will refine and implement a comprehensive predator removal and harassment program for the protection of Plan Species. For northern pikeminnows, activities may include, but not be limited to, angling and long-line fisheries and a sport fishing derby in the Project area. For piscivorous birds, including but not limited to Caspian terns, double-crested cormorants, and various gull species, activities may include, but not be limited to, foraging deterrents (e.g., steel wires in the Project tailrace), hazing, and lethal removal of individual birds. These programs will generally occur in the spring and summer, coinciding with the juvenile outmigration.

3.4.6 Tributary Conservation Plan

The Tributary Conservation Plan is detailed in section 7 of the HCP.[10] To implement the Tributary Conservation Plan, Douglas PUD shall provide a Plan Species Account to fund projects for the protection and restoration of Plan Species habitat within the Columbia River watershed (from the Chief Joseph tailrace to the Wells tailrace), and the Okanogan and Methow

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[10]The Tributary Conservation Plan is supported by Supporting Document A, “Aquatic Species and Habitat Assessment: Wenatchee, Entiat, Methow, and Okanogan Watersheds,” and Supporting Document D, “Tributary Plan, Project Selection, Implementation and Evaluation.” These documents (prepared in 1998) summarize information on aquatic species and their habitats in the four major tributaries to the Mid-Columbia River in Washington State. These documents describe how habitat conditions affect the natural productivity and diversity of aquatic populations native to these watersheds and provide a guidance for Tributary Committee decisions regarding prioritization and funding of tributary habitat protection or restoration projects.

river watersheds, in order to compensate for up to 2% of unavoidable project mortality (the assumed 9% mortality caused by the Project that is compensated through the tributary and hatchery programs). However, if the adult passage survival is determined to be greater than 98% and the juvenile project passage survival is greater than 93% for any one of the Plan Species, contributions to the Plan Species Account would be reduced to reflect the actual survival estimate of that species.

Once the HCP has been approved by FERC, Douglas PUD shall make an initial contribution of $1,982,000 in 1998 dollars to the Plan Species Account. Five years after the initial contribution to the Plan Species Account, Douglas PUD shall do one of the following: 1) make annual payments of $176,178 (2%) in 1998 dollars as long as the HCP is in effect; or 2) provide an upfront payment of $1,761,780 (2% for 10 years) in 1998 dollars, but deducting the actual cost of bond issuance and interest.

The first installment is due within 90 days of the Effective Date of the HCP. The rest of the installments are due by January 31 of each year thereafter. The dollar figures shall be adjusted for inflation on January 1 of each year, based upon the Consumer Price Index for all Urban Consumers for the Seattle/Tacoma area, published by the U.S. Department of Labor, Bureau of Labor Statistics. If said index is discontinued or becomes unavailable, a comparable index suitable to the Tributary Committee shall be substituted.

Douglas PUD will provide an additional $200,000 to monitor and evaluate the relative performance of projects approved by the Tributary Committee. It is not the intent of the evaluation to measure whether the Plan Species Account has provided a 2% increase in survival for Plan Species, because any statistical assessment of such small survival improvements would be lost within variation resulting from naturally fluctuating environment conditions. Instead, the evaluation will ensure that the dollars allocated to the Plan Species Account are utilized in an effective and efficient manner.

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. The Tributary Committee shall also make sure that an appropriate number of projects are chosen upstream of Wells Dam. Whenever feasible, projects selected by the Tributary Committee shall take into consideration and be coordinated with other conservation plans or programs. Whenever feasible, the Tributary Committee shall cost-share with other programs, seek matching funds, and piggyback programs onto other habitat efforts. Habitat protection and restoration projects could include, but are not limited to, the following:

1. Opening fish passage to blocked stream sections or oxbows.
2. Changing the points of origin for problematic irrigation withdrawals to less sensitive site(s).
3. Purchasing, on a willing buyer/seller concept, water shares for the Trust Water Rights

Program or conservation easements on private property.
4. Providing alternative sources of irrigation and domestic water to mitigate impacts of problematic surface water diversions.
5. Removing dams or other passage barriers on the tributaries.
6. Using mechanical means to encourage natural development of riparian areas.
7. Using engineering techniques which increase complexity of permanently altered habitats.

The overarching goal of the Tributary Enhancement Fund is the long-term protection or enhancement of Permit Species' habitats in the tributaries, which in turn should improve the productivity of salmon and steelhead populations in those basins. NOAA Fisheries anticipates that some activities will require additional permitting and ESA consultation. Through these means and through its active participation on the Tributary Committee, NOAA Fisheries would ensure that any negative impacts to Permit Species due to in-water or riparian tributary protection and enhancement activities would be minimized to the extent practical through choice of methodology, seasonal timing of work, and mitigation measures for short-term impacts, and would not jeopardize ESA-listed Permit Species.

More detailed descriptions may be found in section 7 and supporting document D of the HCP and section 2.3.4.8 of the FEIS.

3.4.7 Hatchery Compensation Plan

Douglas PUD will compensate for up to 7% of the unavoidable mortality at the Project for Plan Species originating upstream of Wells Dam through artificial production, or through measures to increase the off-site survival of naturally spawning fish or their progeny. Based upon the results of JPS studies, hatchery compensation for yearling chinook salmon and steelhead will be adjusted to 3.8%, while sockeye salmon and summer/fall-run chinook salmon hatchery compensation will remain at 7%. Douglas PUD shall implement the specific elements of the hatchery program consistent with overall objectives of rebuilding natural populations and achieving NNI in an ESA-compliant manner. Species-specific hatchery program objectives may include contributing to the rebuilding and recovery of naturally reproducing populations in their native habitats, while maintaining genetic and ecologic integrity, and supporting harvest.

Hatchery production levels, except for original inundation mitigation, shall be adjusted in 2013 and every 10 years thereafter as is required to adjust for changes in the average adult returns of Plan Species, for changes in the adult-to-smolt survival rate, and for changes to smolt-to-adult survival rate from the hatchery production facilities, considering methodologies described in supporting document B of the HCP (Biological Assessment and Management Plan). The Hatchery Committee will be responsible for determining program adjustments considering the methodology described in the Biological Assessment and Management Plan and for providing recommended implementation plans to Douglas PUD. Douglas PUD will be responsible for funding the implementation plan.

The Hatchery Committee shall oversee development of recommendations for implementation of the hatchery elements of the HCP that Douglas PUD is responsible for funding. This includes overseeing the implementation of improvements, monitoring and evaluation relevant to Douglas PUD's hatchery programs (as identified in the Hatchery Compensation Plan, section 8 of the HCP), the Hatchery Permits, and the HCP. Hatchery Committee decisions shall be based upon the likelihood of biological success, the time required to implement, and cost-effectiveness of solutions. The Hatchery Committee shall also coordinate in-season information sharing and shall discuss unresolved issues.

Through its active participation on the Hatchery Committee and through future permits for hatcheries and associated biological opinions, NOAA Fisheries would ensure that the negative hatchery effects (including incidental and direct take as a result of these programs) would be minimized to the extent practical and would not jeopardize ESA-listed Permit Species.

More detailed descriptions may be found in section 8 of the HCP and section 5.3.15 of the FEIS. Proposed hatchery mitigation actions have already been or are now being evaluated by NOAA Fisheries in separate species-specific biological opinions (see Section 1).

4. BIOLOGICAL INFORMATION

As described in Section 1.1, step 1 of the analysis in this Opinion requires an evaluation of the rangewide status of the relevant ESUs, within the context of their rangewide biological requirements. Those biological requirements were described in Section 1.1.1 in relation both to ESUs and their constituent populations. The following sections describe the current status in a manner that is relevant to each species' biological requirements.

4.1 Rangewide Status of the Permit Species

4.1.1 Rangewide Status

Four ESUs representing three species of anadromous salmon and steelhead are included in the HCP as Permit Species: UCR steelhead, UCR spring-run chinook salmon, UCR summer/fall-run chinook salmon, and Okanogan River sockeye salmon. Two of these ESUs have been listed as endangered under the ESA: UCR steelhead, on August 18, 1997 (62 FR 43937), and UCR spring-run chinook salmon, on March 24, 1999 (64 FR 14308). NOAA Fisheries is currently reassessing the status of these ESUs. NOAA Fisheries determined in March 1998 that listing under the ESA as either threatened or endangered was not warranted for UCR summer/fall-run chinook salmon (63 FR 11482) or Okanogan River sockeye salmon (63 FR 11750). These populations appear to be stable and are in no danger of extinction or of becoming endangered in the foreseeable future.

4.2 Life Histories, Factors for Decline, and Population Trends

The biological requirements, life histories, migration timing, historical abundance, and factors contributing to the decline of Permit Species migrating through the middle reach of the Columbia River have been well documented (Busby et al. 1996; Gustafson et al. 1997; Myers et al. 1998; NMFS 2000a, 2000b, 2002a; West Coast Salmon BRT 2003). The following sections summarize the relevant biological information for UCR steelhead, UCR spring-run chinook salmon, UCR summer/fall-run chinook salmon, and Okanogan River sockeye salmon contained in these documents. More detailed information is available in the FEIS, in NOAA Fisheries' Status Reviews (Busby et al. 1996; Gustafson et al. 1997; Myers et al. 1998; West Coast Salmon BRT 2003), and on NOAA Fisheries' Northwest Region website: http://www.nwr.noaa.gov.

4.2.1 UCR Steelhead

Geographic Boundaries and Spatial Distribution

The ESU includes all naturally spawned populations of steelhead (and their progeny) in streams adjacent to the mainstem Columbia River upstream of the confluence of the Yakima River to the tailrace of Chief Joseph Dam. NOAA Fisheries has initially identified three important spawning populations within this ESU: the Wenatchee, Entiat, and Methow populations (Interior Technical Recovery Team 2003). Wells Hatchery steelhead stock are also currently part of the listed ESU.

Historical Information
Steelhead are not thought to have occurred in large numbers in British Columbia, Canada, in the upper Columbia River basin. Estimates of historical (pre-1960s) abundance specific to this ESU are available from fish counts at dams. Counts at Rock Island Dam from 1933 to 1959 averaged 2,600 to 3,700, suggesting a pre-fishery run size exceeding 5,000 adults for tributaries above Rock Island Dam. Runs may already have been depressed, however, by lower Columbia River fisheries and other habitat degradation problems in the natal tributaries. Grand Coulee Dam blocked anadromous fish from habitat upstream of RM 596.6 after 1938. The concurrent Grand Coulee Fish Maintenance Project (GCFMP) also influenced the present distribution of the ESU. In 1961, the Chief Joseph Dam also blocked anadromous fish from remaining habitat upstream of RM 545.1.

Life History
Life history characteristics for UCR steelhead are similar to those of other inland steelhead ESUs; however, smolt age is dominated by 2- and 3-year-olds and some of the oldest smolt ages for steelhead, up to 7 years, are reported from this ESU (Peven 1990). Based on limited data, steelhead from the Wenatchee and Entiat rivers return to freshwater after one year in salt water, whereas Methow River steelhead primarily return after two years in salt water. Similar to other inland Columbia River basin steelhead ESUs, adults typically return to the Columbia River between May and October and are considered summer-run steelhead. Adults may remain in freshwater up to a year before spawning. Unlike chinook salmon or sockeye salmon, a fraction of steelhead adults attempt to migrate back to the ocean. These fish are known as kelts, and those that survive will migrate from the ocean to their natal stream to spawn again.

Population Trends and Risks
NOAA Fisheries determined that UCR steelhead are at risk of becoming extinct in the foreseeable future, listing them as endangered under the ESA on August 18, 1997 (62 FR 43937). On April 4, 2002, NOAA Fisheries defined interim abundance recovery targets for each spawning population in this ESU (Lohn 2002). These targets are intended to represent the number and productivity of naturally produced spawners that may be needed for recovery, in the context of whatever take or mortality is occurring. They should not be considered in isolation, as they represent the numbers that, taken together, may be needed for the population to be self-sustaining in its natural ecosystem. For UCR steelhead, the interim recovery levels are 2,500 spawners in the Wenatchee River, 500 spawners in the Entiat River, and 2,500 spawners in the Methow River (Lohn 2002).

Returns of both hatchery and naturally produced steelhead to the upper Columbia River have increased in recent years. The average 1997-2001 return counted through the Priest Rapids fish ladder was approximately 12,900 fish. The average for the previous five years (1992-1996) was

7,800 fish. Abundance estimates of returning naturally produced UCR steelhead have been based on extrapolations from mainstem dam counts and associated sampling information (e.g., hatchery/wild fraction, age composition). The natural component of the annual steelhead run over Priest Rapids Dam increased from an average of 1,040 (1992-1996), representing about 10% of the total adult count, to 2,200 (1997-2001), representing about 17% of the adult count during this period of time (West Coast Salmon BRT 2003).

In terms of natural production, recent population abundances for both the Wenatchee/Entiat river aggregate population and the Methow population remain well below the interim recovery levels developed for these populations (West Coast Salmon BRT 2003). A 5-year geometric mean (1997-2001) of approximately 900 naturally produced steelhead returned to the Wenatchee and Entiat rivers (combined) compared to a combined abundance target of 3,000 fish. Although this is well below the interim recovery target, it represents an improvement over the past (an increasing trend of 3.4% per year). However, the average percentage of natural fish for the recent 5-year period dropped from 35% to 29%, compared to the previous status review. For the Methow population, the 5-year geometric mean of natural returns over Wells Dam was 358. Although this is well below the interim recovery target, it represents an improvement over the past (an increasing trend of 5.9% per year). In addition, the estimated 2001 return (1,380 naturally produced spawners) was the highest single annual return in the 25-year data series. However, the average percentage of wild origin spawners dropped from 19% for the period prior to the 1998 status review to 9% for the 1997 to 2001 returns.

4.2.2 UCR Spring-run Chinook Salmon

Geographic Boundaries and Spatial Distribution

This ESU includes spring-run chinook salmon populations found in Columbia River tributaries between the Rock Island and Chief Joseph dams. NOAA Fisheries has initially identified three important spawning populations within this ESU: the Wenatchee, Entiat, and Methow populations (Interior Technical Recovery Team 2003). The populations are genetically and ecologically separate from the summer- and fall-run populations in the lower parts of many of the same river systems. Chinook salmon (and their progeny) from the following stocks that are raised in hatcheries are considered part of the listed ESU: Chiwawa River, Methow River, Twisp River, Chewuch River, White River, and Nason Creek.

Historical Information

The construction of Grand Coulee Dam (completed in 1942) blocked anadromous fish from habitat upstream of RM 596.6 after 1938. The concurrent GCFMP influenced the present distribution of the ESU. Production of non-listed Carson-origin spring-run chinook salmon has also taken place within the UCR spring-run chinook salmon ESU. Non-listed spring-run chinook salmon hatchery populations contained within this ESU include Leavenworth, Entiat, and Winthrop national fish hatcheries.

Life History (including Ocean)
UCR spring-run chinook salmon exhibit classic stream-type life-history strategies: emigrating from freshwater as yearling smolts and undertaking extensive offshore ocean migrations. The majority of these fish mature at 4 years of age and return to the Columbia River from March through mid-May.

Population Trends and Risks
NOAA Fisheries determined that UCR spring-run chinook salmon are at risk of becoming extinct in the foreseeable future, listing them as endangered under the ESA on March 24, 1999 (64 FR 14307). On April 4, 2002, NOAA Fisheries defined interim abundance recovery targets for each spawning aggregation in this ESU. These numbers are intended to represent the number and productivity of naturally produced spawners that may be needed for recovery, in the context of whatever take or mortality is occurring. They should not be considered in isolation, as they represent the numbers that, taken together, may be needed for the population to be self-sustaining in its natural ecosystem. For UCR spring-run chinook salmon, the interim recovery levels are 3,750 spawners in the Wenatchee River, 500 spawners in the Entiat River, and 2,000 spawners in the Methow River.

All three of the existing UCR spring-run chinook populations have exhibited similar trends and patterns in abundance over the past 40 years. The 1998 status review (Myers et al. 1998) reported that long-term trends in abundance were generally negative, ranging from -5% to +1%. Analyses of the data series, updated to include 1996-2001 returns, indicate that those trends have continued. Based on redd count data series, spawning escapements for the Wenatchee, Entiat, and Methow rivers have declined an average of 5.6%, 4.8%, and 6.3% per year, respectively, since 1958. In the most recent 5-year geometric mean (1997-2001), spawning escapements were 273 for the Wenatchee population, 65 for the Entiat population, and 282 for the Methow population, only 8% to 15% of the interim abundance recovery targets, although escapement increased substantially in 2000 and 2001 in all three river systems. Based on 1980-2000 returns, the average annual growth rate for this ESU is estimated as 0.85. Assuming that population growth rates were to continue at 1980-2000 levels, UCR spring-run chinook salmon populations are projected to have very high probabilities of 90% decline within 50 years (87% to 100%).

4.2.3 UCR Summer/Fall-run Chinook Salmon

Geographic Boundaries and Spatial Distribution
The ESU includes all naturally spawned populations of summer- and fall-run chinook salmon in the Columbia River and tributaries upstream of the confluence of the Snake and Columbia rivers to Chief Joseph Dam (with the exception of chinook salmon that spawn in the Marion Drain). Historically, this ESU may have extended farther upstream, but spawning habitat has compressed downriver since the construction of Grand Coulee Dam. The populations are genetically and ecologically separate from the spring-run populations in the upper parts of many of the same

river systems. Major river basins currently containing spawning and rearing habitat for this ESU comprise approximately 8,795 square miles in the state of Washington.

Historical Information
Artificial propagation in this ESU began in 1899, when hatcheries were constructed on the Methow and Wenatchee rivers. The construction of Grand Coulee Dam (completed in 1942) blocked anadromous fish from habitat upstream of RM 596.6 after 1938. The concurrent GCFMP has also influenced the present distribution of the ESU. At least six former populations from this ESU are now extinct.

Life History (including Ocean)
UCR summer/fall-run chinook salmon typically exhibit classic ocean-type life-history strategies: emigrating from freshwater as subyearling smolts and, based on coded wire tag recoveries, undertaking extensive offshore ocean migrations. The majority of the summer-run fish mature at 4 to 5 years of age and return to the Columbia River from May through early August. Adult fall-run chinook salmon return to the Columbia River from mid-August through October. Compared to the summer-run fish, higher proportions of fall-run fish mature as 2-year-old "jacks" and 3-year-old adults.

Population Trends and Risks
On March 9, 1998, NOAA Fisheries concluded that UCR summer/fall-run chinook salmon are not at risk of extinction nor at risk of becoming endangered in the foreseeable future (63 FR 11482). Limited life-cycle modeling has been conducted for this ESU. McClure et al. (in press) have estimated median population growth rates ranging from 1.00 to 1.11 (stable or increasing) for 5 index groups within this ESU. The risk of extinction in 100 years varies between 0% and 5% for these populations. Estimated total adult returns for the ESU averaged about 58,000 adults (geometric mean for 1990-94). This total includes about 51,000 natural spawners in the Hanford Reach of the Columbia River between the McNary Reservoir and Priest Rapids Dam. The remaining 7,000 adults are comprised primarily of natural spawners from the Wenatchee River, and smaller numbers in the Yakima, Methow, Okanogan, and Similkameen rivers. Long-term trends for the three largest populations are positive, while those for the smaller populations are a mix of positive and negative. Recent returns are the largest ever recorded since the 1930s, with over 50,000 naturally produced and hatchery-produced summer-run chinook salmon returning past Rock Island Dam.

4.2.4 Okanogan River Sockeye Salmon

Geographic Boundaries and Spatial Distribution
The ESU includes sockeye salmon that spawn in areas upstream from Lake Osoyoos, in Lake Osoyoos, or in the downstream tributary Similkameen River (below Enloe Dam) in the Okanogan River basin. The spawning and main rearing area for this ESU is in British Columbia,

Canada, while the migration corridor for both juveniles and adults is through the Columbia River in Washington and Oregon.

