UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
Seattle, WA 98115

VIA ELECTRONIC FILING

February 1, 2008

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

RE: Biological Opinion for the Priest Rapids Hydroelectric Project, FERC No. 2114 (NMFS Consultation No. 2006/01457)

Dear Secretary Bose:

Enclosed is the National Marine Fisheries Service's (NMFS) Biological Opinion on the Federal Energy Regulatory Commission's (FERC) proposed license for the operation of the Priest Rapids Hydroelectric Project (FERC No. 2114). In this Biological Opinion, NMFS determined that the proposed action is not likely to jeopardize the continued existence of the Upper Columbia River spring-run Chinook salmon (*Oncorhynchus tshawytscha*) and Upper Columbia River steelhead (*O. mykiss*).

Enclosed as Section 3 of the Biological Opinion is a consultation regarding essential fish habitat (EFH) under the Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267). NMFS finds that the proposed action will adversely affect EFH for Chinook salmon and coho salmon (*O. nerka*) and recommends that the terms and conditions of Section 2.9 of the Biological Opinion be adopted as EFH conservation measures. Under MSA §305(b)(4)(B) and 50 CFR 6000.920(j), Federal agencies are required to provide a written response to NMFS' EFH conservation recommendations within 30 days of receipt of these recommendations.

Comments or questions regarding this biological opinion and MSA consultation can be directed to Scott Carlon at 503-231-2379 (Scott.Carlon@noaa.gov) or Keith Kirkendall, FERC/Water Diversion Branch Chief, at 503-230-5431 (Keith.Kirkendall@noaa.gov).

Sincerely,

D. Robert Lohn

D. Robert Lohn
Regional Administrator

Enclosure

Cc: Service List

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Grant PUD	)	**Priest Rapids**
	)	**Hydroelectric Project**
	)	**FERC No. 2114**

CERTIFICATE OF SERVICE

I hereby certify that I have this day served, by electronic mail, a letter to Kimberly D. Bose, Secretary, Federal Energy Regulatory Commission, from the National Marine Fisheries Service regarding Biological Opinion for the Priest Rapids Hydroelectric Project, FERC No. 2114 (NMFS Consultation No. 2006/01457) and the foregoing document and this Certificate of Service has been served to each person designated on the official service list compiled by the Commission in the above captioned proceeding.

February 1, 2008

Bethany Downs

Bethany Downs, Secretary
FERC & Water Diversions Branch
Hydropower Division

Endangered Species Act
Section 7(a)(2) Consultation

Biological Opinion

and

Magnuson-Steven Fishery Conservation and Management Act

New License for the Priest Rapids Hydroelectric Project

FERC Project No. 2114
Columbia River, HUC 1702001604
Grant, Yakima, Kittitas, Douglas, Benton, and Chelan Counties, Washington

Action Agency:	Federal Energy Regulatory Commission
Consultation Conducted by:	National Marine Fisheries Service Northwest Region Hydropower Division
NMFS Log Number:	2006/01457
Date:	February 1, 2008

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TABLES & FIGURES

TERMS AND ABBREVIATIONS

Advanced Turbine	new turbines designed by Voith Siemens for the Department of Energy Advanced Hydro Turbine Program
ANODEV	Analysis of Deviance
Central	Communication and control center for coordinating and accounting of power produced by the seven-dam mid-Columbia hydropower complex
cfs	cubic feet per second
CHART	Critical Habitat Analytic Review Team
DPAAP	Downstream Passage Alternatives Action Plan
DPS	distinct population segment
EFH	essential fish habitat
ESA	Endangered Species Act
ESU	evolutionarily significant unit
FCRPS	Federal Columbia River Power System
FEIS	Final Environmental Impact Statement
FERC	Federal Energy Regulatory Commission
FPA	Federal Power Act
FPE	fish passage efficiency
FUB	Future Unit Bypass
GBT	gas bubble trauma
Grant PUD	Public Utility District No. 2 of Grant County, Washington
HCP	Habitat Conservation Plan
HGMP	Habitat Genetics Management Plan
HUC5	Hydrologic Unit Code at the fifth field schedule
ICTRT	Interior Columbia Basin Technical Recovery Team
LiDAR	Light Detection and Ranging
MPG	Major Population Grouping
MSA	Magnuson-Stevens Fishery Conservation and Management Act
msl	mean sea level
MW	megawatt
NMFS	National Marine Fisheries Service
Opinion	this Biological Opinion
PCE	primary constituent element
PFMC	Pacific Fisheries Management Council
PIT	passive integrated transponder
PRCC	Priest Rapids Coordinating Committee
Project	Priest Rapids Hydroelectric Project, FERC No. 2114
Proposed Action	FERC's issuance of a new license for Priest Rapids Hydroelectric Project for a term of up to 50 years
PUD	public utility district
RM	river mile
Settlement Agreement	Priest Rapids Project Salmon and Steelhead Settlement Agreement
TDG	total dissolved gas
TMDL	total maximum daily load

TPL	Trust for Public Land
UCR	Upper Columbia River
USFWS	U.S. Fish and Wildlife Service
VSP	viable salmonid population
WDFW	Washington Department of Fish and Wildlife
WDOE	Washington Department of Ecology
WS	United States Department of Agricultural Animal and Plant Health Inspection Service-Wildlife Services

1. INTRODUCTION

The Biological Opinion (Opinion) and incidental take statement portions of this consultation were prepared by the National Marine Fisheries Service (NMFS) in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973, as amended (16 USC 1531, et seq.), and implementing regulations at 50 CFR 402. With respect to critical habitat, the following analysis relied only on the statutory provisions of the ESA, and not on the regulatory definition of "destruction or adverse modification" at 50 CFR 402.02.

The essential fish habitat (EFH) consultation was prepared in accordance with section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 USC 1801, et seq.) and implementing regulations at 50 CFR 600. The administrative record for this consultation is on file at the Hydropower Division office in Portland, Oregon.

1.1 Background and Consultation History

On March 6, 2006, NMFS received a request for formal consultation under the ESA and consultation under the MSA from the Federal Energy Regulatory Commission (FERC). FERC proposes to issue a new Federal license for the operation of the Priest Rapids Hydroelectric Project (FERC Project No. 2114, hereafter the Project). The Project is owned and operated by the Public Utility District No. 2 of Grant County (Grant PUD). FERC concluded that the proposed relicensing of the Project is likely to adversely affect Upper Columbia River (UCR) spring-run Chinook salmon (*Oncorhynchus tshawytscha*) and UCR steelhead (*O. mykiss*), species that are listed under the ESA as endangered. The Project does lie within designated critical habitat for these species.

On May 3, 2004, NMFS issued an Opinion (NMFS 2004) on interim operations[1] of the Project, which contained crucial measures for the Project to avoid jeopardizing the continued existence of UCR spring-run Chinook salmon and UCR steelhead. Accordingly, FERC issued an order amending the Project's license by incorporating the mandatory conditions in NMFS (2004). These measures were later integrated into the Priest Rapids Project Salmon and Steelhead Settlement Agreement (Settlement Agreement) filed with FERC on February 10, 2006. In November, 2006, FERC issued its Final Environmental Impact Statement (FEIS) for the Project.

1.2 Project Description and Location

The Project, consisting of the Priest Rapids and Wanapum developments, was originally licensed in 1955 and constructed between 1956 and 1964. At present, the total generating capacity is 1,768.8 megawatts (MW). The Project occupies about 58 miles of the Columbia River in central Washington in portions of Grant, Yakima, Kittitas, Douglas, Benton, and Chelan Counties. The Project comprises the two most downstream dams of the seven-dam, 13,600 MW mid-Columbia hydroelectric system, which extends from the US/Canadian border to the upstream end of the Hanford Reach National Monument, a total of about 351 river miles (Figure 1).

[1]Operation of the Project until a new license is issued or expiration of the May 3, 2004 Opinion (December 31, 2013), whichever comes first.

Priest Rapids Development

The Priest Rapids development (Figure 2) was completed in 1961 and is located at river mile (RM) 397 of the Columbia River. The dam consists of both earth embankment and concrete sections that span about 10,103 ft across the river channel, and impounds 18 miles of river with a gross reservoir storage capacity of 237,100 acre-feet (48,600 acre-feet of active storage) and a surface area of 7,725 acres at a normal maximum pool elevation of 488.0 feet above mean sea level (msl). The forebay has a normal operating range of 7.5 feet (481.5-488 feet msl). The powerhouse contains 10, vertical shaft, 6-blade adjustable Kaplan turbines with a total nameplate generation capacity of 955.6 MW. Total powerhouse hydraulic capacity is roughly 175,000 cubic feet per second (cfs). The spillway has a total hydraulic capacity of 1,400,000 cfs and consists of 22 gated (tainter gates) ogee weir spill bays and one top-spill sluiceway (Grant PUD 2003).