Historical Information
Grand Coulee Dam blocked anadromous fish from habitat upstream of RM 596.6 after 1938. Between 1939 and 1943, all adult sockeye salmon were trapped at Rock Island Dam on the Columbia River as part of the GCFMP. The mixed-stock progeny of these adults were released into Lake Osoyoos. Between 1940 and 1968, mixed-stock hatchery fish continued to be released into Lake Osoyoos. No hatchery fish were released into Lake Osoyoos between 1989 and 1992. Between 1993 and 2001, the Cassimer Bar sockeye program released hatchery sockeye salmon into Lake Osoyoos that were progeny of adult sockeye salmon trapped at Wells Dam. Since 2002, no hatchery sockeye salmon have been released into the lake.

Life History (including Ocean)
Sockeye salmon from this ESU primarily spawn in the Okanogan River upstream of Lake Osoyoos from late-September through October, although some spawning has occasionally been observed along the shoreline of Lake Osoyoos. Fry typically emerge in early March through May and emigrate to Lake Osoyoos. Juveniles rear in Lake Osoyoos before emigrating in May as yearling smolts down the Okanogan and Columbia rivers to the ocean. Okanogan River sockeye salmon generally spend one to two years in the ocean before returning to spawn, but in some instances a substantial return of 3-year-old adults has been observed. Adult sockeye salmon enter the Columbia River between mid-June and late-July.

Population Trends and Risks
Life-cycle modeling has not been conducted for this ESU as with endangered UCR steelhead and UCR spring-run chinook salmon, or UCR summer/fall-run chinook salmon. No historical abundance estimates specific to this ESU are available prior to the 1930s. Since this time, the abundance of adult Okanogan River sockeye salmon has fluctuated widely, as is the case with many populations of sockeye salmon. Analysis conducted in the 1930s indicated that less than 15% of the total sockeye salmon run in the upper Columbia River went into Lakes Osoyoos and Wenatchee. At that time, the total run at Rock Island Dam averaged about 15,000. Of these, an estimated 2,250 adults escaped downstream fisheries to return to the Okanogan River and the remainder likely spawned in Lake Wenatchee (approximately 12,750 fish, less any pre-spawn losses). Between 1960 and 1990, estimated sockeye salmon escapement to the Okanogan River ranged from approximately 5,000 to 130,000 fish. Although the lowest count at Wells Dam was observed in 1994 (1,662 fish), the 5-year geometric mean of 1992-1996 adult counts at Wells Dam was about 11,000. The 1997 status review (Gustafson et al. 1997) determined that the long-term (1961-1996) trend for this stock has been relatively flat. The most recent 5-year geometric mean (1998 to 2002) is about 19,404 sockeye salmon passing Wells Dam. Thus abundance for the Okanogan River ESU was clearly lower during the 1930s and 1940s than it is presently.

4.3 Significant Factors Influencing Rangewide Status of Each ESU

4.3.1 Harvest

Harvest rates for most ESUs have been substantially reduced as either a direct or indirect result of many species being listed under the ESA during the 1990s. Table 2 provides NOAA Fisheries' best estimates of current total harvest rates for ESA-listed species which are substantially lower than harvest rates occurring prior to ESA listings in the Columbia River basin (NMFS 2001). Because these fisheries are generally mixed-stock fisheries, they should be generally applicable for adults from other ESUs migrating through the Columbia River at the same time. For example, harvest estimates for ESA-listed Snake River spring/summer-run chinook salmon are likely applicable to the summer-run component of unlisted UCR summer/fall-run chinook salmon.

Table 2. NOAA Fisheries' estimates of current total in-river harvest rates (Treaty Indian Fisheries and Non-Indian Fisheries) for ESA-listed species /Evolutionarily Significant Units.

Species / ESUs	Run / Origin	Total Estimated Impact	
		Maximum	Expected
UCR Steelhead	Wild	9.6 %	4.4 %
	Hatchery	11.6 %	7.2 %
UCR Spring-run Chinook Salmon	Spring Migrants	≤ 15.0 %	≤ 15.0 %
UCR Summer/Fall-run Chinook Salmon	Summer Migrants[1]	≤ 6.0 %	1.7 %
	Fall Migrants[2]	31.29 %	<31.29 %
Okanogan River and Lake Wenatchee Sockeye Salmon*	Summer Migrants[3]	≤ 8.0 %	5.0 %

[1]Estimates for Snake River spring/summer-run chinook salmon - summer run component.
[2]Estimates for Snake River fall-run chinook salmon.
[3]Estimates for Snake River sockeye salmon.
*See Footnote 1.
Source: NMFS 2001 and 2002c.

4.3.2 Hatcheries

The following sections briefly summarize the historical impacts of hatcheries on Permit Species that have contributed to the present status of the ESUs.

UCR Steelhead

The upper Columbia River populations were intermixed during the GCFMP (1939 through 1943). The resulting homogenization remains an important feature of the ESU. Chief Joseph Dam blocked anadromous fish from remaining habitat upstream of RM 545.1 in 1961. The naturally spawning population of UCR steelhead has been augmented for a number of years by returning hatchery fish. Replacement ratios for naturally spawning fish (both natural and hatchery-origin fish) are quite low, on the order of 0.3. This very low return rate suggests that either hatchery-origin spawners are largely supporting the population, or that hatchery-origin spawners are not contributing substantially to subsequent adult returns and natural-origin fish are returning at or just below the replacement rate, or some intermediate combination of these factors. Given these uncertainties, efforts are underway to diversify broodstocks used for supplementation, minimizing the differences between natural- and hatchery-origin fish, as well as other concerns associated with supplementation.

Assuming that the hatchery broodstock represents the listed ESU, NOAA Fisheries expects that the early life-history survival advantage of hatchery smolts will help stocks to rebuild. However, there are also substantive concerns about the long-term effect on the fitness of natural-origin populations resulting from an ongoing, long-term infusion of hatchery-influenced spawners (Busby et al. 1996). The hatchery component is relatively abundant and routinely exceeds the needs of the supplementation program by a substantial margin.

UCR Spring-run Chinook Salmon

The upper Columbia River populations were intermixed during the GCFMP (1939 through 1943). The resulting homogenization remains an important feature of the ESU. Chief Joseph Dam blocked anadromous fish from remaining habitat upstream of RM 545.1 in 1961. In addition, spring-run chinook salmon from the Carson National Fish Hatchery (a large composite, non-native stock) were introduced into and have been released from local hatcheries (Leavenworth, Entiat, and Winthrop national fish hatcheries). Little evidence suggests that these hatchery fish stray into wild areas or hybridize with naturally spawning populations. In addition to these national production hatcheries, two supplementation hatcheries are operated by WDFW in this ESU. The Methow Fish Hatchery Complex (operations began in 1992) and the Rock Island Fish Hatchery Complex (operations began in 1989) were both designed to implement supplementation programs for naturally spawning populations on the Methow and Wenatchee rivers, respectively (Chapman et al. 1995).

Risks associated with artificial production programs within the ESU are a concern because of the use of non-native Carson stock for fishery enhancement and hydropower mitigation. However, programs have been initiated to develop locally-adapted broodstocks to supplement the natural populations in the ESU. The Carson stock is being phased out at those facilities where hatchery strays and natural stock interactions are potentially problematic. Captive broodstock programs are underway in the Nason Creek and the White River (the Wenatchee basin) and in the Twisp River (Methow basin), to prevent those populations from going extinct. In some recent years (1996 and 1998), all Methow basin spring-run chinook salmon have been trapped at the Wells

Hydroelectric Project to begin a composite broodstock supplementation program for the Methow basin.

UCR Summer/Fall-run Chinook Salmon

Artificial propagation in this ESU began in 1899, when hatcheries were constructed on the Methow and Wenatchee rivers. Several summer/fall-run chinook salmon hatcheries were operated intermittently from that time through 1931, using both locally derived and imported broodstock. From 1931 to 1939, no chinook salmon hatcheries were in operation above Rock Island Dam. Grand Coulee Dam (completed in 1942), blocked passage to thousands of summer- and fall-run chinook salmon after 1938. In an effort to mitigate for the loss of spawning habitat above the dam, the GCFMP was authorized by the Federal government. The GCFMP sought to relocate all salmonids migrating past Rock Island Dam into three of the remaining accessible tributaries to the Columbia River: the Wenatchee, Entiat, and Methow rivers. Although hatcheries have operated intermittently throughout the previous century, the percentage of non-indigenous stocks incorporated into this ESU has been low (about 3%), and does not appear to have had a significant impact on the integrity of this ESU. However, the resulting homogenization of populations remains an important feature of the ESU.

Okanogan River Sockeye Salmon

Grand Coulee Dam blocked anadromous fish from habitat upstream of RM 596.6 after 1938. Between 1939 and 1943, all adult sockeye salmon were trapped at Rock Island Dam on the Columbia River as part of the GCFMP. Nearly 2 million of these mixed-stock sockeye salmon juveniles were planted into the Okanogan River system. Between 1940 and 1968, mixed-stock hatchery fish continued to be released into Lake Osoyoos. Between 1993 and 2001, only progeny of adult sockeye salmon trapped at Wells Dam were released into the lake. Since 2002, no hatchery fish have been released into the lake.

Several out-of-basin kokanee introductions have occurred in Lake Osoyoos. These releases are not believed to have had large genetic effects on the ESUs.

4.3.3 Hydropower

This section briefly describes how the existence and ongoing operation of the mainstem hydroelectric projects have contributed to the rangewide status of the Permit Species.

The construction of Grand Coulee Dam blocked upstream migration in the Columbia River after 1938. This project not only eliminated populations of anadromous fish upstream of the dam, but the resultant hatchery mitigation plan (the GCFMP) likely influenced all of the Permit Species ESUs; fish from multiple populations were mixed into relatively homogenous groups and redistributed into streams and lakes throughout the region or raised and released from hatcheries (see discussion in Section 4.2.2). Grand Coulee Dam, as well as the large upstream storage projects in Canada, Idaho, and Montana, have affected the quantity and timing of runoff in the

Columbia River. Compared with historical flows, the spring freshet has been greatly reduced, summer flows have been somewhat reduced, and fall and winter flows have been increased (NMFS 2000a).

The five FERC-licensed Mid-Columbia River hydroelectric dams (Wells, Rocky Reach, Rock Island, Wanapum, and Priest Rapids) and reservoirs have affected the mainstem migration corridor and reduced the survival of juvenile migrants. Each of these projects has license requirements and settlement agreements that specify operations or processes that govern operations for the purpose of reducing the effects of these projects on anadromous salmonids throughout the remainder of their FERC-issued licenses. For these projects, the best estimates of recent juvenile and adult project survivals contributing to the rangewide status of Permit Species are contained in the FEIS and draft QAR (Cooney 2002).

Four Federally-owned hydroelectric projects in the Lower Columbia River (McNary, John Day, The Dalles, and Bonneville) have also affected the mainstem migration corridor and reduced the survival of juvenile and adult migrants. For these projects, the best estimates of recent juvenile and adult project survivals contributing to the rangewide status of Permit Species are contained in NOAA Fisheries' 2002 Findings Report (NMFS 2002d) and the Federal action agencies' 2002 Progress Report (U.S. Army Corps of Engineers et al. 2003).

4.3.4 Habitat

This section briefly summarizes the historical impacts of human activities on Permit Species in tributary, migration, estuarine, and near-shore ocean environments that have contributed to the present status of the ESUs.

Spawning and rearing habitat in the Columbia River and its tributaries upstream of the Yakima River includes conditions that are less conducive to salmon and steelhead survival than in many other parts of the Columbia River basin (Mullan et al. 1992a,1992b). Salmon in this ESU must pass up to nine Federal and non-Federal dams, with Chief Joseph and Grand Coulee dams preventing access to historical spawning grounds farther upstream. Existing degradation of the remaining spawning and rearing habitat continues to be a major concern associated with contemporaneous urbanization, irrigation projects, and livestock grazing along riparian corridors. In addition, development in the vicinity of Lake Osoyoos (Okanogan River sockeye salmon ESU) has increased the likelihood of negative impacts to spawning and rearing sockeye salmon that might not yet be fully reflected in population trends.

More detailed descriptions of tributary habitat conditions in the Methow and Okanogan river basins are available in supporting document B (Aquatic Species and Habitat Assessment: Wenatchee, Entiat, Methow, and Okanogan Watersheds) of the HCP and in the Upper Columbia Regional Technical Team's report to the Upper Columbia Salmon Recovery Board titled "A biological strategy to protect and restore salmonid habitat in the Upper Columbia Region"

(2003).

The estuary and near-shore ocean environment have also been changed by human activities. Historically, the downstream half of the estuary was a dynamic environment with multiple channels, extensive wetlands, sandbars, and shallow areas. Winter and spring floods, low flows in late summer, large woody debris floating downstream, and a shallow bar at the mouth of the Columbia River kept the environment dynamic. Today, navigation channels have been dredged, deepened, and maintained; jetties and pile-dike fields have been constructed to stabilize and concentrate flow in navigation channels; marsh and riparian habitats have been filled and diked; and causeways have been constructed across waterways. These actions have decreased the width of the mouth of the Columbia River from 4 miles to 2 miles and increased the depth of the Columbia River channel at the bar from less than 20 feet to more than 55 feet. Sand deposisition at river mouths has extended the Oregon coastline approximately 4 miles seaward and the Washington coastline approximately 2 miles seaward (Thomas 1981).

More than 50% of the original marshes and spruce swamps in the estuary have been converted to industrial, transportation, recreational, agricultural, or urban uses. More than 3,000 acres of this habitat have been converted to other uses since 1948 (Lower Columbia River Estuary Program 1999). Many wetlands along the shore in the upper reaches of the estuary have been converted to industrial and agricultural lands after levees and dikes were constructed. Furthermore, water storage and release patterns from reservoirs upstream of the estuary have changed the seasonal pattern and volume of discharge. The peaks of spring/summer floods have been reduced, and the amount of water discharged during winter has increased.

4.4 Species Status with Respect to Species-Level Biological Requirements

The current status of ESA-listed Permit Species, as described above, indicates that the species-level biological requirements of these ESUs are not being met at this time. The abundance of UCR steelhead and UCR spring-run chinook salmon, while increasing in recent years, remains far below historical levels. This information clearly indicates that substantial improvements in survival rates (assessed over the entire life cycle and throughout the range of the ESUs) are necessary to increase abundance to meet species-level biological requirements of the ESA-listed ESUs in the future. Because the effects of this Project and the other HCP projects have been identified as significant factors for decline (Section 4.3.3), it is reasonable to expect that a portion of the needed survival improvement should be reflected in future operations at this Project as well as the other HCP projects.

The estimated median annual growth rate for UCR summer/fall-run chinook salmon ranges from 1.00 to 1.11 for five index groups within the ESU, which indicates that the species-level biological requirements of this species are likely being met at this time. Estimates of abundance (comparison of 5-year geometric means with historical estimates of adult escapement) for the remaining unlisted Permit Species, as described above, similarly indicates that the species-level biological requirements of these ESUs are likely being met at this time. In each case, these ESUs appear to be stable or slightly increasing. Thus no additional survival improvements are likely necessary at this time to meet the species-level biological requirements of these ESUs.

5. ENVIRONMENTAL BASELINE

5.1 Biological Requirements within the Action Area

As noted in Section 1.1.2, the relevance of the biological requirements of the Permit Species within the action area depends upon the biological requirements of the ESU as a whole and any constituent populations. NOAA Fisheries looks at certain criteria to assess the viability of fish populations that make up an ESU. The criteria that describe a viable salmonid population include 1) the abundance sufficient to withstand periodic environmental downturns, 2) the productivity (return rate) necessary to maintain or increase a population of fish, 3) the distribution throughout a geographic area that is large enough such that ecological disasters would not likely eliminate the entire population, and 4) a genetic diversity approaching the historical diversity of the population. Salmon and steelhead ESUs generally consist of multiple populations. ESUs with fewer populations are more likely to become extinct due to catastrophic events, and have a lower likelihood that the necessary genetic diversity will exist to maintain future viability. ESUs with a limited geographic range are similarly at increased extinction risk due to catastrophic events. ESUs with populations that are geographically distant from each other, or are separated by severely degraded habitat, may lack the connectivity to function as an ESU and are more likely to become extinct. ESUs with limited life-history diversity are more likely to go extinct as the result of environmental catastrophes or change that occurs too rapidly for an evolutionary response. ESUs comprised of a small proportion of component populations meeting or exceeding viability criteria may lack the source populations necessary to sustain the non-viable populations during environmental downturns. ESUs consisting of a single population are especially vulnerable in this regard.

Assessing an ESU's biological requirements involves evaluating the extent to which the current status of an ESU falls short of what would constitute a viable ESU. The fact that the current status of an ESU does not reflect historical abundance, productivity, spatial structure, or diversity does not mean that it is currently non-viable, but it may serve as an informative benchmark against which to weigh viability and the risk of extinction. Whether an ESU is at risk of extinction or endangerment depends on which viability criteria it fails to meet, what the past trend has been, and how far it is below the benchmark.

The biological requirements within the action area are those conditions that support the continued existence of the ESU by addressing the population-level biological requirements. Within the action area, the biological requirements of Permit Species stem from the essential features of juvenile rearing areas and juvenile and adult migration corridors. Therefore, the biological requirements for Permit Species include adequate substrate, adequate water quality (including quantity, temperature and velocity), adequate cover and shelter, adequate riparian vegetation, adequate space, and adequate conditions for safe passage. In addition, an adequate food supply is required in juvenile rearing areas.

Defining a level of adequacy through specific, measurable standards for many of these biological requirements is problematic. In many cases, the absolute relationship between the critical element and species survival is not clearly understood, thus limiting NOAA Fisheries' ability to develop specific, measurable standards. This is the case for the effects of implementing the HCP's Tributary Enhancement Plan in tributary river systems. Thus these components of the proposed action must be evaluated qualitatively.

However, as noted in Section 1.1.2, this is not the case with respect to the effects of the Project itself (including the existence and operation of the Project, which is the primary subject of the HCP). For these facets of the proposed action, various mainstem migration corridor habitat elements relevant to achieving the biological requirements of the Permit Species within the Project area can be captured in a summary reach survival statistic (Section 6.1.1). Therefore, action-area biological requirements in the mainstem portion of the action area can be defined by using specific juvenile and adult survival standards. The HCP proposes that a CAJPS of 91% (which translates to approximately 98% adult project survival and 93% JPS [covering 95% of the juvenile migrations]) would meet the biological requirements of the Permit Species in the mainstem migration corridor. The adequacy of this proposed numeric standard is evaluated in Section 6.

As a reference for determining the adequacy of conditions within the action area, NOAA Fisheries estimated survival levels within the action area that would result if there were no impoundments in existence, i.e., a free-flowing condition. This condition does not necessarily describe the biological requirements for ESA Section 7(a)(2); however, they are relevant to conditions under which the listed species evolved.

5.2 Environmental Baseline Effects

"The past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all the proposed Federal projects in the action area that have already undergone formal or early Section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process" are all included within the environmental baseline (50 CFR §402.02). The environmental baseline encompasses the effects of both human and natural factors leading to the current status of the species, but does not incorporate impacts specific to the proposed actions. Therefore, future impacts resulting from the future operation of the Project (or other hydroelectric projects in the action area) and other activities authorized pursuant to the proposed action are not part of the environmental baseline. Rather, the environmental baseline describes the current status of the species, and the factors currently affecting the species, within the action area. The resulting "snapshot" of the species' health within the action area provides the relevant context for evaluating the anticipated effects of the proposed actions on the ESU's likelihood of survival and recovery relative to its biological requirements.

The past operation and the continuing effect of the existence of the Project is a critical factor influencing survival in the action area; up to 100% of the Permit Species juveniles and adults may be affected by the continuing effects of the human activities that contributed to the existing conditions in the migration corridor. Mortality and sublethal effects (e.g., changes in migration timing or speed) associated with river impoundments, dam passage, and other aspects of the Project within the action area in recent years are summarized in the FEIS (section 2.2.3) and the draft QAR (Cooney 2002), as well as in Appendix A of this Opinion. Douglas PUD has been operating its JBS in a manner consistent with HCP operations since formal ESA consultation was completed in 2000 (NMFS 2000b). NOAA Fisheries determined in the 2000 biological opinion that the operation of the Project would likely achieve the HCP standards for the ESA-listed species. Although Douglas PUD continues to operate the Project consistent with the 2000 biological opinion, that biological opinion expired on April 1, 2002.

Similarly, the past operation and continuing effect of the existence of four other FERC-licensed dams (Rocky Reach, Rock Island, Wanapum, and Priest Rapids) have substantially affected, both directly and indirectly, the environmental baseline in the action area. The past effects of the Rocky Reach and Rock Island hydroelectric projects are summarized in the FEIS (section 2.2.3), the draft QAR (Cooney 2002), and Appendix A of this Opinion. The past effects of the Priest Rapids Hydroelectric Project (Wanapum and Priest Rapids dams and reservoirs) are summarized in the draft QAR (Cooney 2002). In addition, the effects of past operations and the existence of upstream Federal (Grand Coulee and Chief Joseph dams and reservoirs) and Canadian storage and hydroelectric projects have also affected the environmental baseline within the action area by affecting seasonal and daily flows, the thermal regime, and TDG levels in the Mid-Columbia River.

It is clear that the existence and past operation of the other Federally-owned and PUD-owned projects have substantially affected the migration corridor for the Permit Species in the action area and that many of these effects will continue into the future. It is equally clear that the future effect attributable to the discretionary operation of these projects cannot be considered in the environmental baseline of this Opinion because they have not yet undergone ESA Section 7(a)(2) consultation, or their consultation has expired or been remanded.[11] It is not possible to

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[11]The 2000 biological opinion for the operation of the FCRPS was remanded but not set aside while NOAA Fisheries considers remedies to address concerns identified by the Court in NWF v. NMFS, CV 01-640-RE (D. Or. Order dated 6/2/03). For the purposes of this consultation, the effects of the RPA recommended by that biological opinion are not considered part of the environmental baseline to the extent they occur beyond June 2, 2004. After that date, by which the remand must be accomplished, NOAA Fisheries anticipates that there will be a new consultation for the FCRPS. This means that the existence effects of the FCRPS, which are part of the environmental baseline, will include the operation effects of the current operation under the 2000 biological opinion RPA until June 2, 2004. While this is the legal effect of the restrictions in the regulatory definition of "effects of the action" 50 CFR 402.02 (no consideration of future Federal actions that have not yet completed Section 7 consultation), as a practical matter this analysis can only qualitatively assume that the level of take caused by the

FCRPS will be significantly reduced in the action area as a result of this consideration. Quantitative estimates of this quantitatively analyze the effects of a project's existence without considering the operation of that project. However, in Sections 6.2.2 and 6.2.3, NOAA Fisheries compares estimates of juvenile and adult survival through the mainstem portion of the action area with estimates from unimpounded reaches of the Snake and Columbia rivers, or with those from other free-flowing river systems. This comparison provides a valuable reference for assessing the effect of the proposed action compared to the environmental baseline as well as to what may have occurred historically.

Baseline conditions for tributary spawning and rearing habitat are thoroughly described in the FEIS, supporting document D of the HCP, and the Upper Columbia Regional Technical Team's recent report (2003). Primarily, these impacts result from a wide array of past and present land management activities and natural phenomena (wildfires and flood events) in the Okanogan, Methow, Entiat, and Wenatchee basins including, but not limited to, the following:

1. Habitat is eliminated, cut off, or blocked.
2. Habitat is degraded.
3. Reduced or altered flows (water withdrawals or water storage facilities).
4. Reduced channel migration, complexity, and flood-plain function.
5. Altered channel morphology (increased width-to-depth ratios).
6. Reduced gravel recruitment (armoring and/or loss of spawning substrate).
7. Increased fine sediments (increased erosion).
8. Reduced riparian vegetation (amount and quality).
9. Reduced woody debris recruitment into streams.
10. Water quality is degraded.
11. Elevated levels of fecal coliform bacteria.
12. Elevated nutrient loads and reduced dissolved oxygen levels caused by elevated nutrient loading.
13. Elevated late summer and fall temperatures.
14. Chemical runoff from roads and agricultural and urban areas.
15. Water diversions and/or substandard fish screens at diversions kill or injure juvenile fish.

5.3 Ongoing and Future Environmental Baseline Actions in Action Area

Section 7(a)(2) regulations provide that "the anticipated impacts of all the proposed Federal projects in the action area that have already undergone formal or early Section 7 consultation and the impacts of State or private actions which are contemporaneous with the consultation in process" are included within the environmental baseline.

NOAA Fisheries concludes that few Federal actions, and State or private actions with Federal

reduced take are not possible.

involvement, in this action area have completed Section 7 consultation. To the extent that there are actions with operative biological opinions, NOAA Fisheries knows of none that cover these future activities for more than the first 5 or 10 years of the 50-year term of the HCP under consideration in this ESA consultation.

Similarly, NOAA Fisheries is not aware of particular State or private activities in this action area that are reasonably certain to continue contemporaneous with the 50-year term of this ITP that are reasonably certain to occur, other than the current levels of rural and urban land use that affect the listed species.

Therefore, when evaluating the status of the listed species, including their likelihood of survival and recovery, NOAA Fisheries concludes that new Federal actions, such as future timber sales and agricultural water withdrawals, that would be likely to adversely affect listed species, as well as future beneficial Federal actions, such as habitat restoration projects and conservation easements, are not eligible for consideration in determining whether the authorization of incidental take under this HCP is likely to jeopardize their continued existence. Thus the future abundance and productivity of the listed UCR steelhead and UCR spring-run chinook salmon, against which the effects of this action are considered, are likely to be, in part, improved, and in part, degraded, compared to those reflected by the historical trends resulting under the environmental baseline. It is NOAA Fisheries' judgment, based largely on the description of factors for the decline of these species (see Section 4), that the net effect of the environmental baseline would be an improvement of future abundance and productivity of these species. This improvement cannot be quantified, but NOAA Fisheries does not consider this improvement sufficient to meet all biological requirements within the action area.

5.4 Status of the Species within the Action Area

For UCR steelhead and UCR spring-run chinook salmon, the environmental baseline, as described above, while improving, does not currently meet biological requirements for these species within the action area. Maintenance or further degradation of the existing conditions within the action area would contribute to the long-term declining trend of the ESA-listed Permit Species and thus would continue to increase the high risk of extinction on which the listings were based. Measures must be taken at the Project to avoid or minimize ongoing impacts that have contributed to the trend towards extinction and to aid in establishing improved conditions whereby each species will continue to exist into the future while retaining the potential for recovery. The successful implementation of these measures at the Project will be necessary for the proposed action to avoid jeopardizing listed Permit Species.

For the unlisted Permit Species, as described in Section 4, the environmental baseline appears to meet the species-level biological requirements for these species within the action area at this time. However, further degradation of the existing conditions for currently unlisted Permit Species could result in those ESUs becoming listed under the ESA in the future. Maintenance or improvement of the existing conditions would likely result in continued stable or increasing populations and would thus reduce the likelihood of these ESUs being listed as threatened or endangered in the future.

6. EFFECTS OF PROPOSED ACTION

In this section, NOAA Fisheries evaluates the effects of the proposed action using the five-part approach for applying the ESA jeopardy standard to Pacific salmon described in Section 1.1. During this step of the analysis, effects of the action are evaluated with respect to action-area biological requirements. Specifically, NOAA Fisheries evaluates whether or not species-level biological requirements (described below) are being sufficiently met within the Project boundary (tailrace, dam, forebay, and reservoir) by qualitatively comparing expected adult and juvenile survival rates through the Project resulting from implementation of the HCP to those that have occurred in the past (baseline), as well as to those that would likely have occurred in a free-flowing river of equal length (i.e., survival that would likely have occurred if the Project did not exist). NOAA Fisheries also qualitatively evaluates any remaining Project-related effects and the effects of interrelated and interdependent actions within the entire action area (including those in the tributaries and downstream of the Project) by comparing the expected effect of the proposed action on the specific species-level biological requirements of these species.

6.1 Methods for Evaluating Action-Area Biological Requirements

As noted in Sections 1.1.2 and 5.2, the primary approach to evaluating the proposed action (issuance of an ITP for a term of 50 years for the operation of the Project according to the HCP) in the action area is to estimate juvenile and adult survival rates through the Project area (reservoir, forebay, dam, and tailrace). These estimates include both direct and indirect (or delayed) mortality related to Project impacts, and include natural mortality. These survival rates should capture the great majority, although not necessarily all, of the impacts of the Project's existence and operation on Permit Species' action-area biological requirements in the mainstem Columbia River. The biological requirements include:

1. Adequate Substrate and Adequate Food Supply for Juveniles: The impoundment of the Project reservoir by the Wells Dam has probably changed the characteristics of substrate above the dam from gravel and cobble to finer sediment size. Gravel/cobble substrate is desired for salmon spawning and incubation. However, with the exception of UCR summer/fall-run chinook salmon, this change in substrate is unlikely to affect adults or early life stages of the other Permit Species, because they are tributary spawners. It is possible that the change in substrate has influenced food production, possibly reducing feeding success and growth of smolts migrating through the impounded reach. However, evidence for this effect is speculative at present (ISG 1996). If such an effect occurs, it is likely to be captured in either the direct survival or indirect mortality rates estimated later in this section. The presence of the dam may also decrease gravel recruitment to downstream reaches. This last effect would be most likely to influence the spawning success of UCR summer/fall-run chinook salmon, but would have little or no effect on other Permit Species.

2. Adequate Water Quality: The primary characteristics of water quality most likely to be affected by operations of the Project are TDG levels, including nitrogen levels harmful to salmonids. This effect would presumably be observable in estimates of adult and juvenile survival rates.

3. Adequate Cover and Shelter: Impoundment of the Project reservoir has modified the physiographic complexity of this reach compared to conditions in a free-flowing river, resulting in a modification of cover and shelter and a potential change in predation on juveniles of listed species. This effect would presumably be observable in estimates of juvenile survival, which are the focus of NOAA Fisheries' approach to evaluating effects (Section 6.2). Additionally, Douglas PUD has proposed a program to remove predators from areas where juveniles are most vulnerable to predation.

4. Adequate Riparian Vegetation: Impoundments may have altered the riparian vegetation within the study reach from pre-impoundment conditions. Regulation of the Project reservoir elevation may influence the distribution and composition of riparian vegetation in the study area. Riparian vegetation is likely to influence cover, food production, temperature, and substrate, so the primary effects are addressed with respect to other factors. Additionally, effects of changes in riparian vegetation resulting from the proposed action are likely to be expressed in the survival rates of juveniles and adults (Section 6.2).

5. Adequate Space and Conditions for Safe Passage: The configuration of the dam and the proposed operation of the Project primarily affect the safe passage of juveniles and adults through the action area (Section 6.2). Safe passage is clearly captured in adult and juvenile survival rates.

The general effects of the proposed tributary protection and enhancement activities and hatchery operations to mitigate for inundation and unavoidable project-related mortalities are evaluated with respect to necessary habitat characteristics rather than survival rates, as explained in Sections 6.2.6, 6.2.7, and 6.2.8. Thus NOAA Fisheries qualitatively evaluates the likely impacts of these facets of the proposed action on the action-area habitat-based biological requirements of the Permit Species.

6.2 Effects on Permit Species

This Opinion analyzes the effects of the proposed action (issuance of the ITP for the HCP) to minimize or mitigate for the effects of the Project on ESA-listed UCR steelhead and UCR spring-run chinook salmon, as well as currently unlisted UCR summer/fall-run chinook salmon and Okanogan River sockeye salmon.

Sections 2.2.3, 3.2.5, and 4.2.3 of the FEIS describe the general effects of hydroelectric projects, as well as the specific effects of the Wells, Rocky Reach, and Rock Island hydroelectric projects and HCP agreements on anadromous salmon and steelhead. Included in these descriptions are summaries of the available project, dam, and route-specific survival estimates for each Permit Species (both juvenile and adult). Appendix A of this Opinion provides NOAA Fisheries' best current estimates of JPS that contributed to the environmental baseline, those that would be expected should the HCP standards merely be met, and actual estimates of survival with HCP operations (where available). Appendix A also compares these survival estimates to the likely survival through a hypothetical free-flowing river reach of equal length to the projects.

6.2.1 General Effects and Considerations

Permit Species from the Methow and Okanogan rivers must pass through the Wells Project as well as four other PUD-owned hydroelectric projects (reservoirs and dams) and four Federally-owned projects in the lower Columbia River during their migrations to and from the Pacific Ocean. Permit Species from the Entiat and Wenatchee rivers do not have to pass through the Wells Project, but some adults may overshoot the Entiat or Wenatchee rivers, pass upstream of the Project, and "fall back" through the Project in order to migrate up the Entiat or Wenatchee rivers.

As discussed in Section 6.1, the primary method for evaluating the effects of the proposed action on the biological requirements of Permit Species as they migrate through the Project is to compare survival estimates obtained from paired releases (the control group downstream and the test group upstream of the Project) of juvenile fish. At the Project, the survival of Permit Species is likely to be most affected by:

1. Project impacts on adult salmonid passage (including the reservoir).
2. Project impacts on juvenile salmonid passage (including the reservoir).
3. Project impacts on water quality (including the reservoir)
4. Predator control programs.

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The effects of tributary enhancement activities resulting from the Tributary Enhancement Fund will also be evaluated qualitatively.

The following information analyzes the specific effects that the proposed action and any interrelated and interdependent actions will likely have on UCR steelhead and UCR spring-run chinook salmon, as well as on the unlisted Permit Species. NOAA Fisheries reviewed the analyses contained in the FEIS and the 2000 Wells biological opinion, and considered additional data where appropriate.

6.2.2 Effects of the Project and Operations on Adult Passage and Survival

General Effects and Considerations

Sections 2.2.3, 3.2.5, and 4.2.3 of the FEIS describe the general and specific effects of the Project on upstream migrating adults. These effects are most likely to include adult delay at Project fishways, reduced passage success through the fishways, and injuries and mortalities resulting from upstream (via fishways) as well as downstream (via turbines, spillways, or juvenile bypass systems) passage through the Project. Each of these effects may contribute to reduced reproductive success (increased pre-spawning mortality or reduced ability to spawn) of adult Permit Species. Because Permit Species must pass through seven to nine projects in order to reach their natal spawning areas, any cumulative passage delays and resultant indirect or delayed effects may further decrease spawning success. Unfortunately, the relationship between each of these effects and overall reproductive success is not clearly understood.

Adult passage information (e.g., time spent immediately downstream of the dam, success at passing into the collection channel and fishway entrances, time taken to traverse the ladder, etc.) is typically evaluated using radiotelemetry techniques. Therefore, project passage information is an assessment of how well radio-tagged fish pass from the tailrace of a specific dam into and through the fish ladders. The underlying assumption is that the behavior of radio-tagged fish is generally similar to untagged fish. Laboratory assessments of tagged and untagged fish and several years of field evaluations support this assumption, although little information is available regarding tagging effects on reproductive success. There has not been a direct relationship established between project passage times and reproductive success, although reducing passage times to the greatest extent possible should reduce energy expenditures and improve the likelihood that adult fish will survive to spawn. Although specific criteria are not available, obvious delays in passage may indicate a need for operational or structural modifications.

Project passage times are only developed for radio-tagged fish that successfully migrate through the fishways at the dam. Although fish that do not pass the dam are of equal or greater concern, it is extremely difficult to determine a causative factor for this behavior. Failure of a radio-tagged fish to ascend a dam may result from poorly designed passage facilities, inadequate attraction water, or complicated flow patterns exacerbated by project operations. Fish that fail to ascend the dam may also be destined for a downstream spawning location or may have been injured prior to reaching the dam (as a result of natural or other effects) or may have been injured or harvested during commercial, ceremonial and subsistence, or recreational fisheries. Tagging effects or loss of tags can also be manifested in the data set and affect these conclusions, none of which are related to operation of the facilities. As a result, the detection rate of radio-tagged fish cannot be used to isolate specific cause and effect relationships between passage and reproductive success. The information can be used, however, to generally assess the success of adult salmonids migrating upstream through the Columbia River corridor and to develop an index that can be used to assess annual improvements in passage conditions.

Obtaining robust estimates of adult salmon and steelhead survival is difficult, especially when attempting to use passage counts at mainstem hydroelectric dams (Dauble and Mueller 2000). The results of radiotelemetry studies are also often used to estimate adult survival through individual or multiple hydroelectric projects or river reaches. However, unknown tag losses (as a result of legal or illegal fisheries, tag loss or failure, or adults spawning in unknown locations or tributaries) or mortalities (as a result of fallback or natural mortality) make it difficult to use the results of adult radiotelemetry studies to provide accurate estimates of project-specific mortality. At present, it is also not possible to differentiate between project-caused mortality and natural mortality (which undoubtedly occurs) with radiotelemetry techniques. Per-project mortality estimates based on available information include both sources. Therefore, mortality rates (based on radiotelemetry) attributable to the effects of hydroelectric projects are undoubtedly lower than those presented, but to an unknown extent. For these reasons, it is most appropriate to consider survival estimates based on radiotelemetry studies as minimum estimates of total adult survival, which includes unknown tag loss as well as project-caused and natural mortality.

Specific Effects

Migration delay and fallback

Excessive delay reported at fishway entrances and fallback over dams are the most pronounced problems that adults experience in their upstream migrations that can be assessed using radiotelemetry techniques. Therefore, past evaluations have focused largely on defining these issues.

The effects of the Project on adults are described in sections 2.2.3, 3.2.5, and 4.2.3 of the FEIS. Table 2-4 of the FEIS summarizes the results of radiotelemetry studies estimating passage times and minimum total survival rates of adults migrating through the Project (see discussion of appropriate use of this information in General Effects, above). Time required for fish to ascend the Project, defined as project passage times, for adult steelhead and spring-run chinook salmon ranged from 12 to 29 hours with the longer passage times recorded during the operation of the brood collection traps. Project passage time for other Permit Species ranged from 5 to 47 hours, depending upon whether or not the brood collection traps were in operation. The majority of the passage delay identified at this Project appears to be associated with adult brood stock collection activities, with lesser delays observed within the fish ladder collection gallery (Stuehrenberg et al. 1995). Table 2-5 of the FEIS compares the migration rates of adult chinook salmon, steelhead, and sockeye salmon through both impounded (dams and reservoirs) and unimpounded reaches of the Snake, Mid-Columbia, and Lower Columbia rivers. In each case, migration rates (miles/day) through the Mid-Columbia River generally exceeded migration rates through unimpounded reaches of the Snake or Columbia rivers and were very similar to those observed in other impounded reaches (13 to 36 miles/day versus 6 to 19 miles/day in unimpounded reaches or 15 to 40 miles/day in other impounded reaches, respectively). This information comports well with 2001 and 2002 steelhead passage rate estimates made by English et al.

(2003). This body of information strongly suggests that small delays at these projects are more than compensated for by faster travel through the reservoir impoundments. In addition, any delays that do occur are more likely to affect species that spawn soon after completing their migration (summer/fall-run chinook salmon or sockeye salmon are more likely to be affected than those that hold in the rivers or streams for considerable periods of time prior to spawning [i.e., steelhead or spring-run chinook salmon]). The effect of delays passing the fishway (hours to a few days) on Permit Species is likely non-existent for currently ESA-listed Permit Species and non-existent to very small for currently unlisted Permit Species. Thus the proposed action should have no effect, or a slight beneficial effect, on upstream migrating adults compared to the migration observed under unimpounded conditions.