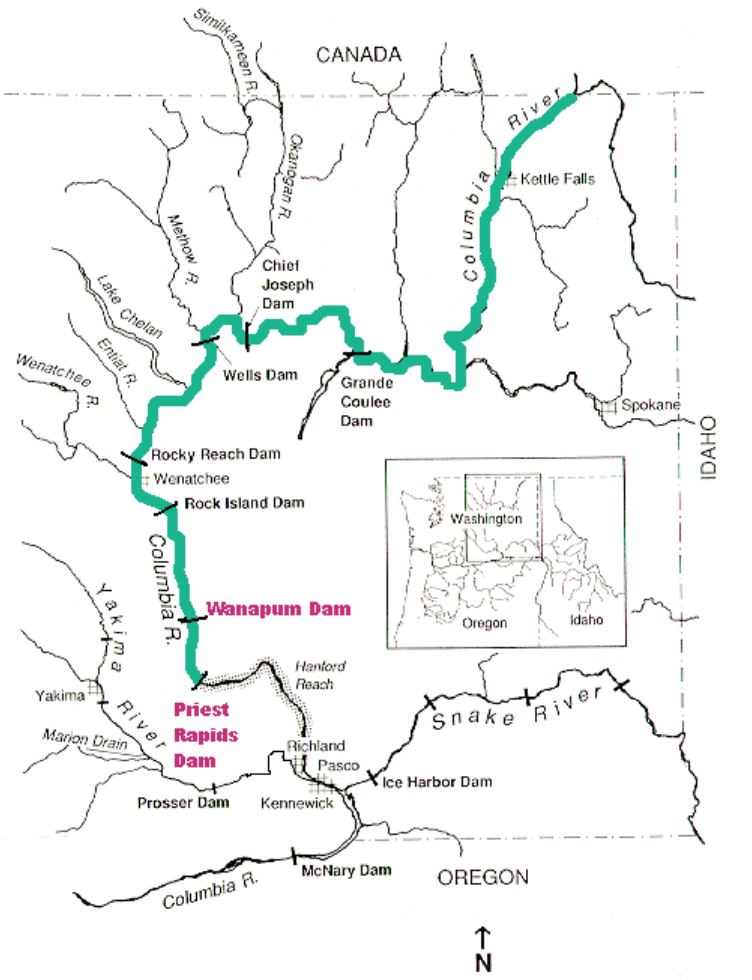

Figure 1. Mid-Columbia hydroelectric system

Adult fish passage is provided via two ladders, one on the right bank and one on the left bank.[2] The left bank fishway consists of a powerhouse adult fish collection channel connected to the left main entrance and ladder, and an off-ladder trapping and handling facility. The right bank ladder is located adjacent to the west end of the spillway. Both ladders contain video fish counting facilities and passive integrated transponder (PIT) tag detectors. Downstream migrants, including juveniles, adult fallbacks and steelhead kelts, pass Priest Rapids Dam either through the turbines or the spillway (including sluiceway) or are collected from the gatewells, transported around the dam and released in the tailrace. There is no volitional juvenile passage facility operating at Priest Rapids Dam at this time.

[2] "Left" or "right" bank refers to the side of the river looking downstream.

Figure 2. Priest Rapids Development

Figure 3. Wanapum Development

Wanapum Development

Wanapum Dam (Figure 3) was completed in 1964 and is located on the Columbia River at RM 415. The dam consists of both earth embankment and concrete sections that span about 8,637 feet across the river channel. The dam impounds 38 river miles, creating a gross reservoir storage capacity of 693,600 acre-feet and a surface area of 14,680 acres at a normal maximum pool elevation of 571.5 feet msl. The forebay has a normal operating range of 11.5 ft (560-571.5 feet msl). The powerhouse encloses 10 turbine bays with vertical shaft, 5-blade adjustable Kaplan turbines. However, Grant PUD is now on a schedule to replace all 10 turbines with new, 6-blade adjustable advanced turbines by 2013. At present, three of the old turbines have been replaced with the new advanced turbines and a fourth turbine will be replaced by October of 2008. The current generation capacity is about 1,038 MW and the total powerhouse hydraulic capacity is around 180,000 cfs. The spillway has a total hydraulic capacity of 1,400,000 cfs and consists of 12, gated ogee weir spill bays and one top-spill sluiceway (Grant PUD 2003).

Adult fish passage is provided by right bank and left bank ladders. The left bank ladder consists of a powerhouse adult fish collection channel connected to the left bank main entrance and fish ladder. The right bank ladder is located adjacent to the west end of the spillway. Both ladders contain video fish counting facilities and PIT tag detectors. At present, downstream migrants, including juveniles, adult fallbacks and steelhead kelts, pass Wanapum Dam through the turbines, the spillway (including sluiceway), or are collected from the gatewells and transported around the dam and released in the tailrace.

1.3 Current Project Operations

The Project is an integral part of the seven dam complex that makes up the mid-Columbia River hydroelectric system. Moving upstream from the Project, the other developments are Rock Island (RM 453) and Rocky Reach Dams (RM 474), owned and operated by Chelan County Public Utility District (PUD); Wells Dam (RM 516), owned and operated by Douglas County PUD; Chief Joseph Dam (RM 545), owned and operated by the U.S. Army Corps of Engineers; and Grand Coulee Dam (RM 597), owned and operated by the U.S. Bureau of Reclamation.

Several agreements, treaties, and natural resource requirements shape how the mid-Columbia hydroelectric system, including the Project, is operated. These include the Columbia River Treaty, Columbia Storage Power Exchange, Canadian Entitlement Allocation Agreements and Extension Agreements, Non-Treaty Storage Agreement, Pacific Northwest Coordination Agreement, Power Purchasers Agreement, Hourly Coordination Agreement, and the Hanford Reach Fall Chinook Protection Program. In essence, these agreements are intended to achieve the goals of flood control, protection and enhancement of fishery resources, assure power supply during peak demand periods, load following, and to keep the transmission systems reliable (Grant PUD 2003).

The Hourly Coordination Agreement is the primary mechanism that influences day-to-day operations of the Project. During development of this agreement, Grant PUD was designated to coordinate scheduling activities and dispatching between the seven mid-Columbia developments at its headquarters (Central). Each day the non-Federal Hourly Coordination participants provide an estimated schedule of desired generation from the lower five non-Federal developments (Wells, Rocky Reach, Rock Island, Wanapum, and Priest Rapids). The Federal project operators provide an estimate of water likely to be discharged from the Grand Coulee and Chief Joseph developments. Central then determines an estimated operation schedule for the following day based on anticipated flows from the Federal developments, reservoir levels and load. Central sends the schedule to each of the five lower non-Federal developments. Each development then pre-schedules its operation, including hourly generation, for the following day based on Central's estimated operation schedule.

During real-time operation each non-Federal project sends Central an uncoordinated load request signal every four seconds. Computer systems at Central determine the actual allocation of generation required to meet load demand and non-power constraints for the mid-Columbia system. The Grand Coulee and Chief Joseph developments are primarily used to satisfy on-peak demand, whereas the Wanapum and Priest Rapids Developments are largely designed to meet daily load requirements through the assignment of allocated generation by Central (FERC 2006).

1.3.1 Anadromous Fish

NMFS (2004) directed Grant PUD, through FERC, to implement a host of measures to avoid jeopardizing listed anadromous species. The primary requisite condition in NMFS (2004) is a Project survival standard for juvenile migrants. The standard is a 93 percent per development (dam and reservoir combined) juvenile survival, or a Project (both developments combined) juvenile survival of 86.5 percent (0.93 X 0.93=0.8649). Many of the remaining requisite measures in NMFS (2004) are designed to achieve this standard. Other measures are aimed at supplementation and habitat restoration.

Some of the measures directly affect Project operations, others are actions carried out on the Project but do not necessarily change operations. For example, measures that require spill or seasonal changes to turbine operations affect how the Project is operated, i.e., the usual, day-to-day operation is altered by the measure. Measures that are carried out within the Project

boundary, such as predatory bird hazing or pikeminnow removal, do not essentially alter usual, day-to-day operations. The following describes current operations that are a result of measures from NMFS (2004) that modify Project operations to avoid jeopardizing UCR spring-run Chinook salmon and UCR steelhead.