Adults' fallbacks at a hydroelectric project can result in substantial mortality. Mortality rates ranging from 14% to 57% have been observed through turbine units and up to 8% through spillways (NMFS 2002a; Ross 1992). Adult survival through state-of-the-art juvenile bypass systems should be similar to or lower than estimates for juvenile mortality (1% to 3%). Table 2-4 of the FEIS indicates that fallback rates at the Project for spring-run or summer-run chinook salmon are 3.6% to 5%. Fallback rates at the Project are 6% to 7% for steelhead and 4% for sockeye salmon. English et al. (2003) found that 12.7% of the hatchery steelhead and 4.3% of the wild steelhead passing Wells Dam fell back (4.4% and 0.0%, respectively, of those fish passing the dam reascended the fishway after falling back).

Due to increased levels and durations of spill (compared to initial operations under the HCP historical operations), non-volitional fallback (presently estimated to be relatively low) could increase slightly. However, the potential negative effect of this action is likely to be more than compensated for by the relatively high survival rates that are expected for adults passing through the dam via the JBS and the spillway. Volitional fallbacks would most likely utilize the JBS and the spillway to move downstream through the Project. Mortalities due to historical fallback at the Project should be included in adult survival estimates (see below). Thus, by slightly decreasing adult mortality as a result of fallback (either volitional or non-volitional) at the Project, the proposed action should somewhat increase adult survival rates compared to those observed in the past.

<u>Adult survival</u>
Because radiotelemetry techniques are unable to differentiate tag loss, tag failure, and fish loss, no accurate estimates of adult survival through the Mid-Columbia River projects are currently available. However, these studies can be used to estimate the minimum survival rates at individual projects or through specific reaches (see discussion in General Effects, above).

Using radiotelemetry techniques, Stuehrenberg et al. (1995) estimated that the maximum mortality of spring-run chinook salmon in the Mid-Columbia River (excluding all fish entering spawning areas) was between 11.1% and 22.2% (depending on the extent to which fish with unknown fates below Priest Rapids Dam were from Ringold Hatchery). The authors estimated that the maximum mortality of summer-run chinook through the study area was 13.5%. Because fall-run chinook salmon primarily spawn in the mainstem, the authors did not attempt to estimate the maximum mortality of these adults through the study area.

A retrospective analysis of radiotelemetry studies conducted prior to 1996 in the Columbia River upstream of Priest Rapids Dam (e.g., Stuehrenberg et al. 1995) determined that these studies were largely unreliable because of problems associated with the tags, receivers, and software used at the time. For example, Wainwrite et al. (2001) found that Lotek receivers had data gaps ranging from tens to hundreds of hours over the course of the season and a substantial number of false positives (tags being recorded that were already removed from the river, etc.) were being recorded and included in the data set. Thus, while the results of this study are probably less reliable for estimating minimum survival than is typically the case, the behavior of adults in this reach was similar to that of fish migrating through the FCRPS dams on the lower Columbia and Snake rivers.

English et al. (2001 and 2003) conducted radiotelemetry studies of adult steelhead migrating upstream through the Mid-Columbia River in 1999 and again in 2001. In 1999, of the 191 radio-tagged steelhead detected in the vicinity of Wells Dam which were not removed prior to spawning (harvested), 178 or 93.2% were either tracked to known spawning areas or successfully passed and remained above Wells Dam. In 2001, of the 263 radio-tagged steelhead detected in the vicinity of Wells Dam which were not removed prior to spawning (harvested), 252 or 95.8% were either tracked to known spawning areas or successfully passed and remained above Wells Dam.[12]

NOAA Fisheries has summarized the available radiotelemetry studies in order to estimate per-project adult survival for each of the ESA-listed species through the mainstem Snake River and Columbia River Federal hydroelectric projects, dams, and reservoirs that are similar to the Mid-Columbia hydroelectric projects. NOAA Fisheries believes that the estimates made for species at these projects are generally applicable to the FERC-licensed projects on the Mid-Columbia River for both listed and unlisted Permit Species. Estimates of average per-project mortality rates based on this analysis are 3.2% for steelhead, 2.4% for spring-run chinook salmon, 2.4% to 4.2% for summer/fall-run chinook salmon, and 1.9% for sockeye salmon (NMFS 2000a, based on data in NMFS 2000c).

Additional radiotelemetry information from several undammed river systems in British Columbia, Canada, is relevant. Radiotelemetry studies conducted on the Nass River in 1992 and 1993 (Koski et al. 1993; Koski et al. 1996b) documented spring-run chinook salmon survival between 81% and 90%. In 1993, under different flow conditions, survival was 70% (Koski et al. 1994; Koski et al. 1996a). Based on this information, the authors concluded that the total

[12]Note: This is not an actual survival estimate, but is instead an estimate of minimum survival, since the ultimate fate (i.e., the survival or mortality) of several adult steelhead that were radio-tagged is not known.

mortality estimates for spring-run chinook salmon made by Stuehrenberg et al. (1995) through the Mid-Columbia River in 1993 fell within the range of expected natural mortality. Similar pre-dam information is unavailable for the Mid-Columbia River, although one estimate of spring/summer-run chinook salmon survival developed for the period 1962 through 1968 on the lower Snake River averaged 55% with only one dam in place (estimated by relating ladder counts at Ice Harbor Dam with redd counts in Snake River tributaries) (Bjornn et al. 1998).

Adult PIT-tag detectors were installed at Wells Dam in 2001, making possible, for the first time, estimates of adult conversion rates in the Columbia River between McNary Dam (RM 292) and Wells Dam (RM 515), a distance of 223 miles. This reach encompasses five dams and reservoirs, as well as over 50 miles of free-flowing river (the Hanford Reach). In this instance, conversion rates can be estimated for adult returns of fish released as juveniles upstream of Wells Dam and should be viewed as the minimum survival rates between McNary Dam and Wells Dam.[13] Because these fish are of known origin and presumably are attempting to return to their natal streams above Wells Dam to spawn, their conversion rates from McNary Dam to Wells Dam constitute the best available estimates of minimum adult survival through the reach available. By taking the 5th root of the reach conversion rate, an estimate of average per-project survival can be obtained. These estimates are provided in Table 3 and summarized below.

Three groups of juveniles were PIT-tagged and released upstream of Wells Dam in 2000: steelhead were released in the mainstem Columbia River to assess JPS for Wells Dam; spring-run chinook salmon were released in the Methow River, and summer-run chinook salmon were released in the Okanogan River. An additional group of juvenile spring-run chinook salmon was released in the Methow River in 2001.

The estimated conversion rate for returning adult steelhead in 2002 was 85.7% (of the 175 returning adults observed at McNary Dam, 150 were redetected at Wells Dam), translating to an average per-project minimum survival estimate of 97.0%. The estimated conversion rate for returning adult spring-run chinook salmon from the Methow River in 2002 was 80.6% (25 fish at Wells Dam, 31 fish at McNary Dam), translating to an average per-project minimum survival estimate of 95.8%. The estimated conversion rate and per-project survival estimate for returning adult spring-run chinook salmon was 100.0% (22 fish at Wells Dam, 22 fish at McNary Dam) for 2003 returns. Lastly, the estimated conversion rate for adult summer-run chinook salmon returning in 2002 was 87.5% (7 adults at Wells Dam, 8 adults at McNary Dam), translating to an

[13]This methodology assumes that all returning adults will attempt to return to locations at or upstream of the release location (in this instance, above Wells Dam). Fish straying into downstream basins to spawn will also bias the estimated conversion rate low. It also encompasses all forms of tag loss (which may occur for fish close to spawning) or mortality within the reach of interest into the conversion estimate. In addition, there is some potential for adults to be inadvertently diverted around the detectors at Wells Dam as a result of research or broodstock collection activities, which is more likely to occur for chinook salmon than for steelhead. Thus conversion rates should be viewed as conservative estimates of minimum survival between the two points of interest (in this case, McNary and Wells dams).

average per project minimum survival estimate of 97.4%.[14]

Table 3. Detections of known origin adult PIT-tagged steelhead and chinook salmon at McNary Dam in 2002, number of adults redetected at Wells Dam, estimated conversion rate (McNary Dam to Wells Dam), and average per-project (5 dams and reservoirs) conversion rates.

PIT-tag Detection Site	Pateros Steelhead 2002	Winthrop Spring Chinook 2002	Winthrop Spring Chinook 2003	Okanogan Summer Chinook 2002
McNary Dam	175	31	22	8
Wells Dam	150	25	22	7
McNary to Wells Total Conversion Rate	85.7 %	80.6 %	100.0 %	87.5 %
McNary to Wells Average Per Project Conversion Rate*	97.0 %	95.8 %	100.0 %	97.4 %

*Calculated as McNary Dam to Wells Dam Total Conversion Rate to the 5th root (5 dams and 5 pools). Any mortality occurring within the 41 mile free-flowing Hanford Reach of the Columbia River is also incorporated into this estimate and evenly distributed among the 5 dams and reservoirs. Adults detected at Wells Dam that were not also detected at McNary Dam were excluded from the analysis.
Source: Columbia River DART website - July 21, 2003: http://www.cqs.washington.edu/dart/pit_obs_adult_conrate.html.

NOAA Fisheries expects, based on the available information, that these Permit Species require a total (natural and project-related) average annual mortality rate of adults migrating upstream through the Project that does not exceed approximately 2% to 4% of the upstream migrating Permit Species. Furthermore, based on the observed ranges of mortality estimates for unimpounded river systems, which often exceed that observed in impounded reaches of the Columbia River, NOAA Fisheries concludes that there is a high likelihood that mortality as a result of direct, indirect, or delayed effects of passing the Project does not exceed 2% for any Permit Species.

Steelhead kelts

The importance of steelhead kelts (adults that have spawned and are migrating downstream to

[14]These average minimum per-project survival estimates do not include any effects of the reservoir created by the Wells Dam, but they do include reservoir effects of the much larger McNary Dam reservoir as well as one-fifth of any mortality which may occurs in the free-flowing Hanford Reach of the Columbia River (because any mortality in this reach is attributed equally to the five projects.

the ocean) to inland populations of steelhead in the Columbia River basin is receiving greater attention in recent years. The proportion of adults that spawn and apparently attempt to migrate to the ocean as kelts is much higher than previously thought. English et al. (2001 and 2003) estimated that 13% to 75% (in 1999) and 56% to 73% (in 2001) of the adult steelhead migrating upstream of Project were observed moving downstream the following spring. In the Snake River, Evans (2002) estimated that the proportion of wild adult steelhead attempting to outmigrate as kelts in 2001 was at least 25% of the ESA-listed adults migrating past Lower Granite Dam in 2000. The majority of these fish (> 70%) were considered to be in good condition. Most importantly, the ratio of female-to-male kelts appears to be very high; for example, at McNary Dam in 2001 the female-to-male ratio was 11:1 (Worthheimer 2002).

Assuming all steelhead kelts attempt to migrate to the ocean, few are apparently able to survive the migration to the ocean and back to their natal streams. Only 3% (7 of 212) of the kelts radio-tagged at Lower Granite Dam on the Snake River were detected at Bonneville Dam in 2001 (Evans 2002). The reasons for this likely include greatly reduced energy reserves, disease, and hydroelectric project-related mortalities. This translates to an estimated mean per-project mortality of nearly 40%, which is comparable to estimates of adult survival through turbines (see discussion above). In 2001, spill for fish passage at most Columbia River hydroelectric projects was either greatly curtailed or eliminated as a result of a regional power emergency. Thus adults migrating downstream in 2001 were forced to pass mainstem hydroelectric projects via turbines (where mortality rates of up to 41% have been observed) rather than via spillways (where mortality rates of up to 8% have been observed (Ross 1992; Bjornn et al. 1998). Similarly, of the 170 spawners tracked as kelts by English et al. (2003), only 30 (18%) were detected below Coyote Rapids, downstream of Priest Rapids Dam, as they migrated downstream out of the study area. Total mortality rates of kelts from all causes (natural mortality, Project-related mortality, or mortality from other sources) at the Mid-Columbia River projects is likely comparable to that observed at the Snake and lower Columbia river projects; however, kelt mortality due to migration through the Project cannot be estimated at this time.

While the historical importance of adult steelhead spawning multiple times on the UCR steelhead ESU is not well understood, should these fish successfully survive the mainstem Columbia River migration corridor and the ocean environment, they could significantly enhance the reproductive capabilities of the naturally spawning populations of UCR steelhead.[15] In summary, NOAA Fisheries concludes that 1) the biological requirements of steelhead kelts are not well known, 2) the Project will continue to contribute to some extent to the continuing failure to meet their likely biological requirements, and 3) the impact should be substantially less than in the past because of the JBS and HCP spill operations.

[15]However, it should be noted that, based on scale analysis, the proportion of summer-run steelhead in the Columbia River that spawn two or more times is not very high. Long and Griffin (1937) estimated that only 2% of the summer-run fish were repeat spawners, which comports well with the findings of McGregor (1986) in the Thompson River basin.

6.2.3 Effects of the Project and Operations on Juvenile Passage and Survival

General Effects and Considerations

Sections 2.2.3, 3.2.6, and 4.2.3 of the FEIS describe the general and specific effects of the Project on downstream migrating juveniles. These effects most likely include 1) mortality at the dam resulting from predacious birds and fish, direct and indirect effects of passing through turbines,
bypass systems, or spillways; 2) mortality in the reservoir, forebay, or tailrace due to predacious birds and fish; and 3) delayed migration.

Juvenile salmon and steelhead pass dams through various routes including turbines, fish bypass systems, and spillways. The best available route-specific survival estimates at Wells Dam that could be used to calculate JDPS estimates is summarized in table 2-4 of the FEIS. Based upon information collected at other hydroelectric projects, juvenile fish survival is estimated to range from 90% to 93% for turbines, 98% to 99% for bypass systems, and 98% to 99% for spillways. Thus some juvenile mortality is associated with all dam passage routes, although the highest levels of mortality typically occur during passage through turbines. Consequently, an important objective of project operations aimed at improving juvenile survival is to route the highest possible proportion of juveniles past the project in a manner that avoids passage through turbines. Thus the proportion of smolts that pass a project through bypasses or over spillways is an important indicator of the effectiveness of fish passage protection measures.

Unfortunately, currently available technology does not allow the JDPS standard to be measured definitively for any Permit Species, although it can be readily calculated using route-specific passage information and survival information for each species. To address this deficiency, the Signatory Parties to the HCP agreed to adopt a JPS standard of 93% (roughly 95% dam passage survival with an assumed 2% reservoir mortality) covering 95% of the migration for each species, which can be readily measured with PIT-tag studies and potentially acoustic tag studies. Utilizing a paired release methodology to measure JPS (reservoir, forebay, dam, and tailrace) should ensure that all direct, indirect, and delayed Project-related effects (at least to McNary Dam) are included in the survival estimate.

The tagging method employed may also affect the results of survival studies. To assist NOAA Fisheries and the other Signatory Parties to the HCP, NOAA Fisheries' Northwest Fisheries Science Center produced a briefing paper that:

1. Summarized the relevant characteristics of each of the migrating salmonid populations using the Mid-Columbia reach.
2. Briefly described available tagging technologies (PIT-tags, radio-tags, balloon tags, and acoustic tags).
3. Developed recommendations for applying particular monitoring approaches given alternative objectives.

4. Developed and described protocols for evaluating future mark/recapture tools and strategies.

This paper will be used by the Coordinating Committee as guidance to ensure that tag-types and methodologies will be best suited to the objectives of the pertinent survival studies (see HCP, appendix D). At this time, NOAA Fisheries believes that, compared to either radio-tag or acoustic-tag studies, PIT-tag studies provide the most accurate and robust estimate of JPS (including direct, indirect, and delayed effects) through the Mid-Columbia hydroelectric projects (reservoirs and dams).

Specific Effects
As noted above in Section 6.2, NOAA Fisheries considers PIT-tag based estimates of JPS to be the best information available. Paired release PIT-tag studies at the Project rely primarily on subsequent detections at McNary Dam and other lower Columbia River FCRPS projects. In addition, PIT-tag studies are more likely to capture any direct, indirect, or delayed effect of the Project in the survival estimate than radiotelemetry, acoustic tag, or balloon tag studies.

Table 3-5 of the FEIS summarizes JPS estimates available for the Project from studies conducted in 1998, 1999, and 2000 with the JBS in operation. Project survival estimates were 99.7% for yearling chinook salmon and from 94.3% to 94.6% for steelhead. NOAA Fisheries believes that this information is the best currently available for estimating JPS through the Project under current operational conditions. No comparable studies have been conducted to date for the unlisted Permit Species. However, these promising results, along with the Coordinating Committee's adaptive management authorities with respect to future operations, assures a high likelihood that the appropriate studies will be conducted and the HCP survival standards also will be met for the unlisted Permit Species juveniles prior to 2013, as required in the HCP.

Thus NOAA Fisheries concludes at this time that the HCP survival standards for UCR steelhead and UCR spring-run chinook salmon are currently being met. In addition, these PIT-tag studies strongly suggest that the JPS standard will likely be met for the unlisted species as well before the 2013 comprehensive check-in date. The survival of other juvenile Permit Species should also be immediately and substantially improved. The adaptive management authorities of the Coordinating Committee also assure that Project facilities and operations will be sufficient to meet the survival standards for the unlisted Permit Species within this time frame as well.

Appendix A of this Opinion compares the likely effect of Project operations under the HCP on JPS with Project survival estimates that contributed the status of the species (Section 4) under the environmental baseline (Section 5) and survival estimates through a free-flowing river of equal length to the Project. This analysis indicates that meeting the Wells HCP's 93% JPS standard (covering 95% of the juvenile migration) would result in survival levels of approximately 92.7% to 95.8% (see Table A-2 in Appendix A) for the entire steelhead and spring-run chinook salmon migration. Compared to baseline survival estimates, this represents a survival increase of 1.6% to 4.9% for steelhead and 4.2% to 7.6% for spring-run chinook salmon. The Wells HCP survival estimates are approximately 94% to 97% of those estimated for both juvenile steelhead and spring-run chinook salmon migrating through a free-flowing river of equal length to the Wells Project.

Information with respect to juvenile sockeye salmon is lacking. However, because these fish are migrating at the same time as the ESA-listed species, it is likely that they will exhibit similar increases in survival (approximately 2% to 8%) compared to baseline operations that contributed to the current status of the species. Similarly, it is likely that, compared to a free-flowing river, achieving the 93% JPS standard would result in survival rates of approximately 94% to 97% of those that would be expected in a free-flowing river of equal length.

Similarly, little information is available for juvenile summer/fall-run chinook salmon which migrate as subyearling smolts. However, based on comparisons to fall-run chinook survival in the Snake and Lower Columbia rivers, it is likely that survival levels are much lower than for spring migrating Permit Species. Thus, compared to baseline survival levels which contributed to the current status of these species, achieving the 93% JPS standard should improve survival to a greater extent for UCR summer/fall-run chinook salmon than for the other Permit Species. Achieving this standard would result in survivals equivalent to approximately 95% (0.927/0.977 [Method B]) of the estimated survival that would likely occur in a free-flowing river of equal length.

Recognizing that the cumulative effects of issuing the three ITPs was considered for the purposes of NEPA in the FEIS, and that these three actions may be considered interrelated as defined by 50 CFR §402.02, NOAA Fisheries has determined it is also appropriate to concurrently consider the effects of the Rocky Reach and Rock Island hydroelectric projects' ITPs on juvenile survival. This analysis is provided in Appendix A of this Opinion (see especially Tables A-1 and A-2) and summarized below.

For UCR steelhead and UCR spring-run chinook salmon, conservative estimates of the expected juvenile project survivals resulting from implementing the HCPs at the Rocky Reach and Rock Island projects range from 92.7% to 95.2%. Compared to historical conditions contributing to the current status of these ESUs, these survival estimates represent an increase of approximately 6.5%, and 5.6% to 8.4%, for UCR steelhead migrating through the Rocky Reach and Rock Island projects, respectively. Similarly, for UCR spring-run chinook salmon migrating through the Rocky Reach and Rock Island projects, these survival estimates represent an increase of approximately 7.2%, and 6.6% to 9.4%, respectively. NOAA Fisheries further estimates that these survival rates represent approximately 94.9% and 93.8% to 96.3%, for UCR steelhead and 97.7% and 93.7% to 96.2%, for UCR spring-run chinook salmon, of the survival rates that would be expected to occur in a free-flowing river of equal length to the Rocky Reach and Rock Island projects, respectively.

Survival rates for juvenile UCR steelhead and UCR spring-run chinook salmon migrating through all three projects would likely range from 79.8% to 84.6%. These survival rates would represent an increase in survival of 14.2 % to 21.1%, and 19.1% to 26.3%, for UCR steelhead and UCR spring-run chinook salmon, respectively, compared to historical conditions contributing to the current status of these ESUs. These survival rates would be approximately 83.9% to 88.9%, and 83.5% to 88.5%, for UCR steelhead and UCR spring-run chinook salmon, respectively, compared to the survival rates that would be expected to occur in a free-flowing river of equal length to all three projects.

For unlisted Permit Species, NOAA Fisheries conservatively estimates that the expected juvenile project survival rates resulting from implementing the HCPs at the Rocky Reach and Rock Island projects will be similar to those previously estimated for the ESA-listed species, ranging from approximately 94% to 96%. Historical survival rates of unlisted Permit Species juvenile migrants through the three projects are likely equal to, or less than, those estimated for ESA-listed Permit Species. Thus, compared to historical conditions contributing to the current status of the unlisted ESUs, the HCPs should result in similar (i.e., 6.5% to 7.2% at the Rocky Reach project and 5.6% to 9.4% at the Rock Island project) or greater increases in survival for these species. As was the case for the ESA-listed ESUs, NOAA Fisheries concludes that survival rates of spring migrating Okanogan River sockeye salmon under the HCPs will be approximately 94% to 96% of those likely to be observed in a free-flowing river of equivalent length to the Rocky Reach and Rock Island projects. For UCR summer/fall-run chinook salmon, achieving the minimum HCP survival standards at these projects should result in survival rates of approximately 94% to 96% of those likely to occur in a free-flowing river of equivalent length to each of these projects.

Juvenile survival rates for unlisted Permit Species migrating through all three projects would likely be similar to those estimated for ESA-listed species (i.e., 79.8% and 84.6%). Compared to historical conditions contributing to the current status of the unlisted ESUs, these survival rates would likely represent survival increases similar to (114.2% to 126.3%), or greater than, those estimated for the ESA-listed species. This would represent survival rates of approximately 86% for UCR summer/fall-run chinook salmon and from 83.5% to 88.9% for Okanogan River sockeye salmon compared to the survival rates that would be expected in a free-flowing river of equivalent length to all three projects.

NOAA Fisheries concludes that implementing the HCPs, both individually and collectively, at each of the three projects would substantially increase juvenile survival rates of each Permit Species migrating through the projects compared to the historical conditions contributing to the current status of these ESUs. Furthermore, the resulting survival rates for each Permit Species

would be approximately 84% to 89% of those expected to occur in a free-flowing river of equal length to all three projects (91.7 miles or 147.6 km).

6.2.4 Effects of the Project and Operations on Water Quality, Quantity, and Timing

General Effects and Considerations

Compared to upstream Federal and Canadian storage projects, the Wells Hydroelectric Project, due to its limited storage capacity, has little effect on downstream flows on a daily basis and no effect on a seasonal basis. The Project also has little effect on temperature, but likely eliminates the downstream transport of larger substrate materials and diminishes the transport of sands, silts, and clays. This diminishes turbidity in the river, which is theorized to affect juvenile survival (turbidity helps juveniles evade predators). Any effect of reduced turbidity within the Project's reservoir, forebay, and tailrace on juvenile survival will be captured in the JPS studies required by the HCP. See sections 3.3.1 and 3.3.2 of the FEIS for more detailed discussions regarding water quality and quantity in the Mid-Columbia River and its tributaries.

At the Mid-Columbia River projects, spillways are currently the most benign routes for juvenile salmonids to pass the dams (Chapman et al.1994a, 1994b). Unfortunately, spill may result in supersaturated levels of TDG. Supersaturated gases in fish tissues tend to pass from the dissolved state to the gaseous phase as internal bubbles or blisters. This condition is called gas bubble trauma (GBT) and can be debilitating or even fatal to aquatic species and to all life-history stages of Permit Species. For these reasons, the Mid-Columbia PUDs limit voluntary spillway discharge levels during the fish passage season to ensure that TDG does not exceed 120% of saturation in Project tailraces or 115% of saturation in Project forebays for more than 12 hours over a 24-hour period, or as otherwise ordered by TDG waivers issued by the Washington Department of Ecology. Due to these operational constraints, spill can be limited under normal operating conditions. Although limited spill can avoid high TDG levels that may be harmful to the Permit Species, spill limitations would also result in higher proportions of migrating juveniles passing through turbine units (rather than juvenile bypass systems or spillways), and consequently, offsetting higher mortality rates for juvenile salmon and steelhead migrants at the dam.

Specific Effects

For UCR steelhead and UCR spring-run chinook salmon smolts, the proven expected effectiveness of the existing juvenile fish bypass system is the most efficient non-turbine passage route for all Plan Species covered by the HCP. However, additional water flow to the JBS could be required to meet HCP survival standards for unlisted Permit Species juveniles. Under current normal operating conditions, the Project does not produce significant increases in TDG (<2%) above those measured in the Project forebay. Survival, therefore, is not expected to be affected as a result of TDG generated at the bypass system under current normal operating conditions. The effect of the Project and its operation on juveniles and adults when river flows do not exceed powerhouse capacity or TDG waivers issued by the Washington Department of Ecology is probably negligible (NMFS 2000a; Backman and Evans 2002a, 2002b).

During high river discharges, elevated levels of TDG may result from involuntary spill, increasing the incidence of mortality related to GBT. However, large flood events are relatively rare due to upstream water storage projects. Therefore, while large flood events may negatively affect spring migrating juvenile and adult Permit Species, the overall magnitude of this effect will be relatively small considering the infrequent occurrence of these events.

6.2.5 Predator Control Programs

The HCP proposes to continue implementing northern pikeminnow (*Ptychochelus oregonensis*) and avian predator (primarily California, ring-billed, and unidentified gulls; double-crested cormorants; Caspian terns; and common mergansers) control and removal measures to reduce the predation rates on juvenile migrants. Avian control measures consist largely of land based activities that include gull wires installed across project tailraces and pyrotechnics to discourage predation. In addition, some avian predators are killed each year. Although aimed at improving juvenile steelhead and salmon survival, avian control measures do not otherwise affect Permit Species (listed or unlisted) and therefore do not require special permitting by NOAA Fisheries.

Removal of northern pikeminnows, however, may result in the take of small numbers of juvenile and adult Permit Species, depending on the harvest methods used (e.g., hook and line and long-lines). For example, in five years of long-line fishing in the Wells tailrace or reservoir, no anadromous salmonids were encountered. Only 4 rainbow trout and 1 steelhead were encountered over a seven-year period in hook and line fisheries (Jerald 2003). Similarly, over an eight-year period at both Rocky Reach and Rock Island dams, only 13 steelhead have been caught.

Previously, NOAA Fisheries determined these actions resulted in a net benefit to listed populations in the Mid-Columbia River (NMFS 1998). Assuming predator control efforts at the Project remain at current levels or are increased in the future, the removal of predator-sized northern pikeminnows and the hazing or removal of avian predators should result in maintaining or increasing juvenile Permit Species' survival rates compared to present survival estimates. Any survival improvements resulting from predator removal should be reflected in the results of JPS studies for each Permit Species at the Project. Negative impacts to adult Permit Species should be negligible or non-existent for all Permit Species.

6.2.6 Tributary Conservation Plan

A detailed description of the Tributary Conservation Plan, the Plan Species Account, and its allowable uses by the Tributary Committee can be found in section 7 of the HCP and in sections 2.3.4.7 and 2.3.4.8 of the FEIS. The following discussion is a brief summary of this information.

To offset unavoidable project mortality, Douglas PUD will initially contribute $1,982,000 (in 1998 dollars adjusted for inflation) to a Plan Species Account in order to fund projects for the protection and restoration of Plan Species' habitat within the Columbia River watershed (from Chief Joseph tailrace to the Wells tailrace, and the Okanogan and Methow rivers). Five years after the initial contribution, Douglas PUD could either provide annual payments of $176,178 (in 1998 dollars) throughout the HCP term or provide an upfront payment of $1,761,780 (equivalent to 10 yearly payments in 1998 dollars), deducting the actual costs of bond issuance and interest. After a total of 15 years, the Signatory Parties would determine the contribution method of the remaining funds (at a rate equivalent to $176,178 per year). Tributary protection and conservation projects may include, but not be limited to, 1) providing access to currently blocked stream sections or oxbows, 2) removing dams or other passage barriers on tributary streams, 3) improving or increasing the hiding and resting cover habitat that is essential for these species during their relatively long adult holding period, 4) improving in-stream flow conditions by correcting problematic water diversion or withdrawal structures, or 5) purchasing (or leasing on a long-term basis) conservation easements to protect or restore important aquatic habitat and shoreline areas.

The Tributary Committee is responsible for selecting projects and approving budgets from the Plan Species Account for the purposes of implementing the Tributary Plan. The HCP directs the Tributary Committee to coordinate with other conservation plans or programs and to cost-share, seek matching funds, and piggyback programs onto other habitat efforts, whenever feasible. No attempt to assess whether or not tributary enhancement projects are increasing the survival of Plan Species by 2% will be made by the Tributary Committee (see Response to Comment 30, 7th paragraph in appendix C of the FEIS for explanation). Instead, Douglas PUD will provide additional money to fund a Tributary Assessment Program which will be used to ensure that the dollars allocated to the Plan Species Account are utilized in an effective and efficient manner. The total cost associated with the Tributary Assessment Program may not exceed $200,000 (not subject to inflation adjustment).

The Tributary Committee will be guided by the general strategy outlined in supporting documents A and D to the HCP: protection of existing productive habitat and restoration of high priority habitat by restoring, when practical, natural processes that, over time, will create and maintain suitable habitat conditions without human intervention. NOAA Fisheries' representative on the Tributary Committee will ensure that take resulting from these activities is minimized to the extent practical.

Based on the certainty of funding, the authorities granted to the Tributary Committee, the Tributary Assessment Program, and NOAA Fisheries' participation, we find that there is an extremely high likelihood that effective protection and restoration measures will be implemented throughout the term of the HCP.

Protection or restoration projects requiring in-water work or physical alterations to adjacent lands (riparian habitat or flood-plain) could have short-term minor negative impacts to spawning, incubating, and rearing Permit Species by 1) negatively impacting substrate and juvenile food supplies (temporarily elevating sedimentation rates and removing food organisms from aquatic or terrestrial sources); 2) negatively impacting water quality (e.g., increasing turbidity); 3) negatively impacting structures providing cover and shelter to both adults and juveniles; 4) negatively impacting (e.g., removing , replacing, etc.) riparian vegetation; and 5) negatively impacting space and conditions for safe passage (e.g., noise, vibrations, physical presence of people or equipment, etc.) for both adults and juveniles. In the long-term, these actions should have either no effect, or a slight beneficial effect, on one or more of these biological requirements.

NOAA Fisheries concludes that implementing the Tributary Conservation Plan should result in a net benefit to both juveniles and adults of each Permit Species over the long term. In most instances (e.g., leasing riparian lands, leasing or purchasing instream flow water rights, etc.), funded projects are not expected to have any deleterious effects on Permit Species. However, in a few cases (e.g., removal of migration blocks, reconnecting side channels, etc.), some short-term unavoidable negative effects (e.g., some individuals killed or injured, temporarily increased sediment loads and turbidity, etc.) would likely result from funded protection or restoration projects. These projects would require future formal ESA Section 7(a)(2) consultation and authorization of incidental take of ESA-listed Permit Species.

6.2.7 Hatchery Compensation Plan

As discussed in Section 3, current hatchery production levels have been previously analyzed in ESA Section 7 consultations on the issuance of Section 10(a)(1)(A) enhancement permits for UCR steelhead (#1094) and UCR spring-run chinook salmon (#1196) artificial propagation programs. Continued hatchery mitigation activities proposed as part of the HCP will undergo separate ESA Section 7 consultations at 10-year intervals pursuant to which NOAA Fisheries will consider the potential for both beneficial and adverse effects to listed species. This section generally considers the direct and indirect programmatic effects to Permit Species that may result from the HCP's hatchery mitigation actions.

Scientific knowledge regarding the benefits and risks of artificial propagation is incomplete, but improving. Artificial propagation techniques and strategies have proven effective in many cases at alleviating near-term extinction risks, yet the potential long-term benefits of artificial propagation as a recovery tool for depleted salmon populations are unclear. Hatchery-based artificial propagation techniques may provide benefits to fish populations, both ESA-listed and unlisted, by several mechanisms including: reducing the risk that a population on the verge of extirpation will be lost by expeditiously boosting the number of emigrating juveniles in a given brood year, preserving or increasing the abundance of salmonid populations while other factors causing decreased abundances are addressed, accelerating the recovery of populations by increasing abundances in a shorter time frame than may be achievable through natural production, increasing the "nutrient capital" in the freshwater ecosystem supporting natural salmonid populations by increasing the numbers of decomposing salmonid carcasses in a watershed, establishing a reserve population for use if the natural population suffers a catastrophic loss, seeding vacant habitat by reintroducing populations to streams where indigenous populations have been extirpated while the causes of extirpation are being addressed, and collecting and providing new scientific information regarding the use of supplementation in conserving natural populations.

Potential negative effects of artificial propagation on naturally produced populations include effects on the genetic and ecological health of natural populations, effects of fisheries management, and the potential to mask the status of naturally producing stocks which effects public policy and decision making. Existing and ongoing ESA Section 7 consultations concerning artificial propagation evaluate the risk of 11 generic effects on listed species, which are: 1) operation of hatchery facilities, 2) broodstock collection, 3) genetics, 4) disease, 5) competition/density dependent effects, 6) predation, 7) residualism, 8) fisheries, 9) masking, 10) nutrient cycling, and 11) monitoring and evaluation.

7. CUMULATIVE EFFECTS

Cumulative effects are defined in 50 CFR §402.02 as "those effects of future State, tribal, local or private actions, not involving Federal activities, that are reasonably certain to occur in the action area considered in this biological opinion." Future Federal actions, including the ongoing operation of hatcheries, fisheries, and land management activities, are not considered within the category of cumulative effects for ESA purposes because they require separate consultations pursuant to Section 7 of the ESA after which they are considered part of the environmental baseline. Future State, tribal, local, or private actions within the action area are described for NEPA purposes in the FEIS (sections 3.7, 5.4, 5.5, and 5.6). NOAA Fisheries evaluated these actions to determine whether or not they would meet the requirements of its implementing regulations. Those actions which are most notable include Washington State TMDL (total maximum daily load) development and implementation, Washington State legislation to enhance salmon recovery through tributary enhancement programs, and recent human population trends in the action area. However, after considerable review, NOAA Fisheries has determined that these actions cannot be deemed reasonably likely to occur based on its ESA implementing regulations.

The Endangered Species Consultation Handbook describes this standard as follows:

> "Indicators of actions 'reasonably certain to occur' may include, but are not limited to: approval of the action by State, tribal or local agencies or governments (e.g., permits, grants); indications by State, tribal or local agencies or governments that granting authority for the action is imminent; project sponsors' assurance the action will proceed; obligation of venture capital; or initiation of contracts. The more State, tribal or local administrative discretion remaining to be exercised before a proposed non-Federal action can proceed, the less there is a reasonable certainty the project will be authorized."

There are, of course, numerous non-Federal activities that have occurred in the action area in the past, which have contributed to both the adverse and positive effects of the environmental baseline. This step of the analysis for application of the ESA Section 7(a)(2) standards requires the consideration of which of those past activities are "reasonably certain to occur" in the future within the action area.

First of all, any of these actions that involve Federal approval, funding, or other involvement are not considered "cumulative effects" for this analysis (see ESA definition, above). This Federal involvement will trigger ESA Section 7(a)(2) consultation in the future. Once the consultation on those actions is completed the effects may be considered part of the environmental baseline, consistent with the ESA regulatory definition of "effects of the action" (50 CFR §402.02). Thus, for example, state efforts to improve water quality in compliance with the Federal Clean Water Act would not be considered because of the involvement of the EPA, until separate ESA consultations are completed. Others examples include irrigation water withdrawals involving the

U.S. Forest Service (right-of-way permits for irrigation canals) or agricultural practices that receive Federal funding through the U.S. Department of Agriculture.

Next, actions that do not involve Federal activities must meet the "reasonably certain to occur" test for NOAA Fisheries to consider their effects in this Opinion. Recognizing that this is a narrower standard than used for NEPA purposes, not all of the actions identified in the FEIS may be considered as "cumulative effects" for this ESA Section 7(a)(2) consultation. In reviewing the actions identified in cumulative effects analysis of the FEIS, after eliminating from consideration those with Federal involvement, NOAA Fisheries finds that currently few, if any, of the future adverse or beneficial State, tribal or private actions qualify for consideration in this analysis as "cumulative effects."

Therefore, when evaluating the status of the listed species, including their likelihood of survival and recovery, NOAA Fisheries concludes that most of the factors for the decline of these species are not eligible for consideration in determining whether the authorization of incidental take under this HCP is likely to jeopardize their continued existence. Thus the future abundance and productivity of the listed UCR steelhead and UCR spring-run chinook salmon (as well as currently unlisted Permit Species), against which the effects of this action are considered, are likely to be improved, although to an unknown or possibly minor extent, over those reflected by the historical trends under the environmental baseline.

8. CONCLUSIONS

This section presents NOAA Fisheries' biological opinion regarding whether the aggregate effects of the factors analyzed under the environmental baseline (Section 5), effects of the proposed action (Section 6), and the cumulative effects (Section 7) in the action area, when viewed against the current rangewide status of the species (Section 4), are likely to jeopardize the continued existence of UCR steelhead or UCR spring-run chinook salmon. To "jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (CFR §402.02). NOAA Fisheries has also conducted a similar analysis for unlisted Permit Species (UCR summer/fall-run chinook salmon and Okanogan River sockeye salmon) addressed in this HCP as part of its unlisted Permit Species analysis. This analysis is necessary because Douglas PUD requests assurances (i.e., No Surprises) that it will receive a Section 10(a)(1)(B) ITP for the currently unlisted anadromous salmonids that are adequately addressed in the HCP, if they are listed under the ESA and absent relevant new information available at the time these species may be listed.

As determined in Section 4, the status of the listed ESUs is characterized by low abundance and downward population growth rates, despite recent encouraging adult returns. Were NOAA Fisheries to simply project this status forward over the term of this ITP, these population growth rates would need to substantially improve for them to survive with an adequate potential for recovery. As determined in Section 5, however, the effects of the environmental baseline, while responsible for this current status, cannot be assumed to continue over the term of the ITP given the fact that few Federal actions that contributed to the environmental baseline in the past have completed ESA Section 7 consultation for more than the next few years. Thus NOAA Fisheries can assume that the current status will improve, although to an unknown or possibly minor extent, as natural processes (e.g., recovery of riparian vegetation removed as a result of past timber harvest activities) reduce the continuing effects of the environmental baseline. As determined in Section 7, there are few, if any, State or private projects that meet the ESA definition of "reasonably certain to occur" and therefore their effects cannot be assumed for this analysis. This is also true for the unlisted Permit Species, except that their status is characterized as stable or increasing. Thus, for these species, additional survival improvements are likely not necessary for them to survive.