1.3.2 Spill

Juvenile Pacific salmonids conduct their migration to the ocean from early spring to mid-summer. To improve juvenile fish passage efficiency (FPE), i.e., percent passage via a non-turbine route, the fish management agencies and Tribes reached an agreement with Grant PUD in July 2000, for a spring and summer spill operation. The agreement for spill during the spring period (early April to June 15) calls for spill of 43 percent and 61 percent of average daily total river flow at Wanapum Dam and Priest Rapids Dam, respectively. Spring spill ends when either 95 percent of the spring migrants have passed or June 15, which ever occurs first. The spring portion of the spill agreement is also required under NMFS (2004) for listed UCR spring-run Chinook salmon and UCR steelhead, which migrate to the Pacific during the spring months. As such, spill typically begins at both developments in mid April when juvenile migrants begin arriving and terminates on June 15, at which time Grant PUD switches to a summer spill program for summer migrating anadromous species. The summer migrating species are not listed under the ESA.

Spill operations are constrained by total dissolved gas limits. The Washington Department of Ecology (WDOE) sets seasonal limits on the amount of total dissolved gas (TDG) that can occur in the Columbia River. The limits are an average of 115 percent TDG in the forebay and 120 percent TDG in the tailrace of each development. These averages are based on the 12 highest readings taken in any one day. If these limits are exceeded at either development, Grant PUD consults with the fish management agencies to determine the necessary reduction in spill volume and then adjusts the volume until TDG falls within WDOE's standards. Note that TDG levels arriving at the forebay of any development in excess of the 115 percent standard is the responsibility of the next upstream development to correct, if possible. For Grant PUD, violation of the TDG standard at the forebay of Priest Rapids Dam typically requires reduction in spill at Wanapum Dam, which is the next upstream development.

The Wanapum Dam spillway tends to elevate TDG even with flow deflectors which are designed to reduce TDG production. As a result, Grant PUD cannot maintain a spill rate of 43 percent at Wanapum Dam and usually must reduce the spill volume by about 10 percent in early to mid May as river temperature rises. On the other hand, the spill volume at Priest Rapids Dam can usually be maintained at 61 percent of river flow through the spring migration season due to its shallow stilling basin.[3]

Grant PUD continues to provide spring spill as required in NMFS (2004), which allows for adjustments in the spill program as more information about juvenile passage is developed. It further requires development of alternative passage programs. For example, a series of Project survival studies using juvenile Chinook salmon have shown that survival through the Wanapum

[3] TDG becomes elevated when water plunges over a spillway, carrying atmospheric gases deep into a stilling basin. For this reason, TDG is lower at projects with shallow stilling basins.

spillway is the most lethal route of passage at this development for this species (English et al. 2003, Robichaud et al. 2003). Consequently, the spill program has undergone significant adjustment over the last 3 years. The current spill program begins with target spill levels, but as TDG rises, spill at Wanapum Dam is reduced to just the top-spill bulkhead in spill bay 12 and the sluiceway. Both of these routes achieve good survival but do not pass significant numbers of juvenile migrants. Grant PUD is currently constructing the Wanapum Future Unit Fish Bypass which is intended to be the alternative non-turbine passage route and is designed to minimize TDG production.

In contrast, spill at Priest Rapids Dam has proven to be a viable passage alternative for juvenile migrants. Studies show survival through this spillway is acceptable and ranges from 95-98 percent for both Chinook salmon and steelhead (English et al. 2003; Robichaud et al. 2003), with FPE for steelhead reported to be about 70 percent (Skalski et al. 2000). As with Wanapum, Grant PUD begins with the target spill level of 61 percent of flow and is usually able to maintain this level throughout the spring migration season. Grant PUD is currently developing alternatives to spill, in consultation with NMFS and the Priest Rapids Coordinating Committee (PRCC)[4], for juvenile passage at Priest Rapids Dam.

1.3.3 Powerhouse

Wanapum Dam

Based on turbine model studies, fish distribution data, and a turbine survival study (Normandeau Associates and Skalski1996), Grant PUD developed a model to predict juvenile salmonid survival rates through the Wanapum turbines over a range of forebay elevations, flows, and turbine efficiencies. Based on the model results, Grant PUD operates all 10 turbines within the 95 percent fish survival curve during the fish passage season. Discharge through all turbines is limited so as to not exceed 15,700 cfs to minimize cavitation. During periods of high river flow and forced spill (i.e., river flow exceeds powerhouse capacity), this limit is exceeded to decrease spill volume and stay within TDG criteria, if possible.

On October 2, 2003, and supplemented on April 5 and May 28, 2004, Grant PUD filed an application to amend its license for the Project seeking authorization to replace the 10 turbines at the Wanapum Development with new, advanced turbines. After discussions with NMFS and other members of the PRCC and under FERC (2004a), Grant PUD installed and tested an advanced turbine at Unit 8. Biological evaluation of this turbine showed that juvenile fish survival through the turbine was equal to or slightly better than for the existing turbines. Based on this evaluation, and after conferring with NMFS and the PRCC, Grant PUD sought and received approval from FERC to replace the remaining nine turbines (FERC 2005). At present, three of the old turbines have been replaced with the new advanced turbines and a fourth will be replaced by October of 2008. Grant PUD expects to finish replacing all ten turbines by 2013.

[4] The Priest Rapids Coordinating Committee consists of representatives from the U.S. Fish and Wildlife Service, National Marine Fisheries Service, Washington Department of Fish and Wildlife, Colville Indian Reservation, Yakama Nation, Confederated Tribes of the Umatilla Indian Reservation, and Grant PUD.

Priest Rapids Dam
In spring 2005, Grant PUD conducted a turbine evaluation at Priest Rapids Dam (Normandeau Associates and Skalski 2005). The objectives of the Priest Rapids turbine evaluation were to (1) estimate direct survival probabilities within ±0.025, 95 percent of the time, and (2) evaluate the relationship between turbine discharges and the survival and condition of juvenile fish entrained at different depths. Ultimately, the goal was to use the resulting data to operate the turbine units (and powerhouse) in such a manner that ensures the highest survival rate for salmonid turbine passage. Grant PUD now operates the turbines in a non-cavitation mode and operates two or more adjacent turbines concurrently during the spring migration period. Running adjacent turbines is thought to reduce predation by piscivorous birds (e.g., gulls and turns).

1.4 Proposed Action

The Proposed Action is FERC's issuance of a new license under the Federal Power Act (FPA) for the existing Project for a term of up to 50 years (Proposed Action). The Proposed Action includes license requirements consistent with the FERC staff's recommended alternative in its FEIS (FERC 2006). In addition, the Proposed Action includes measures that Grant PUD will implement, under the February 10, 2006 Settlement Agreement, in collaboration with Federal, state, and Tribal governments. To the extent that FERC staff's recommended alternative and the measures in the Settlement Agreement may affect listed salmonids or their critical habitat, this Opinion analyzes the effects of such measures.

The measures contained within the Proposed Action in FERC (2006), Grant PUD (2003) and the Settlement Agreement were essentially developed prior to NMFS (2004). As such, the measures proposed for listed anadromous fish species have been *in action* since issuance of the 2004 Opinion (NMFS 2004). That is, as described in section 1.3, Grant PUD has been carrying out, or is in the process of developing, the requisite measures contained in NMFS (2004). For this reason, the measures in the Proposed Action, described in this section, are, for all intents and purposes, *updates* to or a continuation of measures already under development or currently being carried out.

1.4.1 Juvenile Fish passage

Project Survival Standard
FERC (2006) recommended measure:

- Make steady progress towards achieving a minimum 91 percent combined adult and juvenile salmonid survival performance standard at the project.

The 91 percent standard included in FERC's recommended measure is further explained in FERC (2006) at Section 3.5.2, page 138. The 91 percent is a combined juvenile and adult survival standard that includes a 93 percent juvenile survival standard per development (reservoir and dam), or a Project (both developments combined) juvenile survival standard of 86.5 percent (0.93 X 0.93=0.8649).

Based on 3 consecutive years of yearling Chinook salmon PIT-tag survival evaluations for the Project, Grant PUD has satisfied the survival Project standard for this species (Anglea et al. 2003, 2004 and 2005). The Priest Rapids Project survival estimates for each of the past 3 consecutive years was 86.63 percent during 2003, 86.4 percent in 2004, and 86.74 percent in 2005. The arithmetic average of these three estimates is 86.59 percent, which is above the required 86.49 percent Project standard set out in NMFS (2004).

Grant PUD is currently in the process of evaluating steelhead survival through the Project, and proposes to continue efforts to accomplish the 93 percent standard. This measure is included in the Settlement Agreement.

Downstream Passage Alternatives Action Plan

FERC (2006) recommended measure:

- Develop and annually revise a Downstream Passage Alternatives Action Plan (DPAAP) to contribute to achievement of the applicable performance standards at Wanapum and Priest Rapids Dams.

The DPAAP (Voskuilen 2003) was developed by Grant PUD in 2002. The purpose of this measure was to develop, and revise as necessary, a logical process by which to accomplish the passage survival standard for the Project. This measure is included in the settlement agreement.

Spill

*FERC (2006) recommended measures***:**

- Evaluate modifications to the spill regime and spill pattern at each dam to improve juvenile salmonid survival while remaining within applicable TDG limits;

- continue to study possible ways to improve downstream juvenile salmonid survival at Priest Rapids Dam, including alternative application of top-spill concepts;

- continue to provide spill at 61 percent of river flow in spring for downstream passage at Priest Rapids Dam until a better downstream passage alternative is designed, tested, and implemented;

- continue to provide spill at 43 percent river of flow in spring for downstream passage at Wanapum dam until a better downstream passage alternative is designed, tested, and implemented;

- construct a downstream fish bypass at Wanapum dam consisting of an ogee-crested weir through the center of Unit 11 and a submerged tailrace chute; and

- investigate the gate seals at Wanapum dam as a source of juvenile salmonid mortality.

All of these measures are already in place or are under development. Grant PUD jointly manages spring spill in consultation with the agencies and Tribes. Prior to each spring migration season, three members of the PRCC volunteer to participate on a *spill team*. Conference calls are frequently held to discuss start-up dates, fish numbers, and spill options as river temperatures and

TDG begin to rise, or if there are any maintenance emergencies that affect spill operations. NMFS has participated in evaluating spill patterns for both developments at Grant PUD's physical models at the University of Iowa, and Grant PUD, in consultation with NMFS and the PRCC, is currently investigating alternative spill and top-spill concepts.

Grant PUD will continue with the 61 percent spill rate at Priest Rapids until an alternative, non-turbine passage option is developed that demonstrates downstream passage survival equaling or exceeding that provided by the current spill program. A top-spill concept is currently under evaluation at Priest Rapids Dam. The Wanapum Dam Future Unit Bypass (FUB) Facility is currently under construction in the future Unit 11 bay. Beginning with the 2008 spring migration season, this will begin operating and is expected to replace the current spill program.

Powerhouse Operations

*FERC (2006) recommended measures***:**

- To improve turbine passage survival at Priest Rapids and Wanapum Dams, develop and implement operating criteria to avoid settings that have been shown to result in poor survival and, in the future, install new Advanced Design Turbines; and

- study the effects of gatewell exclusion screens on juvenile salmonid passage.

Turbine operating criteria have been established for both developments (see Section 1.3.3 above). Replacement of the existing 10 turbines with new advanced turbines at Wanapum Dam is progressing with completion expected by 2013. Grant PUD anticipates replacing the existing turbines at Priest Rapids Dam with new advanced turbines as well. Grant PUD also proposes to install gatewell exclusion screens to prevent juvenile migrants from being entrained into the powerhouse gatewells at both developments and to eliminate their gatewell dipnetting program. Studies regarding gatewell exclusion screens will be conducted.

Predator Controls

FERC (2006) recommended measures:

- Fund a northern pikeminnow removal program to improve smolt passage survival through the reservoirs and tailraces of Priest Rapids and Wanapum Dams; and

- fund and implement an avian hazing and control program to improve smolt passage survival through the tailraces of Priest Rapids and Wanapum Dams.

These programs are currently in place. Grant PUD develops annual reports for the PRCC and any proposed changes to these programs are done in consultation with the PRCC.

Fish Evaluations

FERC (2006) recommended measures:

- As part of anadromous fish monitoring and evaluation studies, use radiotelemetry or other techniques to evaluate upstream and downstream route-specific survival at Priest Rapids and Wanapum Dams.

- As part of anadromous fish monitoring and evaluation studies, conduct survival studies using PIT-tag technology or other suitable study methods to obtain dam and project passage survival estimates.

These programs are ongoing under NMFS (2004) and the Settlement Agreement. With approval from NMFS and the PRCC, Grant PUD has begun to use acoustic tags to study both fish behavior and Project survival.

1.4.2 Adult Fish Passage

FERC (2006) recommended measures:

- Continue to operate and maintain two adult fishways at each dam according to Fishway Operating Plans and investigate methods for improving hydraulic conditions in the fishway collection channels, junction pools, and entrance pools;

- use the spill and bypass programs for juvenile downstream passage to provide fallback passage routes for adult spring and (unlisted) summer Chinook salmon and operate the sluiceways at both Priest Rapids and Wanapum Dams to provide fallback routes for steelhead and (unlisted) fall Chinook salmon;

- construct, operate, and maintain an off-ladder adult trapping facility in the left-bank fishway at Priest Rapids Dam;

- operate and maintain PIT-tag detection equipment at the Priest Rapids fishways; and

- fund fish counting at Priest Rapids and Wanapum Dams, provide daily fish counts for both facilities, and develop video monitoring capability for counting adults in fishways at both dams.

After discussions with NMFS, Grant PUD made changes to adult fish entrances at Priest Rapids Dam in 2005. Preliminary results indicate that collection channel and slotted entrance velocity targets have been improved. A removable velocity meter was installed in the collection channel which greatly assists with monitoring. The sluiceways at both developments are being operated for steelhead kelts and adult fallbacks. It is anticipated that the Wanapum FUB and a potential top spill facility at Priest Rapids Dam will provide a safe route for adult fallbacks and steelhead kelts during the spring and summer juvenile passage season. Finally, Grant PUD completed an adult off-ladder trapping facility during the spring of 2007 and operations started in the summer of 2007. Grant PUD has also installed and is operating video adult fish counting equipment and adult fish PIT tag detectors at both developments.

1.4.3 Supplementation

FERC (2006) recommended measures:

- To help recover natural populations to self-sustaining and harvestable levels, fund and develop the hatchery facilities necessary to annually produce 600,000 yearling spring Chinook salmon, and 100,000 steelhead smolts; and

- develop and implement Habitat Genetics Management Plans (HGMP) for spring Chinook salmon and steelhead.

The supplementation programs will be addressed in detail in separate Section 7 consultations. This Opinion only addresses the general purpose and funding of these programs. The production of 100,000 steelhead juveniles and 600,000 juvenile spring-run Chinook salmon by Grant PUD is required under NMFS (2004). Adjustment to the production levels may be made based on changes in average adult returns, adult-to-smolt survival rates, and smolt-to-adult survival rates from the propagation programs. The Priest Rapids Hatchery Subcommittee is responsible for determining program adjustments considering methodology described in the Biological Assessment Management Plan (NMFS et al. 1998a) and recommending modified implementation plans for Grant PUD funding. Where two or more alternatives to achieving production levels exist, priority is placed on the basis of biological effectiveness, time required for implementation, and cost effectiveness. All program adjustments are subject to the approval of NMFS, in consultation with the Hatchery Subcommittee and the PRCC, as appropriate.

Included in the spring-run Chinook salmon production is a supplementation program in the Wenatchee River Basin that was initiated using captive brood techniques. Since 1997, the White River spring Chinook supplementation program has been in a juvenile-based captive brood phase. In the coming years, the program will transition into an adult-based supplementation phase as the number of adult salmon destined for the White River increases to levels that can sustain an adult broodstock based hatchery program. Additional releases are planned for other tributaries in the Wenatchee Watershed. Starting as soon as 2011, adults will be trapped and spawned to produce 250,000 smolts for release into Nason Creek and 150,000 smolts targeted for release in the White River. The facilities required for the program have the following functions: capturing adults, holding adults, rearing presmolts, acclimating through the winter, and acclimating at final release locations on surface water. Necessary facilities are still in planning stages but are expected to be functional by 2011.

Grant PUD is also funding a 200,000 yearling spring Chinook salmon smolt program in the Methow basin. Currently this obligation is being met by Grant PUD's funding a portion of the hatchery programs at the Methow Hatchery owned by Douglas County PUD. Improvements in the program's operational practices may be identified through the Hatchery Scientific Review Group process; the collaboration process associated with the Federal Columbia River Power System (FCRPS); and/or as the result of ongoing research, monitoring, and evaluation of the spring Chinook program at the Methow Hatchery. Grant PUD's obligation includes the funding of new or modified facilities that are necessary to reduce risks and improve the programs to meet the biological objectives of conserving and rebuilding the ESA listed population.

Grant PUD's steelhead obligation is currently being met by funding of a 20,000 steelhead program in Omak Creek in the Okanogan Basin and production of 80,000 steelhead at Wells Hatchery, owned by Douglas County PUD. The collaboration process associated with the Federal Columbia River Power System (FCRPS) has indicated that UCR steelhead hatchery programs may require modification to reduce the risk to the natural component of the DPS and to ensure that hatchery programs do not delay or inhibit recovery. Following the completion of the HSRG review process, Grant PUD should develop a new HGMP to specifically address their steelhead hatchery program such that it operates in a manner consistent with TRT recovery criteria.