In reaching it conclusions, NOAA Fisheries finds that there will be continuing adverse impacts to species considered under this biological opinion allowed under the HCP. These impacts, as described in Section 6, include continuing mortality of juveniles passing the Project and are related to both the existence and the operation of the Project, which cannot be separated. The level of continuing juvenile mortality relative to the level of juvenile mortality expected in a free-flowing river of equal length (see Section 6.2.3 for discussion of biological requirements necessary for survival and recovery of listed ESUs), does not by itself constitute an appreciable reduction in the likelihood of survival and recovery. Adult mortality through the Project appears to be similar to that expected in a free-flowing river of equal length. NOAA Fisheries also notes that the levels of juvenile and adult mortality associated with the HCP represent an improvement over the Project-caused mortality that occurred historically and contributed to the current species status under the environmental baseline.

Although some short-term negative impacts may result from HCP tributary enhancement projects, these activities are also likely to benefit, to an as yet unknown extent, all Permit Species, by protecting or enhancing tributary habitat in which these fish spawn and rear throughout the term of the ITP.

Based on these considerations, NOAA Fisheries concludes that its issuance of an ITP under Section 10(a)(1)(B) of the ESA for the lawful operation of the Wells Hydroelectric Project is not likely to jeopardize the continued existence of the ESA-listed Permit Species. NOAA Fisheries also concludes that the proposed action would not jeopardize the continued existence of currently unlisted Permit Species (in the event that they are listed under the ESA in the future).

Although no critical habitat is currently designated for these species, NOAA Fisheries' analysis and no-jeopardy determinations are likely to be highly relevant for the consideration of this ITP's effects on habitat should any be designated as critical for these species during the term of the ITP.

8.1 Conclusions for UCR Steelhead

After reviewing the current status of UCR steelhead, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects, it is NOAA Fisheries' biological opinion that the proposed action is not likely to jeopardize the continued existence of this species for the term of this ITP.

Contemporaneously with this Opinion, NOAA Fisheries is preparing separate biological opinions on its proposed issuance of ITPs to Chelan PUD for its Anadromous Fish Agreements and Habitat Conservation Plans for the Rocky Reach and Rock Island hydroelectric projects. Regulations governing ESA Section 7(a)(2) consultations restrict consideration of future Federal action that have yet to undergo their own consultation (50 CFR §402.02). Analysis of the proposed action in this Opinion considered the individual effect of the proposed action for the Wells Hydroelectric Project.

However, NOAA Fisheries recognizes that the cumulative effects of issuing the three ITPs was considered for purposes of NEPA in the FEIS and that these three actions may be considered interrelated as defined by 50 CFR §402.02. For these reasons, NOAA Fisheries has considered, in the alternative, whether its ESA Section 7(a)(2) determination for the Wells Hydroelectric

Project would be affected if it had considered the effects of the Rocky Reach and Rock Island hydroelectric projects' ITPs at the same time.

NOAA Fisheries has estimated that, based on comparisons of expected juvenile survival rates to baseline survival rates, achieving the HCP survival standards at the Rocky Reach or Rock Island hydroelectric projects would increase juvenile UCR steelhead survival rates through each project by 6.5%, and 5.6% to 8.4%, respectively. Collectively, achieving the HCP survival standards at each of the three projects would increase juvenile survival rates through the three projects by 14.2% and 21.1% for those juveniles migrating through all three projects (i.e., from the Methow River). NOAA Fisheries finds that, based on this information, the three HCPs, both individually and collectively, represent a substantial improvement to juvenile survival over baseline conditions (see Section 6.2.2 and 6.2.3 and Appendix A). NOAA Fisheries estimates that the resulting juvenile project survival rates would be approximately 94% to 97% of that estimated in a hypothetical free-flowing river of equal length to each of the projects individually, and 84% to 89% of that estimated for the projects collectively (see Section 6.2.3 and Appendix A).

Based upon this comprehensive review of the collective impacts of the issuance of these three ITPs, the current status of ESA-listed UCR steelhead, the environment baseline for the action area, and cumulative effects, it is NOAA Fisheries' biological opinion that the proposed issuance of this ITP is not likely to jeopardize the continued existence of this species for the term of the HCP.

8.1.1 Adult UCR Steelhead

This conclusion is based, in large part, on recent survival information (Section 6.2.2) and the expected effects on adult migration and survival resulting from the following elements of the proposed action:

- There is a high likelihood that Project-related mortality of migrating adults is near 2% (Section 6.2.2).

- Adult survival and migration speed through the Project appears to be similar to or higher than that observed in free-flowing rivers or reaches of the Columbia or Snake rivers (Section 6.2.2).

- Project operations (spill and adult fishway operations) should have no effect, or a small reduction in historical negative effects that contributed to the current status on adult migration and survival through the Project (Section 6.2.2).

- The JBS and spillway operations should provide a safe passage route for downstream migrating adults that should result in a reduction in historical Project-caused mortality that contributed to the current status for fallbacks or volitional migrants (especially steelhead kelts) compared to turbine passage routes (Section 6.2.2).

- TDG levels resulting from spill operations for juvenile migrants will not exceed expected TDG waivers from the state of Washington and should not affect adult survival at the Project (Section 6.2.4).

- TDG levels resulting from high river discharges would likely increase the incidence of mortality or other sublethal effects related to GBT; however, the overall magnitude of this effect will be relatively small considering the infrequent occurrence of these events (Section 6.2.4).

- Predator control measures should have no effect, or only a negligible effect, on adult survival (Section 6.2.5).

- In general, the Tributary Conservation Plan should result in tributary habitat that is more likely to satisfy biological requirements than the current habitat condition and thus should provide a small benefit to migrating and spawning adults (Section 6.2.6). Even though NOAA Fisheries expects a small benefit from the Tributary Conservation Plan, it does not depend upon this benefit in its finding of no jeopardy beyond the programmatic benefits provided by the HCP. The benefits of site-specific projects implemented under this plan will be evaluated and added to the environmental baseline after future Section 7(a)(2) consultations are conducted once those projects are defined.

- In general, the Hatchery Compensation Plan will support hatchery mitigation actions, which should reduce extinction risks and may increase the abundance of this ESU in the near term. Hatchery mitigation actions may also have potential negative effects on naturally produced populations of this ESU in the long term (Section 6.2.7). NOAA Fisheries is not depending upon the benefit of these hatchery mitigation actions in its finding of no jeopardy, other than the programmatic benefit of the establishment of the Hatchery Compensation Plan. The effects of current hatchery production levels have been and will be considered in previous and ongoing ESA Section 7 consultations.

8.1.2 Juvenile UCR Steelhead

This conclusion is also based on recent project survival estimates (Section 6.2.3) and the expected survival improvements for juvenile migrants resulting from the following elements of the proposed action:

- There is a high likelihood that Project-related mortality is equal to or less than 7%, based upon the results of three years of survival study indicating JPS for steelhead is in excess of 95%, and the fact that juvenile survival through the Project appears to be at least 95% of that estimated for a free-flowing river of equal length (Section 6.2.3).

- The JBS operations, compared to the historical operations that contributed to the current status, should increase survival by increasing the proportion of juveniles passing the Project via the bypass system (estimated survival of 98% to 99%) and decreasing the proportion of juveniles passing the Project via turbines (estimated survival of 90% to 93%) (Section 6.2.3).

- TDG levels resulting from spill operations for juvenile migrants will not exceed the state of Washington's provisions for TDG related to voluntary fish spill and should not affect juvenile survival at the Project (Section 6.2.4).

- TDG levels resulting from high river discharges would likely increase the incidence of mortality or other sublethal effects related to GBT; however, the overall magnitude of this effect will be relatively small considering the infrequent occurrence of these events (Section 6.2.4).

- Predator control measures should increase juvenile survival (if measures beyond those currently being implemented prove effective) or have no effect on juvenile survival (if measures beyond those currently being implemented do not prove effective) in comparison with the historical survival levels that contributed to the current status (Section 6.2.5).

- In general, the Tributary Conservation Plan should result in tributary habitat that is more likely to satisfy biological requirements than the current habitat conditions and thus will benefit rearing and migrating juveniles (Section 6.2.6). Even though NOAA Fisheries expects a small benefit from the Tributary Conservation Plan, it does not depend upon this benefit in its finding of no jeopardy beyond the programmatic benefits provided by the HCP. The benefits of site-specific projects implemented under this plan will be evaluated and added to the environmental baseline after future Section 7(a)(2) consultations are conducted once those projects are defined.

- In general, the Hatchery Compensation Plan will support hatchery mitigation actions, which should reduce extinction risks and may increase the abundance of this ESU in the near term. Hatchery mitigation actions may also have potential negative effects on naturally produced populations of this ESU in the long term (Section 6.2.7). NOAA Fisheries is not depending upon the benefit of these hatchery mitigation actions in its finding of no jeopardy, other than the programmatic benefit of the establishment of the Hatchery Compensation Plan. The effects of current hatchery production levels have been and will be considered in previous and ongoing ESA Section 7 consultations.

8.2 Conclusions for UCR Spring-run Chinook Salmon

After reviewing the current status of UCR spring-run chinook salmon, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects, it is NOAA Fisheries' biological opinion that the proposed action is not likely to jeopardize the continued existence of this species for the term of this ITP.

Contemporaneously with this Opinion, NOAA Fisheries is preparing separate biological opinions on its proposed issuance of ITPs to Chelan PUD for its Anadromous Fish Agreements and Habitat Conservation Plans for the Rocky Reach and Rock Island hydroelectric projects. Regulations governing ESA Section 7(a)(2) consultations restrict consideration of future Federal action that have yet to undergo their own consultation (50 CFR §402.02). Analysis of the proposed action in this Opinion considered the individual effect of the proposed action for the Wells Hydroelectric Project.

However, NOAA Fisheries recognizes that the cumulative effects of issuing the three ITPs was considered for purposes of NEPA in the FEIS and that these three actions may be considered interrelated as defined by 50 CFR §402.02. For these reasons, NOAA Fisheries has considered, in the alternative, whether its ESA Section 7(a)(2) determination for the Wells Hydroelectric Project would be affected if it had considered the effects of the Rocky Reach and Rock Island hydroelectric projects' ITPs at the same time.

NOAA Fisheries has estimated that, based on comparisons of expected juvenile survival rates to baseline survival rates, achieving the HCP survival standards at the Rocky Reach or Rock Island hydroelectric projects would increase juvenile UCR spring-run chinook salmon survival rates through each project by 7.2%, and 6.6% to 9.4%, respectively. Collectively, achieving the HCP survival standards at each of the three projects would increase juvenile survival rates through the three projects by 19.1% and 26.3% for those juveniles migrating through all three projects (i.e., from the Methow River). NOAA Fisheries finds that, based on this information, the three HCPs, both individually and collectively, represent a substantial improvement to juvenile survival over baseline conditions (see Sections 6.2.2 and 6.2.3 and Appendix A). NOAA Fisheries estimates that the resulting juvenile project survival rates would be approximately 94% to 97% of that estimated in a hypothetical free-flowing river of equal length to each of the projects individually, and 84% to 89% of that estimated for the projects collectively (see Section 6.2.3 and Appendix A).

Based upon this comprehensive review of the collective impacts of the issuance of these three ITPs, the current status of ESA-listed UCR spring-run chinook salmon, the environment baseline for the action area, and cumulative effects, it is NOAA Fisheries' biological opinion that the proposed issuance of this ITP is not likely to jeopardize the continued existence of this species for the term of the HCP.

8.2.1 Adult UCR Spring-run Chinook Salmon

For adults, this conclusion is based, in large part, on recent survival information (Section 6.2.2) and expected impacts on adult migration and survival resulting from the following elements of the proposed action compared to estimates obtained in free-flowing river systems:

- There is a high likelihood that Project-related mortality of migrating adults is near 2% (Section 6.2.2).
- Adult survival and migration speed through the Project appears to be similar to or higher than that observed in free-flowing rivers or reaches of the Columbia or Snake rivers (Section 6.2.2).
- Project operations (spill and adult fishway operations) should have no effect, or a small reduction in historical negative effects that contributed to the current status on adult migration and survival through the Project (Section 6.2.2).
- The JBS and spillway operations should provide a safe passage route for downstream migrating adults that should result in a reduction in historical Project-caused mortality that contributed to the current status for fallbacks or volitional migrants compared to turbine passage routes (Section 6.2.2).
- TDG levels resulting from spill operations for juvenile migrants will not exceed 120% (TDG waivers from the state of Washington) and should not affect adult survival at the Project (Section 6.2.4).
- TDG levels resulting from high river discharges would likely increase the incidence of mortality or other sublethal effects related to GBT; however, the overall magnitude of this effect will be relatively small considering the periodicity of these events (Section 6.2.4).
- Predator control measures should have no effect, or only a negligible effect, on adult survival (Section 6.2.5).
- In general, the Tributary Conservation Plan should result in tributary habitat that is more likely to satisfy biological requirements than the current habitat condition and thus should provide a small benefit to migrating and spawning adults (Section 6.2.6). Even though NOAA Fisheries expects a small benefit from the Tributary Conservation Plan, it does not depend upon this benefit in its finding of no jeopardy beyond the programmatic benefits provided by the HCP. The benefits of site-specific projects implemented under this plan will be evaluated and added to the environmental baseline after future Section 7(a)(2) consultations are conducted once those projects are defined.

- In general, the Hatchery Compensation Plan will support hatchery mitigation actions, which should reduce extinction risks and may increase the abundance of this ESU in the near term. Hatchery mitigation actions may also have potential negative effects on naturally produced populations of this ESU in the long term (Section 6.2.7). NOAA Fisheries is not depending upon the benefit of these hatchery mitigation actions in its finding of no jeopardy, other than the programmatic benefit of the establishment of the Hatchery Compensation Plan. The effects of current hatchery production levels have been and will be considered in previous and ongoing ESA Section 7 consultations.

8.2.2 Juvenile UCR Spring-run Chinook Salmon

For juveniles, this conclusion is based on recent Project survival estimates (Section 6.2.3) and the expected survival improvements for juvenile migrants resulting from the following elements of the proposed action:

- There is a high likelihood that Project-related mortality is equal to or less than 7%, based upon the results of three years of survival study indicating JPS for spring-run chinook salmon is in excess of 95%, and the fact that juvenile survival through the Project appears to be at least 95% of that estimated for a free-flowing river of equal length (Section 6.2.3).

- The JBS operations, compared to the historical operations that contributed to the current status, should increase survival by increasing the proportion of juveniles passing the Project via the bypass system (estimated survival of 98% to 99%) and decreasing the proportion of juveniles passing the Project via turbines (estimated survival of 90% to 93%) (Section 6.2.3).

- TDG levels resulting from spill operations for juvenile migrants will not exceed the state of Washington's provisions for TDG related to voluntary fish spill and should not affect juvenile survival at the Project (Section 6.2.4).

- TDG levels resulting from high river discharges would likely increase the incidence of mortality or other sublethal effects related to GBT; however, the overall magnitude of this effect will be relatively small considering the infrequent occurrence of these events (Section 6.2.4).

- Predator control measures should either increase juvenile survival (if measures beyond those currently being implemented prove effective) or have no effect on juvenile survival (if measures beyond those currently being implemented do not prove effective) in comparison with the historical survival levels that contributed to the current status (Section 6.2.5).

- In general, the Tributary Conservation Plan should result in tributary habitat that is more likely to satisfy biological requirements than the current habitat conditions and thus will benefit rearing and migrating juveniles (Section 6.2.6). Even though NOAA Fisheries expects a small benefit from the Tributary Conservation Plan, it does not depend upon this benefit in its finding of no jeopardy beyond the programmatic benefits provided by the HCP. The benefits of site-specific projects implemented under this plan will be evaluated and added to the environmental baseline after future Section 7(a)(2) consultations are conducted once those projects are defined.

- In general, the Hatchery Compensation Plan will support hatchery mitigation actions, which should reduce extinction risks and may increase the abundance of this ESU in the near term. Hatchery mitigation actions may also have potential negative effects on naturally produced populations of this ESU in the long term (Section 6.2.7). NOAA Fisheries is not depending upon the benefit of these hatchery mitigation actions in its finding of no jeopardy, other than the programmatic benefit of the establishment of the Hatchery Compensation Plan. The effects of current hatchery production levels have been and will be considered in previous and ongoing ESA Section 7 consultations.

8.3 Conclusions for Currently Unlisted Permit Species

After reviewing the current status of the currently unlisted Permit Species (UCR summer/fall-run chinook salmon and Okanogan River sockeye salmon), the environmental baseline for the action area, the effects of the proposed action, and cumulative effects, it is NOAA Fisheries' biological opinion that the proposed action is not likely to jeopardize the continued existence of these species for the term of this ITP.

Contemporaneously with this Opinion, NOAA Fisheries is preparing separate biological opinions on its proposed issuance of ITPs to Chelan PUD for its Anadromous Fish Agreements and Habitat Conservation Plans for the Rocky Reach and Rock Island hydroelectric projects. Regulations governing ESA Section 7(a)(2) consultations restrict consideration of future Federal action that have yet to undergo their own consultation (50 CFR §402.02). Analysis of the proposed action in this Opinion considered the individual effect of the proposed action for the Wells Hydroelectric Project.

However, NOAA Fisheries recognizes that the cumulative effects of issuing the three ITPs was considered for purposes of NEPA in the FEIS and that these three actions may be considered interrelated as defined by 50 CFR §402.02. For these reasons, NOAA Fisheries has considered, in the alternative, whether its ESA Section 7(a)(2) determination for the Wells Hydroelectric Project would be affected if it had considered the effects of the Rocky Reach and Rock Island hydroelectric projects' ITPs at the same time.

Historical survival rates of unlisted Permit Species juvenile migrants through the three projects are likely equal to, or less than, those estimated for ESA-listed Permit Species. Thus NOAA Fisheries concludes that, compared to baseline survival rates, achieving the HCP survival standards would likely increase the survival of unlisted Permit Species juvenile migrants by at least 6.5% to 7.2%, and 5.6% to 9.4%, at the Rocky Reach and Rock Island hydroelectric projects, respectively. The expected survival levels for juvenile UCR summer/fall-run chinook salmon and Okanogan River sockeye salmon are estimated to be approximately 95% to 96%, and 94% to 96%, respectively, of those estimated for a free-flowing river of equal length to each project. Collectively, achieving the HCP survival standards at each of the three projects would likely increase survival rates by 14.2% to 26.3% for unlisted Permit Species juveniles migrating through all three projects (i.e., from tributaries upstream of Wells Dam). This represents survival levels that are approximately 86% for UCR summer/fall-run chinook salmon and 84% to 89% for Okanogan River sockeye salmon compared to survival rates estimated for a free-flowing river of equal length to the three projects.

Based upon this comprehensive review of the collective impacts of the issuance of these three ITPs, the current status of the unlisted Permit Species, the environment baseline for the action area, and cumulative effects, it is NOAA Fisheries' biological opinion that the proposed issuance of the proposed action is not likely to jeopardize the continued existence of these species for the term of the HCP.

8.3.1 Currently Unlisted Permit Species: Adults

For adults, this conclusion is based on expected impacts on adult migration and survival (Section 6.2.2) resulting from the following elements of the proposed action:

- Based on the available information (including that from other species), there is a high likelihood that Project-related mortality of migrating adults is near 2% (Section 6.2.2).

- There is also a high likelihood that adult survival and migration speed through the Project is similar to or higher than that observed in free-flowing rivers or reaches of the Columbia or Snake rivers (Section 6.2.2).

- Project operations (spill and adult fishway operations) should have no effect, or a small reduction in historical negative effects that contributed to the current status on adult migration and survival through the Project (Section 6.2.2).

- The JBS and spillway operations should provide a safe passage route for downstream migrating adults that should result in a reduction in historical Project-caused mortality that contributed to the current status for fallbacks or volitional migrants compared to turbine passage routes (Section 6.2.2).

- TDG levels resulting from spill operations for juvenile migrants will not exceed expected TDG waivers from the state of Washington and should not affect adult survival at the Project (Section 6.2.4).

- TDG levels resulting from high river discharges would likely increase the incidence of mortality or other sublethal effects related to GBT; however, the overall magnitude of this effect will be relatively small considering the infrequent occurrence of these events (Section 6.2.4).

- Predator control measures should have no effect, or only a negligible effect, on adult survival (Section 6.2.5).

- In general, the Tributary Conservation Plan should result in tributary habitat that is more likely to satisfy biological requirements than the current habitat condition and thus should provide a small benefit to migrating and spawning adults (Section 6.2.6). Even though NOAA Fisheries expects a small benefit from the Tributary Conservation Plan, it does not depend upon this benefit in its finding of no jeopardy beyond the programmatic benefits provided by the HCP. The benefits of site-specific projects implemented under this plan will be evaluated and added to the environmental baseline after future Section 7(a)(2) consultations are conducted once those projects are defined.

- In general, the Hatchery Compensation Plan will support hatchery mitigation actions, which should reduce extinction risks and may increase the abundance of this ESU in the near term. Hatchery mitigation actions may also have potential negative effects on naturally produced populations of this ESU in the long term (Section 6.2.7). NOAA Fisheries is not depending upon the benefit of these hatchery mitigation actions in its finding of no jeopardy, other than the programmatic benefit of the establishment of the Hatchery Compensation Plan. The effects of current hatchery production levels have been and will be considered in previous and ongoing ESA Section 7 consultations.

8.3.2 Currently Unlisted Permit Species: Juveniles

For juveniles, this conclusion is based on the expectation that survival improvements for currently unlisted juvenile migrants will be similar to those of currently listed juvenile migrants (Section 6.2.3) and the expected impact of the following elements of the proposed action:

- Based on the available information (including that from other species), there is a high likelihood that Project-related mortality is equal to or less than 7% and juvenile survival through the Project appears to be approximately 95% of that estimated for a free-flowing river of equal length (Section 6.2.3).

- The JBS operations, compared to the historical operations that contributed to the current status, should increase survival by increasing the proportion of juveniles passing the Project via the bypass system (estimated survival of 98% to 99%) and decreasing the proportion of juveniles passing the Project via turbines (estimated survival of 90% to 93%) (Section 6.2.3).

- TDG levels resulting from spill operations for juvenile migrants will not exceed the state of Washington's provisions for TDG related to voluntary fish spill and should not affect juvenile survival at the Project (Section 6.2.4).

- TDG levels resulting from high river discharges would likely increase the incidence of mortality or other sublethal effects related to GBT; however, the overall magnitude of this effect will be relatively small considering the infrequent occurrence of these events (Section 6.2.4).

- Predator control measures should either increase juvenile survival (if measures beyond those currently being implemented prove effective) or have no effect on juvenile survival (if measures beyond those currently being implemented do not prove effective) in comparison with the historical survival levels that contributed to the current status (Section 6.2.5).

- In general, the Tributary Conservation Plan should result in tributary habitat that is more likely to satisfy biological requirements than the current habitat conditions and thus should benefit rearing and migrating juveniles (Section 6.2.6). Even though NOAA Fisheries expects a small benefit from the Tributary Conservation Plan, it does not depend upon this benefit in its finding of no jeopardy beyond the programmatic benefits provided by the HCP. The benefits of site-specific projects implemented under this plan will be evaluated and added to the environmental baseline after future Section 7(a)(2) consultations are conducted once those projects are defined.

- In general, the Hatchery Compensation Plan will support hatchery mitigation actions, which should reduce extinction risks and may increase the abundance of this ESU in the near term. Hatchery mitigation actions may also have potential negative effects on naturally produced populations of this ESU in the long term (Section 6.2.7). NOAA Fisheries is not depending upon the benefit of these hatchery mitigation actions in its finding of no jeopardy, other than the programmatic benefit of the establishment of the Hatchery Compensation Plan. The effects of current hatchery production levels have been and will be considered in previous and ongoing ESA Section 7 consultations.

9. INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulations pursuant to Section 4(d) of the ESA prohibit the take of endangered or threatened species, respectively, without special exemption. Take is defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct." Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of Section 7(b)(4) and Section 7(o)(2), taking that is incidental to and not intended as part of an agency action is not considered to be prohibited under the ESA, provided that such taking is in compliance with the terms and conditions of the incidental take statement.

The measures described in this section are nondiscretionary and must be included in the ITP issued by NOAA Fisheries to Douglas PUD for the operation and maintenance of the Project. NOAA Fisheries has a continuing duty to regulate the Douglas PUD activities covered by this incidental take statement. In the event that the agreed upon measures to increase survival are not implemented or conditions specified in the HCP (subject to the conditions specified in sections 2 and 10 of the HCP) are not met by 2018 or at any time thereafter, the protective coverage of Section 7(a)(2) would lapse prior to the 50-year term per the conditions set forth in Section 10 of this Opinion. To monitor the effect of incidental take, NOAA Fisheries must require Douglas PUD and the HCP committees to report their progress toward implementing the HCP measures and achieving the relevant survival standard for each Permit Species; this information must be given to NOAA Fisheries, as specified in the HCP or in this incidental take statement (50 CFR §402.14(i)(3)).

9.1 Amount or Extent of Take Anticipated

NOAA Fisheries' proposed action (issuance of an ITP for the HCP for a period of up to 50 years from the Effective Date of the HCP) is designed to minimize the incidental take of Permit Species (including currently listed UCR steelhead and UCR spring-run chinook salmon) to the maximum extent practical.

This incidental take statement explicitly excludes any take that might result from projects implemented in tributaries under the Tributary Enhancement Plan component of the HCP. Any projects implemented under this program that are likely to adversely affect listed species and result in incidental take of ESA-listed species will require separate ESA Section 7(a)(2) consultation. Similarly, this ITP explicitly excludes any take (either direct or incidental) that might result from implementing the Hatchery Compensation Plan component of the HCP, which is being considered in separate biological opinions (see Section 1).

9.1.1 Take of Juvenile Permit Species Resulting from Operation of the Project

NOAA Fisheries expects that project-related deaths (i.e., direct, indirect, and delayed mortality resulting from project effects) for juveniles of each Permit Species migrating through the Project will be equal to, or less than, 7% throughout the term of the HCP. However, through 2013, juvenile mortality may slightly exceed 7%, to the extent that initial measures fail to achieve the HCP standards. Assessments of juvenile take (JPS) will adhere to the study requirements of the HCP (see description in Section 3). This shall include any lethal take associated with the predator removal program, or the capture, handling, and transport of naturally produced juveniles for HCP-required research.

9.1.2 Take of Adult Permit Species Resulting from Operation of the Project

NOAA Fisheries further expects, based on the available information, that project-related deaths of adult Permit Species will be equal to or less than 2%. The best available information (presented in Table 3) indicates that total (natural and project-related) mortalities of adults migrating upstream through the Project range from approximately 2% to 4%. Taking into account natural mortality, which undoubtedly occurs, it is likely that the HCP standard of no more than 2% adult mortality resulting from project-related effects is being met at this time for each Permit Species. However, because it is not possible to distinguish between project-caused and natural mortality at this time, nor is it reasonable to determine the combined mortality at an individual project, NOAA Fisheries identifies the extent of allowed incidental lethal take of adult Permit Species to be no more than 4%. Take of adults will be monitored using conversion rates (as utilized in Section 6.2.2 to assess current survival levels) until such time that technologies allow for a reasonable differentiation of these sources of mortality. At that time, allowable project-related lethal take shall not exceed 2% for any Permit Species.

Project-related mortality of downstream migrating UCR steelhead kelts is unknown at this time. Survival of kelts from all tributaries within the action area to below Priest Rapids Dam was estimated at about 18% in 2002. Estimates of "natural" mortality rates for these fish - which have gone many months without feeding while expending considerable energy migrating and spawning - are not available, but are thought to be high. NOAA Fisheries expects that, compared to current survival rates, implementing HCP measures at the Project (the increased operating period of the JBS and spill to achieve the HCP survival standards) will substantially improve steelhead kelt survival through the Project in future years.

9.1.3 Take of Permit Species Resulting from Predator Control Measures

Non-lethal take of juvenile and adult Permit Species (capture and handling) as a result of predator control measures is expected to be rare. Thus NOAA Fisheries limits non-lethal take from these measures to no more than 20 juveniles and 4 adults of any Permit Species each year and lethal take from these measures to no more than 10 juveniles and 2 adults of any Permit Species each year.

9.2 Effect of Take

Earlier in this Opinion (Sections 8.1, 8.2, and 8.3), NOAA Fisheries determined that the projected levels of survival through the term of the HCP are not likely to result in jeopardy to listed UCR steelhead or UCR spring-run chinook salmon or currently unlisted Permit Species.

9.3 Reasonable and Prudent Measures and Terms and Conditions

NOAA Fisheries believes the following reasonable and prudent measures and terms and conditions are necessary and appropriate to minimize the impacts of incidental take associated with the proposed actions at the Project. In order to be exempt from the prohibitions of Section 9 of the ESA, NOAA Fisheries must incorporate into the ITP, and FERC and Douglas PUD must comply with, all of the reasonable and prudent measures and terms and conditions set forth in Section 9.3.1.

9.3.1 HCP Measures, Terms, and Conditions

1. In accordance with the provisions of section 10 of the HCP, the ITP authorizes Douglas PUD to incidentally take Permit Species that are listed under the ESA, to the extent that such incidental take of these species would otherwise be prohibited under Section 9 of the ESA, and its implementing regulations, or pursuant to a rule promulgated under Section 4(d) of the ESA, and to the extent that the take is incidental to Douglas PUD's lawful operation of the Wells Hydroelectric Project, subject to the condition that Douglas PUD must fully comply with all requirements of the HCP and the ITP. The ITP will become immediately effective upon issuance for Permit Species currently listed under the ESA. The ITP will become effective for currently unlisted Permit Species upon any future listing of such species under the ESA as described in section 10.1.3 (Permit Modification) of the HCP, and in accordance with NOAA Fisheries' regulations governing ESA-listed species permits (50 CFR Parts 222.301-222.309).

2. Douglas PUD, in effecting the take authorized by this ITP, is considered to have accepted the terms and conditions of this ITP and to be prepared to comply with the provisions of the HCP, the ITP, the applicable regulations, and the ESA.

3. Douglas PUD must make available a copy of the ITP, including the accompanying HCP and related agreements, to personnel, contractors, or agents of Douglas PUD conducting authorized activities. All applicable provisions of the ITP must be presented and clearly explained to all authorized employees, contractors, or agents of Douglas PUD engaged in these activities.

4. Incidental take of ESA-listed Permit Species resulting from the actions of individual employees, contractors, or agents of Douglas PUD operating under the authority of this ITP in accordance with activities described in the HCP (with the exception of tributary enhancement activities or artificial production activities which are covered under separate permits or biological opinions) shall be included, as appropriate, in the allowable take authorized above in Sections 9.1.1, 9.1.2, and 9.1.3.

5. Upon request by NOAA Fisheries, Douglas PUD must allow NOAA Fisheries, or any other person(s) duly designated by NOAA Fisheries, to inspect Douglas PUD's records and facilities if such records and facilities pertain to (i) activities for which take of listed species is authorized by the ITP, (ii) ESA-listed species covered by this ITP, or (iii) NOAA Fisheries' responsibilities under the ESA.

6. Douglas PUD must provide NOAA Fisheries with copies of the HCP-specified information and reports (e.g., survival studies, committee reports, etc.) within the time frame specified by the HCP or otherwise agreed upon by the Policy, Coordinating, Hatchery, or Tributary committees.

7. Douglas PUD shall report all observations of any adult Permit Species mortality (noting whenever possible whether adult steelhead are kelts or pre-spawning adults). Douglas PUD shall also report exceedences of threshold values for descaling, injury, and mortality of juvenile Permit Species, as described in Section 3.3.5, to NOAA Fisheries, within two days of the incident, and shall include a concise description of the causative event (if known) and a description of any resultant corrective actions taken at the facility.

8. Douglas PUD shall report to NOAA Fisheries (by December 31 of each year) the number of juvenile and adult Permit Species salmon or steelhead caught or killed via implementation of the predator removal programs (noting whenever possible whether adult steelhead are kelts or pre-spawning adults).

10. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of threatened and endangered species. Conservation recommendations are discretionary measures suggested to minimize or avoid adverse effects of a proposed action on listed species, to minimize or avoid adverse modification of critical habitat, or to develop additional information. NOAA Fisheries has no conservation recommendations to make at this time.

11. REINITIATION OF CONSULTATION

This concludes formal consultation on NOAA Fisheries' proposed issuance of an ITP to Douglas PUD for the proposed Anadromous Fish Agreement and Habitat Conservation Plan for the Wells Hydroelectric Project. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained. To the extent that discretion has been retained, reinitiation of this consultation is required if: 1) any action is modified in a way that causes an adverse effect on the species that is new or significantly different from those analyzed in connection with the HCP, 2) new information or project monitoring reveals adverse effects of the action in a way not previously considered or that involves additional take not analyzed in connection with the original HCP, or 3) a new species is listed or critical habitat is designated that may be affected by the action.

In this HCP, NOAA Fisheries' discretion is retained subject to the following conditions (or as otherwise described in the HCP): 1) the agreement terminates early (section 1 of the HCP); 2) NOAA Fisheries elects to exercise its ability to withdraw from the HCP and/or revoke the ITP according to the conditions set forth in sections 2 and 10 of the HCP; or 3) no later than 50 years from the Effective Date of the HCP, whichever occurs sooner.

12. MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

12.1 Background

The MSA, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance EFH for those species regulated under a Federal fisheries management plan. Pursuant to the MSA:

- Federal agencies must consult with NOAA Fisheries on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (§305(b)(2)).

- NOAA Fisheries must provide conservation recommendations for any Federal or State action that would adversely affect EFH (§305(b)(4)(A)).

- Federal agencies must provide a detailed response in writing to NOAA Fisheries within 30 days after receiving EFH conservation recommendations. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with NOAA Fisheries' EFH conservation recommendations, the Federal agency must explain its reasons for not following the recommendations (§305(b)(4)(B)).

- EFH means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (MSA §3). For the purpose of interpreting this definition of EFH: "waters" include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; "substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities; necessary means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle (50 CFR §600.10). "Adverse effect" means any impact which reduces quality and/or quantity of EFH, and may include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey or reduction in species fecundity), site-specific, or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR §600.810).

- EFH consultation with NOAA Fisheries is required regarding any Federal agency action that may adversely affect EFH, including actions that occur outside EFH, such as certain upstream and upslope activities.

The objectives of this EFH consultation are to determine whether the proposed action as described in Section 3 of this Opinion would adversely affect designated EFH and to recommend conservation measures to avoid, minimize, or otherwise offset potential adverse effects to EFH.

12.2 Identification of EFH

Pursuant to the MSA, the Pacific Fisheries Management Council has designated EFH for three species of Federally-managed Pacific salmon: chinook salmon (*Oncorhynchus tshawytscha*); coho salmon (*O. kisutch*); and Puget Sound pink salmon (*O. gorbuscha*) (1999). Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other water bodies currently or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable manmade barriers (as identified by PFMC 1999), and longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for several hundred years). Detailed descriptions and identifications of EFH for salmon are found in Appendix A to Amendment 14 to the Pacific Coast Salmon Plan (PFMC 1999). Assessment of potential adverse effects to these species' EFH from the proposed action is based, in part, on this information.

12.3 Proposed Action

The proposed action and action area are detailed in Section 3 of this Opinion. The action area includes habitats that have been designated as EFH for various life-history stages of UCR spring-run chinook salmon and UCR summer/fall-run chinook salmon (*O. tshawytscha*) and coho salmon (*O. kisutch*) (once established).

12.4 Effects of Proposed Action

As described in detail in Section 6 of this Opinion, the continued existence and operation of the Project will continue to result in both short- and long-term adverse effects to a variety of habitat parameters. These adverse effects to chinook salmon and coho salmon (once established) are:

Mainstem Spawning Habitat

- Inundation of mainstem summer/fall-run chinook salmon spawning habitat upstream of the Project.
- Altered mainstem summer/fall-run chinook salmon spawning habitat substrate downstream of the Project (reduced proportion of gravels and cobbles downstream of the Project).

Juvenile Rearing Habitat and Juvenile and Adult Migration Corridor

- Altered flow conditions (ramping) that can modify juvenile and adult fish distribution.
- Altered invertebrate (food) sources and production in the mainstem migration corridor for juvenile chinook salmon and coho salmon.

- Altered water quality, especially TDG resulting from uncontrolled spill at the Project.
- Higher than natural predation rates resulting from the Project enhancing predator habitat or foraging opportunities.
- Altered riparian vegetation which can influence cover, food production, temperature, and substrate.
- Altered juvenile behavior or reduced survival of juveniles migrating through the action area as a result of Project inundation and operations.
- Altered adult behavior or reduced survival or spawning success of adults migrating through the action area as a result of Project operations.

The HCP was developed to mitigate, to the extent practical, these adverse impacts on all Plan Species, including chinook salmon and coho salmon (once established).

12.5 Conclusion

NOAA Fisheries concludes that the continued existence and operation of the Project would continue to adversely affect designated EFH for chinook salmon and coho salmon (once established). These adverse effects would continue, but would be mitigated to the extent practical by NOAA Fisheries' issuance of an ITP to Douglas PUD for the implementation of the HCP.

12.6 EFH Conservation Recommendations

Pursuant to §305(b)(4)(A) of the MSA, NOAA Fisheries is required to provide EFH conservation recommendations to Federal agencies, including itself, regarding actions which may adversely affect EFH. The applicable conservation measures described in the FEIS and in Section 3 of this Opinion will be implemented by Douglas PUD at the Project and in upstream tributary habitat. These measures, in addition to those terms and conditions outlined in Section 9 of this Opinion, are generally applicable to designated EFH for chinook salmon and coho salmon and, together, should address these adverse effects to the extent practical (e.g., inundation effects). Consequently, NOAA Fisheries recommends that the terms and conditions in Section 9, in addition to those required by the HCP, be adopted as EFH conservation measures.

12.7 Statutory Response Requirement

Pursuant to the MSA (§305(b)(4)(B)) and 50 CFR §600.920(j), Federal agencies are required to provide a detailed written response to NOAA Fisheries' EFH conservation recommendations within 30 days of receipt of these recommendations. The response must include a description of measures proposed to avoid, mitigate, or offset the adverse impacts of the activity on EFH. In the case of a response that is inconsistent with the EFH conservation recommendations, the response must explain the reasons for not following the recommendations, including the scientific justification for any disagreements over the anticipated effects of the proposed action and the measures needed to avoid, minimize, mitigate, or offset such effects.

12.8 Supplemental Consultation

NOAA Fisheries must reinitiate EFH consultation with itself in the event that it elects to withdraw from the HCP and/or revoke the ITP. This action would constitute a substantially revised proposed action that may adversely affect EFH and new information that affects the basis for NOAA Fisheries' EFH conservation recommendations (50 CFR §600.920(k)).

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APPENDIX A

ASSESSMENT OF THE MID-COLUMBIA HABITAT CONSERVATION PLANS' 93% JUVENILE PROJECT SURVIVAL STANDARD COMPARED TO BASELINE SURVIVAL ESTIMATES AND ESTIMATED SURVIVALS IN A HYPOTHETICAL FREE-FLOWING RIVER

The purpose of this appendix is to assess the relative juvenile survival benefit of implementing the proposed anadromous fish agreements and habitat conservation plans (HCP) compared to two useful points of reference: 1) the survival that might be expected in a hypothetical "free-flowing" or undammed river, and 2) the estimated survival of these fish under existing operations (i.e., baseline conditions that contributed to the current rangewide status of the evolutionarily significant units [ESU] prior to the HCP measures being either partially or fully implemented).