Draft HGMPs for the White River and Nason Creek spring Chinook salmon programs have been developed by Grant PUD in consultation with NMFS and the Priest Rapids Hatchery Subcommittee. The draft HGMPs are being developed in a manner that has prioritized public involvement. This has included the release for public comment of draft HGMPs prior to submittal to NMFS. Currently, draft HGMPs are undergoing interagency and Tribal review and will undergo separate ESA section 7 consultations with NMFS after review comments are addressed. NMFS' consultation process will include an additional public comment period on the final draft HGMPs. New HGMPs for Grant PUD's Methow basin spring Chinook salmon and UCR steelhead program have not yet been developed. The date for submittal to NMFS of HGMPs for ESA consultation of each program is identified in the Terms and Conditions section of this Biological Opinion.

1.4.4 Habitat

FERC (2006) recommended measure:

- Annually provide $1,096,552 to the Priest Rapids Project Habitat Fund to mitigate for a 2 percent per development unavoidable loss of upriver stocks and develop a habitat plan to identify goals, objectives, a process for coordination, and a process by which habitat projects would be identified and implemented.

The specified amount is established in the settlement agreement and recommended by FERC. The $1,096,552.00 is for listed and non-listed species combined. The specific amount for listed species was a requirement in NMFS (2004). This amount is an annual contribution of $288,600.00.

1.4.5 Water Quality

FERC (2006) recommended measures:

- Implement a water quality plan that continues reservoir management and maintenance operations and monitoring of spill patterns to minimize ambient total dissolved gas levels; a water temperature monitoring plan at four fixed sites; monitoring dissolved oxygen, turbidity, and pH at the four fixed monitoring sites during the non fish-spill season (September 15 through April 1), and address potential short-term water quality impacts associated with construction activities at the Project, emergency situations, and routine maintenance activities; and

- Provide biological monitoring to determine the incidence of gas bubble trauma (GBT) symptoms in downstream migrating juvenile salmonids and continue development of its *realtime* TDG monitoring system at the fixed monitoring sites.

These actions are already being implemented by Grant PUD.

1.4.6 Reporting Requirements

FERC (2006) recommended measures:

- Develop and implement a performance evaluation program to assess the hatchery program, habitat program, and improvements to juvenile and adult passage survival;
- produce annual progress and implementation plans to describe the implementation activities for spring-run Chinook salmon and steelhead;
- prepare a performance evaluation report that assesses the ability of each program to meet program objectives and contribute to achievement of performance standards; and
- continue to use Standard Operating Procedures at both dams to provide operators with turbine operating criteria, spill patterns for use during downstream passage operations, fishway operation criteria, and other criteria pertaining to upstream and downstream passage of salmon and steelhead.

1.5 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 UCR spring-run Chinook salmon and UCR steelhead occur in the reservoir, forebay, dam, and tailrace of both the Priest Rapids and Wanapum Developments. This area is defined as the mainstem Columbia River from approximately 1,000 ft downstream of Rock Island Dam to roughly 1,000 ft downstream of Priest Rapids Dam, a distance of approximately 56 river miles. In addition, water quality degradation resulting from elevated levels of TDG due to voluntary or involuntary spill at the Project can directly or cumulatively affect listed species. This occurs either by the Project's elevation of TDG or by maintaining TDG levels entering the Project due to spill at upstream developments. Levels of TDG that are elevated at the Project continue downstream through the Hanford Reach.

Finally, activities carried out under the proposed habitat and supplementation programs may affect listed species in the mainstem Columbia River and tributary streams upstream of the Project. The programs were directed under NMFS (2004) and are also included in the Proposed Action. Given these considerations, the action area is best defined as the mainstem Columbia River from about RM 545 (roughly 1,000 feet downstream of Chief Joseph Dam) and RM 354 (the upper terminus of the McNary Dam pool), a distance of nearly 191 miles, as well as the Wenatchee, Okanogan, Methow, and Entiat River Basins.

2. ENDANGERED SPECIES ACT

The ESA establishes a national program to conserve threatened and endangered species of fish, wildlife, plants, and the habitat on which they depend. Section 7(a)(2) of the ESA requires Federal agencies to consult with U.S. Fish and Wildlife Service (USFWS), NMFS, or both, to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or adversely modify or destroy their designated critical habitats. Section 7(b)(4) requires the provision of an incidental take statement that specifies the impact of any incidental taking and includes reasonable and prudent measures to minimize such impacts.

2.1 Biological Opinion

This Opinion presents NMFS' review of the rangewide status of the UCR spring-run Chinook salmon evolutionarily significant unit (ESU)[5] and UCR steelhead distinct population segment (DPS)[6] considered in this consultation and the condition of critical habitat, and within the action area, the environmental baseline, all the effects of the action as proposed, and cumulative effects (50 CFR 402.14(g)). For the jeopardy analysis, NMFS analyzes those combined factors to conclude whether the Proposed Action is likely to appreciably reduce the likelihood of both the survival and recovery of the affected ESA-listed species.

In the critical habitat analysis, NMFS determines whether the Proposed Action will destroy or adversely modify critical habitat for ESA-listed species by examining the potential for change in the functioning and conservation value of its essential features. This analysis relies on statutory provisions of the ESA, and does not rely on the regulatory definition of "adverse modification or destruction" of critical habitat recently at issue in the 9th Circuit Court of Appeals (Gifford Pinchot Task Force et al. v. U.S. Fish and Wildlife Service, No. 03-35279, August 6, 2004).

If the action under consultation is likely to jeopardize the continued existence of an ESA listed species, or destroy or adversely modify a critical habitat, NMFS must identify any reasonable and prudent alternatives for the action that avoid jeopardy or destruction or adverse modification of critical habitat and meet other regulatory requirements (50 CFR 402.02).

[5] 'ESU' means a population or group of populations that is considered distinct (and hence a 'species') for purposes of conservation under the ESA. To qualify as an ESU, a population must (1) be reproductively isolated from other conspecific populations, and (2) represent an important component in the evolutionary legacy of the biological species (Waples 1991).

[6] In 1996, NMFS and USFWS adopted a joint policy for recognizing DPSs under the ESA (DPS Policy; 61 FR 4722; February 7, 1996 (USFWS and NMFS 1996)). The DPS Policy adopts criteria similar to, but somewhat different from, those in the ESU Policy for determining when a group of vertebrates constitutes a DPS: The group must be discrete from other populations, and it must be significant to its taxon. A group of organisms is discrete if it is ''markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological, and behavioral factors'' (NMFS 2006)

2.2 Status of the Species and Critical Habitat

This section reviews the rangewide status of the ESU and DPS and of the affected critical habitat and the risks to the long-term survival of each species and the conservation value of designated critical habitat. The present risk of extinction faced by each species informs NMFS' determination of whether additional risk will appreciably reduce the likelihood that the species will survive or recover in the wild. The greater the present risk, the more likely it is that any additional risk resulting from the Proposed Action's effects on the population size, productivity (growth rate), spatial structure, or genetic diversity can be interpreted as an appreciable reduction in the likelihood of both the survival and recovery of the affected species in the wild. Similarly, the greater the threshold risk based on existing functional condition of critical habitat, the more likely any added risk will be an appreciable reduction in the conservation value of critical habitat for both the survival and recovery of the species.

2.2.1 Status of Species

NMFS reviews the condition of the species affected by the Proposed Action using criteria that describe a *viable salmonid population* (VSP) (McElhany et al. 2000). Attributes associated with a VSP include the abundance, productivity, spatial structure, and genetic diversity that enhance its capacity to adapt to various environmental conditions and allow it to be self-sustaining in the natural environment. These attributes are influenced by survival, behavior, and experiences throughout the entire life cycle, characteristics that are influenced in turn by habitat and other environmental conditions.

To be considered viable (i.e., with a negligible risk of extinction due to threats from demographic variation, local environmental variation, and genetic diversity changes over the long term), an ESU or DPS should have the following characteristics. It should contain multiple populations so that a single catastrophic event is less likely to cause the species to become extinct, and so that the ESU or DPS may function as a metapopulation as necessary to sustain population-level extinction and recolonization processes. Multiple populations within an ESU or DPS also increase the likelihood that a diversity of phenotypic and genotypic characteristics will be maintained, thus allowing natural processes to operate and increase the species' long-term viability. Some of the ESU or DPS populations should be relatively large and productive to further reduce the risk of extinction in response to a single catastrophic event that affects all populations. If an ESU or DPS consists of only one population, that population must be as large and productive (i.e., resilient) as possible. Some populations in each ESU or DPS should be geographically widespread to reduce the risk that spatially–correlated environmental catastrophes could drive the species to extinction. Other populations in the same ESU or DPS should be geographically close to each other to increase connectivity between existing populations and encourage metapopulation function. Populations with a diversity of life-histories and phenotypes should be maintained in each ESU or DPS to further reduce the risk of correlated environmental catastrophes or changes in environmental conditions that occur too rapidly for natural processes to operate within an ESU or DPS. Finally, evaluations of a species'

status should take into account uncertainty about ESU- or DPS-level processes. Our understanding of spatial and temporal processes is limited such that the historical number and distribution of populations serve as a useful goal in maintaining viability of ESUs and DPS' that were likely self-sustaining historically.