Background and Purpose

The Public Utility District No. 1 of Douglas County (Douglas PUD) and the Public Utility District No. 1 of Chelan County (Chelan PUD) have applied for Incidental Take Permits (ITPs) for the operation of the Wells, Rocky Reach, and Rock Island hydroelectric projects (Projects) in accordance with three HCPs offered for signing on March 26, 2002. The HCPs are the culmination of over nine years of planning and negotiations between the National Marine Fisheries Service (NOAA Fisheries), Douglas PUD, Chelan PUD, and other participants in the HCP process. Participants included U.S. Fish and Wildlife Service (USFWS), Washington Department of Fish and Wildlife (WDFW), the Confederated Tribes and Bands of the Yakama Indian Nation (Yakama), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes of the Umatilla Indian Reservation (Umatilla), American Rivers, and representatives of the major wholesale purchasers of electricity from Wells Dam. All of the participants, with the exception of the Yakama and Umatilla Tribes and American Rivers, indicated their support of the Wells HCP, pending the outcome of regulatory review, by signing the HCP document in the spring of 2002. Douglas PUD, NOAA Fisheries, USFWS, WDFW, the Colville Tribe, and Douglas PUD's power purchasers are hereinafter referred to as the Signatory Parties. The species included in the HCPs include both ESA-listed (Upper Columbia River [UCR] steelhead and UCR spring-run chinook salmon) and unlisted (UCR summer/fall-run chinook salmon, Lake Wenatchee sockeye salmon, and Okanogan River sockeye salmon), collectively referred to as Permit Species.[1]

NOAA Fisheries noticed receiving completed ITPs (Nos. 1391, 1392, and 1393) and HCPs in the Federal Register on June 25, 2002 (67 FR 42755) and received public comments through July 29, 2002. The Environmental Protection Agency (EPA) noticed NOAA Fisheries' Final Environmental Impact Statement (FEIS) in the Federal Register on December 27, 2002 (67 FR 79081), initiating a 30-day cooling-off period during which NOAA Fisheries invited comments on, or questions about, the FEIS. NOAA Fisheries received comments through February 10, 2003. Alternative 3 (Proposed Action - Project HCPs) of the FEIS describes the proposed action as well as the likely effect of issuing the proposed ITPs to Douglas and Chelan PUDs for a

[1]Coho salmon are considered extinct in the Mid-Columbia River and its tributaries. However, coho salmon are also included in the agreement, pending their successful reintroduction. They and the other Permit Species are jointly referred to as "Plan Species" in the HCPs.

period of 50 years. At this time, NOAA Fisheries proposes to issue an ITP permit to Douglas PUD for incidental take of ESA-listed and unlisted salmon and steelhead resulting from the continued operation of the Wells Hydroelectric Project, in accordance with the conservation, minimization, and mitigation measures proposed in the HCP. The FEIS thus serves as NOAA Fisheries' biological assessment for the purpose of consulting on its proposed action of issuing the ITPs in accordance with Section 10(a)(2)(B) of the ESA.

As a good-faith gesture, Douglas and Chelan PUDs have been implementing the operational components of the HCPs since the HCPs were offered for signing in 2002. In addition, Chelan PUD has constructed a new juvenile bypass facility at its Rocky Reach project, which became operational in 2003. Thus the operational and structural components of the HCPs are being fully implemented at all three projects for the first time during the 2003 outmigration.

Fish from the Methow and Okanogan rivers must migrate through all three of the HCP projects, Grant County PUD's Wanapum and Priest Rapids dams, the free-flowing Hanford Reach, and four Federally-owned hydroelectric projects (McNary, John Day, The Dalles, and Bonneville dams). Fish from the Entiat River must migrate through only two HCP projects (Rocky Reach and Rock Island dams) and fish from the Wenatchee River must migrate through only the Rock Island Hydroelectric Project, in addition to the other downstream hydroelectric projects.

Estimate of Survival in Free-Flowing River

Estimates of survival have been made for wild spring-run chinook salmon smolts migrating from the Salmon River trap at Whitebird to Lower Granite Dam (1966 through 1968) and for wild spring chinook salmon and steelhead from 1993 through 1998. The estimates for both periods include survival through Lower Granite Reservoir. NOAA Fisheries, after factoring out mortalities resulting from Lower Granite Dam and Reservoir, has estimated that the per/km survival of Snake River steelhead and spring-run chinook salmon would be approximately 0.99966 and 0.99969, respectively, in a free-flowing Snake River.[2]

The distance from the tailrace of Chief Joseph Dam to the tailrace of Rock Island Dam is approximately 147.6 km and includes the three HCP projects - hereinafter referred to as the HCP Reach. Assuming that per/km survival estimates based on information collected in the Snake River can be utilized as reasonable surrogates for likely per/km survival estimates in a hypothetical free-flowing Columbia River yields the estimates of juvenile survival shown in Table A-1. These values are calculated by taking the per/km survival estimate to the X (# of kilometers in the reach) power. For example: 0.99966 to the 147.6th power = 0.951 or 95.1%. The estimated average "natural" survival through a hypothetical free-flowing HCP Reach would

[2] The methodologies used in this analysis are detailed in Appendix A (Annex 1) of the 2000 FCRPS biological opinion.

be 95.1% and 95.5% for juvenile steelhead and spring-run chinook salmon, respectively (Table A-1).

Estimated Survival Through HCP Reach Under Baseline Conditions

Cooney (2002) reviewed the available survival data during the 1980s and early 1990s in the Mid-Columbia Reach. This information was summarized and presented in the draft Quantitative Analytical Report (QAR). The project survival estimates used in the draft QAR for the HCP projects resulting from operations during this period are shown in Table A-2 (baseline). Survival estimates for each project ranged from 87.1% to 91.3% for migrating steelhead, and from 86.5% to 89.0% for spring-run chinook salmon smolts.

Based on these estimates, the estimated survival of migrating steelhead during this period was approximately 69.8% through the HCP Reach, or 73.4% of the "natural" survival estimate through the hypothetical free-flowing river of equal length. The estimated baseline survival of migrating spring chinook salmon was approximately 67.0% through the HCP Reach, or 70.1% of the estimated survival through the hypothetical free-flowing river of equal length. These are the best estimates available of baseline survival through the HCP Reach.

Estimated Survival Through the HCP Reach (93% Juvenile Project Survival Standard Achieved)

The key juvenile survival metric stipulated in the HCPs is the 93% juvenile project survival metric. This metric encompasses survival through the reservoir, forebay, dam, and tailrace of each individual HCP project during HCP operations that are designed to cover at least 95% of the juvenile migration of each Permit Species. It is the minimum standard that would indicate that the HCP survival standards have been achieved.

This scenario assumes that 95% of the juvenile spring-run chinook salmon and steelhead pass the project and survive at the minimum HCP standard survival rate of 93%. It also assumes that only 96% of the remaining migrants (5%) survive the reservoir, and that all of these fish are forced to pass the dam via turbines at an average survival rate of 91.5%.[3] This approach yields an estimated juvenile project survival of 92.7% ([.95 x.93]+[.05 x.96 x.915]) for both species.

Using these assumptions, the survival at each project for either juvenile steelhead or spring-run chinook salmon would be approximately 92.7% (see Table A-2, HCP, 93% Juvenile Project Survival). The minimum survival estimates through the HCP Reach after implementing the HCPs would be 79.8% for both steelhead and spring-run chinook salmon, representing an improvement over the baseline survival through the HCP Reach of 14.2% for steelhead and

[3] 91.5% is the middle of the range (90% to 93%) of estimated survival for fish passing through turbines at the three HCP projects - see FEIS, table 2-4.

19.1% for spring-run chinook salmon. At each project, implementing the HCP would result in survival improvements (over baseline) ranging from 1.6% to 6.5% for juvenile steelhead and 4.2% to 7.2% for juvenile spring-run chinook salmon.

Comparing these minimum survival estimates as a fraction of those that would occur in a hypothetical free-flowing river of the same length as the HCP Reach is also indicative of the survival benefits accruing to these species as a result of implementing the HCPs. For steelhead and spring-run chinook salmon, minimum HCP survivals would result in survival levels that are roughly 83.9% and 83.5%, respectively, of estimated survival in the hypothetical free-flowing HCP Reach. Comparisons for individual projects result in survivals of between 93.7% and 94.9% (for each species) of those estimated for hypothetical free-flowing rivers of equal length to the individual projects (Table A-2, HCP, 93% Juvenile Project Survival).

These survival estimates should be viewed as very conservative, especially for spring migrating juveniles like UCR steelhead and UCR spring-run chinook salmon. In reality, project survival is expected to be much higher for the following reasons:

1. Because the HCP applies equally to all Permit Species, the differential timing of the migration of each species during the spring will result in 95% to 100% of an individual species' juvenile migration being covered by HCP measures. This will likely not be the case for summer migrants (primarily UCR summer/fall-run chinook salmon).

2. Similarly, because juveniles of different species will undoubtedly survive at different rates under one suite of operations, the requirement to meet the minimum survival standard of each Permit Species will automatically result in some species surviving at rates substantially exceeding the 93% juvenile project survival metric. For example, 15% spill levels may prove sufficient (in addition to other measures) to achieve the standard for steelhead and spring-run chinook salmon, but spill levels of 25% may be needed to meet the HCP standard for sockeye salmon. The increased spill to meet the HCP standard for sockeye salmon in this example would likely result in survival rates in excess of 93% for the other species.

3. Finally, some measures (e.g., operation of juvenile bypass systems at Wells and Rocky Reach) are relatively inexpensive (compared to providing passage via the spillways) and will be operated to cover 95% of the juvenile migrations - potentially covering virtually the entire migration of all Permit Species.

Estimated Survival Through HCP Reach (Actual Survival Measurements with HCP

Operations)

Only four juvenile survival studies that comply with HCP study requirements have been completed at the individual projects. Three of these studies were conducted at the Wells Project (two using steelhead and one using yearling chinook salmon) and the fourth was conducted at the Rock Island Project using yearling chinook salmon.[4] Under most environmental conditions, steelhead and yearling chinook salmon smolts typically survive at similar rates.[5] Thus the average of these project-specific estimates is used in the remainder of this analysis. Because no HCP compliant survival studies have been conducted to date at the Rocky Reach Project, the survival estimate used in this analysis was simply the minimum HCP survival would be achieved (as analyzed in the previous section).[6] For the reasons noted at the end of the previous section, these estimates (especially that for the Rocky Reach Project) should again be viewed as very conservative.

Using these assumptions, the estimated juvenile project survivals range from 92.7% to 95.8% for both species at the HCP projects for a total HCP Reach survival estimate of 84.6%. Compared to baseline survival estimates for juvenile steelhead, fully implementing the HCPs would increase survival by 4.9% to 8.4% at each project (21.1% for the HCP Reach). Compared to baseline survival estimates for juvenile spring-run chinook salmon, fully implementing the HCPs would increase survival by 7.2% to 9.4% at each project (26.3% for the HCP Reach). These results are summarized in Table A-2 (HCP, Actual Measured).

Compared to the hypothetical free-flowing river, implementing the HCPs for steelhead and spring-run chinook salmon will result in survival estimates that are 94.9% to 97.3%, and 94.7% to 97.2%, respectively, of the "free-flowing" survival estimates for reaches of equal lengths to the projects. Together, survival through the HCP Reach would be 88.9% (steelhead) and 88.5% (spring-run chinook salmon) of that estimated to occur through a free-flowing HCP Reach.

Unlisted Permit Species

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[4]The survival of yearling chinook is again being assessed at the Rock Island Project in 2003. Unfortunately, the results of this study were not available for inclusion in this analysis. Additional studies are planned in future years.

[5]In 2001, an extremely low flow year in the Columbia River basin, yearling chinook salmon smolts survived at much higher rates than steelhead smolts.

[6]A new juvenile bypass system was constructed at Rocky Reach Dam and became operational in time for the 2003 migration season. Project operations are being evaluated in 2003 and HCP-compliant survival studies are planned for 2004 through 2006.

Comparisons using the hypothetical free-flowing river cannot be made for unlisted sockeye salmon at this time, as per/km survival estimates for sockeye salmon are unavailable. However, estimates are available for Snake River fall-run chinook salmon, which exhibit an "ocean-type" life history similar to that of UCR summer/fall-run chinook salmon. The 2000 FCRPS biological opinion provided two estimates of juvenile Snake River fall-run chinook salmon survival through a hypothetical free-flowing Snake River. The first (Method A) provided an estimate of .9978 per/ km, and the second (Method B) provided an estimate of .9995 per/km. Using these estimates, survival through a free-flowing river of equal length to each HCP project could range from 86.4% to 98.3%. Survival through the HCP Reach could range from 72.3% to 92.9% using these estimates (see Table A-1). Survival of unlisted sockeye salmon in a free-flowing river would most likely be similar to that of other spring migrants.

For the unlisted Permit Species, implementing the HCPs will probably result in survival levels somewhere between those estimated for the listed Permit Species with the HCP Juvenile Project Survival Standards merely being met and the actual measured survival estimates (i.e., 92.7% to 95.8%) (see Table A-2). Because estimates of juvenile steelhead and spring-run chinook salmon survival through hydroelectric projects are generally equal to or higher than those estimates for summer/fall-run chinook salmon or sockeye salmon, the expected improvement in survival should also be equal to or greater than those indicated in Table A-2 for the ESA-listed species. Thus for those unlisted juveniles migrating through the entire HCP Reach, survival should also improve by approximately 14% to 26% compared to the survival rates that were probably occurring prior to any HCP measures being implemented (baseline).

Implementing the HCPs should increase survival rates of juvenile sockeye salmon to a similar extent (if per/km juvenile sockeye salmon survival rates are similar to or lower than those estimated for ESA-listed steelhead or spring-run chinook salmon) compared to a hypothetical free-flowing HCP Reach (i.e., to somewhere between 83.5% and 88.9%).

Assuming that only the minimum HCP juvenile project survival standard (93% covering 95% of the migration) is achieved for UCR summer/fall-run chinook salmon (92.7% survival for the entire migration), implementing the HCPs would result in HCP Reach survivals of 79.7%. Compared to survival through a free-flowing HCP Reach (72.3% using Method A and 92.9% using Method B), this would equate to a relative survival of 110.2% using Method A and 85.8% using Method B. Using Method A per/km survival estimates appears to generate unreasonable survival estimates (i.e., expected survivals with the HCP would be higher than survival estimates for hypothetical free-flowing river reaches of equal lengths) when compared to the analysis for other species presented earlier in this document. Method B per/km survival estimates appear to generate comparative HCP Reach survival estimates more in line with those estimated for other species: 85.8% of the hypothetical free-flowing river versus 83.9% for steelhead and 83.5% for spring-run chinook salmon. Achieving the HCP project survival standards would thus appear to provide equivalent or higher survival levels (compared to the hypothetical free-flowing river of the same length) for UCR summer/fall-run chinook salmon as for UCR steelhead or UCR spring-run chinook salmon.

Conclusions

Based on this analysis, for ESA-listed UCR steelhead and UCR spring-run chinook salmon smolts, implementing the HCPs should provide survival levels similar to (or greater than, in the case of the Rocky Reach Project) those actually measured in recent years Table A-2 (HCP, Actual Measured). Thus implementing the HCPs would substantially increase survival rates of juvenile steelhead and spring-run chinook salmon through each project as well as through the HCP Reach (by up to approximately 21% for steelhead and 26% for spring-run chinook salmon) compared to baseline survival estimates. Survival rates with the HCPs should result in juvenile survival rates approaching 90% of those estimated for a hypothetical free-flowing river reach of comparable length for steelhead and spring-run chinook salmon (and for unlisted sockeye salmon) (see Table A-2, HCP, Actual Measured) and 86% or better for summer/fall-run chinook salmon (see Unlisted Species section above).

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Table A-1. Estimated average per/km juvenile survival of steelhead and chinook salmon in a hypothetical free-flowing river through the HCP projects and HCP Reach.

	Species		Steelhead	Spring Chinook	Summer/Fall Chinook	
					Method A	Method B
	Per/km survival estimate		0.99966	0.99969	0.9978	0.9995
Project	Length (miles)	Length (km)	Est. Surv. Steelhead	Est. Surv. Spring Chinook	Est. Surv. Sum/Fall chinook	
					Method A	Method B
Rock Island	21.1	34.0	0.989	0.990	0.928	0.983
Rocky Reach	41.3	66.5	0.978	0.980	0.864	0.967
Wells	29.3	47.2	0.984	0.985	0.901	0.977
HCP Reach	91.7	147.6	0.951	0.955	0.723	0.929

Source: 2000 FCRPS Opinion, pg. 9-262 and 263.

Table A-2. Estimates of baseline, minimum HCP implementation, and actual estimated survivals of juvenile steelhead and spring-run chinook salmon in the HCP Reach compared to estimated survival in a hypothetical free-flowing river.

Estimated Juvenile Steelhead Survivals								
	Baseline (Draft QAR 2002)		HCP (93% Juvenile Project Survival)[1]			HCP (Actual Measured)[1, 2]		
Project	Project Survival	Percentage of Free-flowing	Project Survival	Est. Survival Improvement	Percentage of Free-flowing	Project Survival	Est. Survival Improvement	Percentage of Free-flowing
Rock Island	0.878	88.8 %	0.927	5.6%	93.8%	0.952	8.4%	96.3%
Rocky Reach	0.871	89.1%	0.927	6.5%	94.9%	0.927	6.5%	94.9%
Wells	0.913	92.8%	0.927	1.6%	94.2%	0.958	4.9%	97.3%
HCP Reach Total	0.698	73.4%	0.798	14.2%	83.9%	0.846	21.1%	88.9%

Estimated Juvenile Spring-run Chinook Salmon Survivals								
	Baseline (Draft QAR 2002)		HCP (93% Juvenile Project Survival)[1]			HCP (Actual Measured)[1, 2]		
Project	Project Survival	Percentage of Free-flowing	Project Survival	Est. Survival Improvement	Percentage of Free-flowing	Project Survival	Est. Survival Improvement	Percentage of Free-flowing
Rock Island	0.870	87.9%	0.927	6.6%	93.7%	0.952	9.4%	96.2%
Rocky Reach	0.865	88.3%	0.927	7.2%	94.7%	0.927	7.2%	94.7%
Wells	0.890	90.3%	0.927	4.2%	94.1%	0.958	7.6%	97.2%
HCP Reach Total	0.670	70.1%	0.798	19.1%	83.5%	0.846	26.3%	88.5%

[1] Project Survival standard apples to 95% of the juvenile migration. The remaining 5% is assumed to pass through turbines. These are minimum estimates as some juvenile measures (Wells bypass operations and Rocky Reach bypass operations) will cover nearly 100% of the migration of UCR steelhead and/or spring-run chinook at these projects. Turbine survival estimated at 91.5% (middle of range presented in table 2-4 of FEIS); pool survival estimated at 96.0% (consistent with draft QAR analysis and similar to pool survival estimates in 2000 FCRPS Opinion).

[2] Wells Project survival estimates represent the average of three juvenile survival studies conducted in accordance with the HCP study requirements and with HCP operations being implemented (covering 95% of the juvenile migrants). Individual estimates were: 1998 yearling chinook salmon (99.7%); 1999 steelhead (94.3%); 2000 steelhead (94.6%). Rock Island Project survival estimates represent a single juvenile survival study conducted in accordance with the HCP study requirements (covering 95% of the juvenile migrants) and with HCP operations being implemented. The estimate for 2002 yearling chinook was 95.6%. Rocky Reach had no survival studies conducted which meet HCP study requirements or operations.