Upper Columbia River Spring-run Chinook Salmon

The UCR Spring-run Chinook salmon ESU was listed as endangered on March 24, 1999 (NMFS 1999) and this designation was reaffirmed in a subsequent status review (NMFS 2005a). This ESU is currently limited to three extant populations in one Major Population Grouping (MPG). The MPG supported a fourth population in the Okanogan River basin, but it is functionally extinct. Two additional MPGs likely existed; the tributaries that supported them are now cut off from anadromous access by Grand Coulee and Chief Joseph Dams (ICTRT 2003).

This ESU includes all natural-origin, stream-type Chinook salmon from river reaches above Rock Island Dam and downstream of Chief Joseph Dam, including the Wenatchee, Entiat, and Methow River Basins. The spring-run components of the following hatchery stocks are also listed: Chiwawa, Methow, Twisp, Chewuch, and White Rivers, and Nason Creek. Adult and juvenile UCR spring-run Chinook salmon migrate and juveniles rear in the action area.

Life History. The UCR spring-run Chinook salmon ESU exhibits a classic stream-type life-history strategy, emigrating from freshwater during the spring months 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 though mid-May.

Biological Requirements. Range-wide UCR Spring-run Chinook salmon biological requirements include food, flowing water (quantity), high quality water (cool, free of pollutants, high dissolved oxygen concentrations, low sediment content), clean spawning substrate, and unimpeded migratory access to and from spawning and rearing areas (Spence et al. 1996). Range-wide habitat threats include: mainstem Columbia River dams that impede safe passage; diversion structures in tributary streams that impede safe migration and divert water for agriculture; loss of riparian habitat that increases water temperature, destabilizes banks, and reduces detritus and food inputs; and road construction and development that constrict the floodplain and retard or prevent natural channel forming processes and accelerate channel and bank erosion (sediments). All of these habitat threats are also found in the action area.

Population Trends and Risks. In March 2007, the Interior Columbia Basin Technical Recovery Team (ICTRT) proposed minimum abundance thresholds for Interior Columbia Basin stream type Chinook populations. 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 minimum abundance thresholds are 2,000 spawners each in the Wenatchee and Methow River Basins and 500 spawners in the Entiat River basin (ICTRT 2007). The three extant UCR spring-run Chinook salmon populations have exhibited similar trends and patterns in abundance over the past several decades. The 1998 status review (Myers et al. 1998) reported that long-term trends in abundance were generally negative. 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 percent, 4.8 percent, and 6.3 percent 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 percent to 15 percent of the minimum abundance thresholds, although the 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 (a growth rate of less than 1.0 is not self-supporting). Assuming that population growth rates[7] were to continue at 1980-2000 levels, UCR spring-run Chinook salmon populations are projected to have very high probabilities of decline within 50 years (87 to 100 percent) (Good et al. 2005). However, as described in NMFS (2007), a reduction in the average harvest rate since 1998 and recent improvements in FCRPS and PUD dams' configurations and operations, estuary habitat, (reductions in) Caspian tern predation, and hatchery practices are in the process of improving survival by 24 to 42 percent for all UCR spring Chinook populations.[8] These changes are increasing population productivity and reducing the likelihood of extinction.

Major Limiting Factors. NMFS (2005b) listed the following as major factors limiting UCR steelhead productivity.

- Mainstem Columbia River hydropower system mortality
- Tributary riparian degradation and loss of in-river wood
- Altered tributary floodplain and channel morphology
- Reduced tributary stream flow and impaired passage
- Harvest impacts

Upper Columbia River Steelhead

The UCR steelhead DPS was listed as Endangered on August 18, 1997 (NMFS 1997). This DPS includes all natural-origin populations of steelhead in the Columbia River Basin upstream from the Yakima River in Washington to the US/Canada border of the Okanogan River Basin. The Wells Hatchery stock is included among the listed populations. This DPS is currently limited to three extant populations in one MPG. The MPG historically included a fourth population in the Crab Creek drainage which is now believed to be functionally extinct. Two additional MPGs likely existed but the tributaries that supported them are now cut off from anadromous access by Grand Coulee and Chief Joseph Dams. Adult and juvenile UCR steelhead migrate, spawn, and rear in the action area.

Life History. Life history characteristics for UCR steelhead are similar to those of other inland steelhead DPS'; 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 DPS (Peven 1990). Based on limited data, steelhead from the Wenatchee and Entiat Rivers return to freshwater after 1 year in salt water, whereas Methow River steelhead primarily return after 2 years in salt water. Similar to other inland Columbia River Basin steelhead DPS', adults typically return to the Columbia

[7] Population growth rates were (calculated as the median population growth rate, lambda [λ]) in Good et al. (2005).
[8] Survival will continue to improve assuming that these actions continue into the future.

River between May and October and are considered summer-run steelhead. Adults may remain in fresh water up to a year before spawning. Unlike Chinook salmon or sockeye salmon, steelhead adults migrate back to the ocean after spawning. These fish are known as kelts, and those few that survive will migrate from the ocean to their natal stream to spawn again.

Biological Requirements. Range-wide UCR steelhead biological requirements include food, flowing water (quantity), high quality water (cool, free of pollutants, high dissolved oxygen concentrations, low sediment content), clean spawning substrate, and unimpeded migratory access to and from spawning and rearing areas (Spence et al. 1996).

Population Trends and Risks. The ICTRT (2007) proposed minimum abundance thresholds for Interior Columbia Basin steelhead populations. 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 minimum abundance thresholds are 1,000 spawners each in the Wenatchee, Methow, and Okanogan River Basins and 500 spawners in the Entiat River Basin.

Returns of both hatchery- and naturally-produced UCR steelhead have increased in recent years. The average 1997-2001 return counted through the Priest Rapids Dam fish ladder was approximately 12,900 fish. The average for the previous 5 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 percent of the total adult count, to 2,200 (1997-2001), representing about 17 percent of the adult count during this period of time.

In terms of natural production, recent population abundances for both the Wenatchee and Entiat aggregate population and the Methow population remain well below the minimum abundance thresholds developed for these populations (ICTRT 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 1,500 fish. Although this is well below the minimum abundance thresholds, it represents an improvement over the past (an increasing trend of 3.4 percent per year). However, the average percentage of natural fish for the recent 5-year period dropped from 35 percent to 29 percent, 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 also well below the minimum abundance thresholds, it is an improvement over the recent past (an increasing trend of 5.9 percent per year). In addition, the 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 percent for the period prior to the 1998 status review to 9 percent for the 1997 to 2001 returns. Further, as described in NMFS (2007), a reduction in the average harvest rate since 1998 and recent improvements in FCRPS and PUD dams configurations and operations, estuary habitat, (reductions in) Caspian tern predation, and hatchery practices are in the process of improving survival by 41 to 177% for all UCR steelhead populations. These changes are increasing population productivity and reducing the likelihood of extinction.

Major Limiting Factors. NMFS (2005b) listed the following as major factors limiting UCR steelhead productivity.

- Mainstem Columbia River hydropower system mortality
- Reduced tributary stream flow
- Tributary riparian degradation and loss of in-river wood
- Altered tributary floodplain and channel morphology
- Excessive sediment
- Degraded tributary water quality

2.2.2 Status of Critical Habitat

Critical habitat was designated for UCR spring-run Chinook salmon and UCR steelhead within the action area (NMFS 2005c). NMFS reviews the status of designated critical habitat affected by the proposed action by examining the condition and trends of primary constituent elements (PCEs) throughout the designated area. PCEs consist of the physical and biological features identified as essential to the conservation of the listed species (Table 1).

Table 1. Types of sites, essential physical and biological features named as PCEs for UCR spring-run Chinook salmon and UCR steelhead critical habitat designations, and affected life histories (NMFS 2005c).

Site	Essential Physical And Biological Features (PCEs)	Life Histories
Freshwater spawning	Water quality, water quantity, and substrate	Spawning, incubation, and larval development
Freshwater rearing	Water quantity and floodplain connectivity	Juvenile growth and mobility
	Water quality and forage	Juvenile development
	Natural cover[1]	Juvenile mobility and survival
Freshwater migration	Free of artificial obstructions, water quality and quantity, and natural cover[1]	Juvenile and adult mobility and survival
Estuarine areas	Free of obstruction, water quality and quantity, and salinity	Juvenile and adult physiological transitions between salt and freshwater
	Natural cover, forage,[2] and water quantity	Growth and maturation

[1]Natural cover includes shade, large wood, log jams, beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.
[2]Forage includes aquatic invertebrate and fish species that support growth and maturation.

In the designation process, NMFS' Critical Habitat Analytical Review Teams (CHARTs) rated occupied fifth field hydrologic units (referred to as HUC5s or watersheds) in the Columbia River Basin. The CHARTs gave each of these occupied HUC5s a high, medium, or low rating. High-value watersheds or areas are those with a high likelihood of promoting conservation, while those given a low value rating are expected to contribute relatively little.

The CHART identified 34 watersheds or areas within the range of UCR spring-run Chinook salmon. A high conservation value was assigned to 27 watersheds/areas and five received a medium rating. Two of the 34 watersheds/areas were not rated due to minimal presence of PCEs. Furthermore, 15 of the 27 high value watersheds/areas are located on the mainstem Columbia River due to its high value for rearing and migration, including the area within the Project boundary.

The CHART identified 43 watersheds/areas within the range of UCR steelhead. A high conservation value was assigned to 32 watersheds/areas, seven received a medium rating and three received a low rating. One watershed/area above an existing barrier was given a *possible* high rating. The mainstem Columbia River contains 16 of the 32 high value watersheds/areas due to its significance for rearing and migration, including the area within the Project boundary.

2.3 Updated 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, the anticipated impacts of all 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 (50 CFR 402.02). Generally, the environment for listed species in the Columbia River Basin, including UCR Spring-run Chinook and UCR steelhead, has been dramatically affected by hydroelectric and water storage development both in the United States and Canada. Access to a substantial portion of historical habitat for both species is blocked by Chief Joseph and Grand Coulee Dams on the mainstem Columbia River. For both the UCR spring-run Chinook salmon and the UCR steelhead, there are also local habitat problems related to irrigation diversions, degraded riparian and instream habitat from urbanization, land conversion to crops and orchards, livestock grazing, and timber harvest (Busby et al. 1996, NMFS 1996 and 1998b, BRT 1997 and 2003, and Myers et al. 1998).

NMFS must also consider whether there are any recent changes to the environmental baseline for the action area, or any cumulative effects, that must be considered (i.e., in addition to those effects which constituted the environmental baseline in NMFS 2004). Although NMFS (2004) fully described the environmental baseline and cumulative effects at the time of its issuance, there have been additional Federal actions in the action area that have undergone ESA Section 7(a)(2) consultation and therefore now must be added to the environmental baseline; they are enclosed with this document as Exhibit A. A few of these Federal actions may have negative impacts to the environmental baseline, but these are over relatively small spatial scales (e.g., issuing permits for water use in tributaries and for constructing over-water structures and docks). However, many of these Federal actions (e.g., operating hatcheries in the Upper Columbia River in accordance with conservation practices which should reduce adverse effects on listed fish;

installing fish passage facilities; minimizing the impacts of future road maintenance activities; improving hatchery operations; and protecting or restoring habitat) are expected to have largely improved the species' status.

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." NMFS is not aware of state or private activities in the action area that are reasonably certain to continue contemporaneous with the term of the new FERC license, other than the current levels of rural and urban land use that affect the listed species.

Measures required in NMFS (2004), which have been or are in the process of being carried out, along with the habitat conservation plans in place for the Rock Island, Rocky Reach, and Wells developments, and the actions listed in Exhibit A of this Opinion, have improved the baseline from that described in NMFS (2004).

2.4 Effects of the Proposed Action

Effects of the action means 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 that action, that will be added to the environmental baseline (50 CFR 402.02). If the proposed action includes offsite measures to reduce net adverse effects by improving habitat conditions and survival, NMFS will evaluate the net combined effects of the proposed action and the offsite measures as interrelated actions (e.g., habitat improvement projects and supplementation activities).

Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur (50 CFR 402.02). Indirect effects may occur outside the area directly affected by the action, and may include other Federal actions that have not undergone section 7 consultation but will result from the action under consideration.

The general effects of hydroelectric operations on adult and juvenile anadromous species are described in NMFS (2004) and not repeated here. The following discussion describes the effects that Project operations under the proposed new license and proposed fish measures are likely to have on juvenile and adult UCR spring-run Chinook salmon and UCR steelhead.

2.4.1 Juvenile Fish Passage

Project Survival Standards

NMFS developed juvenile and adult survival standards during development of the habitat conservation plans (HCP) for the Wells, Rocky Reach, and Rock Island Developments (all upstream of the Project). These standards were determined to account for the listed species

biological requirements under the environmental baseline such that the species would survive and recover. These standards, 93 percent juvenile survival and a juvenile and adult combined survival of 91 percent per project, are described in Cooney (2002) and were applied to the analysis in NMFS (2004).

Under NMFS (2004), Grant PUD is required to achieve a combined adult and juvenile survival of 91 percent minimum per development. A maximum of 7 percent mortality per development is allowed for juveniles migrating downstream, and a maximum of 2 percent mortality is allowed for adults passing upstream. NMFS recognizes that adult fish survivals cannot be accurately measured at this time because of the inability to differentiate between natural sources of survival versus those caused by the hydroelectric system. Until this can be achieved with an adequate degree of confidence, compliance is based on the 93 percent juvenile survival standard, or a combined (both developments) minimum survival standard of 86.5 percent (0.93 X 0.93 = 0.8649).

The survival standard is considered accomplished if after 3 consecutive years of study, the average of the three is at least the standard or above. After completing 3 years of Project survival studies on yearling Chinook salmon, Grant PUD was able to demonstrate that they achieved this standard with a combined result of 86.6 percent survival averaged over 3 successive years (Anglea et al. 2003, 2004, and 2005). Grant PUD has begun a series of survival studies on steelhead, which is expected to be completed by 2010. NMFS anticipates that the survival standards will be satisfied for UCR steelhead and at least maintained, if not improved, for UCR spring-run Chinook salmon. This is because the Wanapum FUB will become operational starting in 2008 which is expected to improve passage survival and water quality (i.e., less TDG production). Furthermore, additional advanced turbines will be installed, additional habitat projects completed, and predator deterrence and reduction will continue, all of which should improve passage survival for these species.

Downstream Passage Alternatives Action Plan

The DPAAP was completed in consultation with NMFS and the Washington Department of Fish and Wildlife (WDFW) (Voskuilen 2003). The DPAAP laid out a logical framework and path forward for Grant PUD to meet the required survival standards. Following completion of the DPAAP, a process was initiated to develop the new Wanapum FUB (discussed below) to replace the current fish spill program at Wanapum Dam. While results of the Wanapum FUB remain to be seen, NMFS anticipates that the Wanapum FUB will result in increased Project survival and less TDG production.

The DPAAP is a planning and guidance document that was initially required in NMFS (2004) to assist NMFS, other fishery management entities, and Grant PUD with directing progress toward achieving the juvenile survival standards. It is intended to be a *living document*. That is, as new facilities are constructed and evaluated, this plan will be modified as appropriate in collaboration with NMFS and the PRCC.

Spill

Juveniles migrating through the Project pass through a combination of the spillway, sluiceway and powerhouse routes. There are no bypass facilities at either development. The primary purpose of the spill program at the Project has been to provide as high an FPE as possible. Spill is one of several methods employed at mainstem Columbia River developments to divert downstream migrants away from turbines and move them more quickly past the concrete. One of the drawbacks to spilling large volumes of flow is that it can entrain atmospheric gas to a depth where hydrostatic pressure forces it into solution resulting in high concentrations of TDG. At higher saturation levels, fish can develop GBT which may cause stress, injury, and at very high ("super") saturation levels (≥130%) mortality. The likelihood of supersaturation is higher at a project with a deep stilling basin below the spillway because water and the entrained gases plunge deeper into the water column where hydrostatic forces are higher.

This section primarily discusses spill as a passage route for juvenile salmon and steelhead. Some discussion here also addresses the effect of spill on water quality because it affects the ability to use spill as a route of passage for fish. For further detail on water quality impacts from spill, see the section below under "Water Quality."

Wanapum Dam. Grant PUD installed flow deflectors at the Wanapum Dam spillway during the winter of 1999-2000. The deflectors were successful in reducing TDG and allowed Grant to increase FPE via spill, which at the time NMFS expected would increase juvenile fish survival. However, even with flow deflectors, spill levels were often restricted during the fish passage season (spring and summer) to prevent TDG from exceeding an average of 120 percent in Project tailraces or 115 percent in the Priest Rapids Dam forebay. Spill at Wanapum was also restricted when spill at projects further upstream created high levels of TDG in the dam's forebay.

During periods of high runoff, Grant PUD spilled flows that exceeded the hydraulic capacity of the powerhouse ("involuntary" spill). Although this may have increased FPE, TDG levels exceeded the water quality standards for TDG. Mean daily flows recorded at Wanapum Dam during the 2006 fish spill season exceeded the Wanapum powerhouse capacity, requiring involuntary spill about 74 percent of the time (Grant PUD 2007).

To evaluate the effectiveness of the spill program, Grant PUD conducted several years of juvenile survival evaluations using radiotelemetry techniques. This method allows for evaluation of discrete routes and thus the comparison of survival between different routes of passage through the Project. These studies indicate that about half of the juvenile steelhead and over half of the juvenile Chinook salmon migrants pass through the Wanapum powerhouse (i.e., turbine route) under current spill levels (Robichaud et al. 2003). In each year of the 3-year evaluation (2001 through 2003), study results showed higher survival rates through the powerhouse than through the spillway. Survival rates ranged between 85.5 and 88.3 percent through the spillway and 91.2 and 98.3 percent through the powerhouse (English et al. 2001, 2003 and Robichaud et al. 2003). These results have led to some modifications in voluntary spring spill operations.[9] That is, once TDG levels approach an average high reading over a 12-hour period of 120 percent,

[9] As described above, river flows during spring runoff can exceed powerhouse hydraulic capacity and force Grant to spill at both dams.

spill volumes are reduced to stay within this limit. As river flow and water temperature increase over the spring migration, spill is usually reduced to just the top-spill bulkhead in spill bay 12 and the sluiceway if possible. Survival through the top-spill bulkhead is roughly equal to that of the powerhouse.

To date, most of the evaluations have been conducted with yearling Chinook salmon. The source of spillway mortality is speculative, but spill is turbulent and could therefore cause physical injury and/or disorientation and predation on these juvenile fish. Passage survival rates are unknown for the other anadromous fish species that migrate through the Project: listed steelhead and unlisted fall Chinook and sockeye salmon. Grant PUD is currently conducting a 3-year evaluation of juvenile steelhead survival, as required in NMFS (2004). While this Opinion can only address listed UCR spring-run Chinook salmon and UCR steelhead, it is prudent to consider effects of the proposed action and any mandatory conditions NMFS may find essential for listed species on non-listed anadromous fish species. In other words, research is needed for other anadromous fish species to determine if they survive passage through the Wanapum turbines at similar rates as yearling Chinook. Thus, NMFS has continued requiring that tainter gate spill be maintained during the spring and summer months because survival rates are unknown for other unlisted anadromous fish species.

To address issues associated with spillway passage (e.g., mortality, TDG production, and revenue losses), Grant PUD developed the DPAAP (Voskuilen 2003), which eventually led to the design of the Wanapum Dam Future Unit Bypass facility (see discussion below). This facility was designed in consultation with NMFS and will be in operation beginning with the spring 2008 outmigration season. NMFS anticipates that survival for both UCR spring-run Chinook salmon and UCR steelhead will improve. Water quality is expected to improve as well as this facility should not produce significant amounts of TDG. However, mortality of listed UCR spring-run Chinook salmon and UCR steelhead will continue to occur during periods of high runoff when Grant PUD is forced to spill involuntarily. Therefore, further investigation is warranted to determine the source of mortality at the spillway.

Wanapum Dam Future Unit Bypass. With completion of the downstream passage alternatives study (Voskuilen 2003), a process was initiated to develop a new passage measure to replace the current voluntary fish spill program at Wanapum Dam. With less than expected survival rates measured through standard tainter-gate spill, Grant PUD proposed to construct a surface bypass facility at Wanapum Dam. This was based on the recommendations of Voskuilen (2003), following comparison to other alternatives, and was developed in collaboration with NMFS and the PRCC.

Given the general preference of smolts to maintain a relatively constant depth in their migration (i.e., resist sounding), a surface-oriented outlet was adopted. Several locations were evaluated and eventually future unit bay 11 was chosen as the best location to place a surface bypass. Future unit 11 is a turbine bay that was constructed as part of the original dam but was never occupied by a turbine and is located between the spillway and powerhouse, immediately adjacent to the operational turbines. Based on computer and physical modeling, a bypass flow of 20,000 cfs was determined to be sufficient to develop a discernable flow field in the powerhouse forebay for fish to discover the bypass route. In addition, to deliver bypassed fish safely to the tailrace

while minimizing TDG, efforts were directed toward optimizing the tailrace discharge component to minimize turbulence (and potential injury and predation), entrainment of air, and riverbed erosion. These objectives led to a design that consists of a 20-foot-wide, ogee-crested weir through the middle of future unit 11, combined with flow fairings (nose piers) at the bypass entrance that allows for a gradual acceleration of flow to the highpoint of the ogee. The 20,000 cfs flow would then descend a spillway-like structure into a submerged chute, which gradually widens to 90 feet at its terminus. This serves to spread out the flow which significantly dissipates energy and minimizes turbulence. The chute would also create a skimming effect in the tailrace. In other words, the 20,000 cfs of bypass flow would be directed across the tailrace water surface which serves to reduce or eliminate plunging, minimizing TDG production.

Grant PUD conducted numerous evaluations via computer modeling, physical modeling, and prototype testing in the field. This entailed designing and installing a 20,000 cfs top-spill bulkhead in spill bay 12 to use as a prototype for evaluating how fish may respond to a surface bypass of equal flow (Grant PUD 2005). The sluiceway was also modified by constructing a chute on the downstream side that mimicked expected hydraulic conditions of the future unit bypass. Balloon tag tests were conducted to measure direct survival of juvenile yearling Chinook passed through the sluiceway. There were no observed mortalities and less than 2 percent of the test fish showed signs of injury, which were reported to be abrasions (Grant PUD 2004). In addition, sensor fish[10] were passed though the sluiceway to measure hydraulic pressures and accelerations that juvenile fish could experience while passing through the future unit bypass facility. No abnormalities were recorded.

This bypass design was reviewed and approved by the FERC in an order issued on December 16, 2004 (FERC 2004b). The facility is currently under construction and is scheduled to be operational in the spring 2008. The Wanapum FUB will significantly reduce passage through the Wanapum spillway, the route with the lowest survival rates. Only involuntary spill will occur, i.e., when flow exceeds the hydraulic capacity of the powerhouse and the FUB, or when unusual circumstances require turbines to be taken off line (e.g., mechanical failures). This will also significantly reduce TDG production. Therefore, NMFS anticipates that the effect of the new facility is that juvenile passage survival will improve at Wanapum Dam. Spill at Wanapum Dam will continue to have negative effects on Chinook salmon and steelhead, but the improvements will reduce those effects over time.

Priest Rapids Dam. In contrast, spill at Priest Rapids Dam has proven to be a viable passage alternative for juvenile migrants. Studies show that while continued spill is expected to cause mortality in migrating juvenile Chinook salmon and steelhead, survival through this spillway is acceptable, ranging from 95 to 98 percent for both juvenile Chinook salmon and steelhead (English et al. 2003 and Robichaud et al. 2003) with an FPE of about 70 percent for steelhead (Skalski et al. 2000). Grant PUD begins with the target spill level of 61 percent of flow and is usually able to maintain this level throughout the spring migration season. The stilling basin at the Priest Rapids spillway is relatively shallow and does not create nearly the same level of TDG as that of the Wanapum spillway. Grant PUD is currently developing alternatives to spill for

[10] The sensor fish is a device designed to measure and collect data on the various hydraulic forces that a fish would be likely to experience passing through a spillway or turbine.

juvenile passage at Priest Rapids Dam and is doing so in collaboration with NMFS and the PRCC. Passage survival through any new facility must, at a minimum, be equal to or exceed survival provided by the current spill program before NMFS considers replacing it with an alternative passage plan.

Powerhouse Operations

Wanapum Dam. Due to continuous maintenance issues, Grant PUD began replacing the Wanapum turbines in 2004. The new turbines were designed by Voith Siemens for the Department of Energy Advanced Hydro Turbine Program (Advanced Turbine). The Advanced Turbine design improves power output, increases efficiency and includes design features that are expected to improve fish passage survival.

Consistent with NMFS (2004), Grant PUD designed and conducted a study to test the hypothesis that survival of yearling Chinook salmon smolts through a new advanced turbine would be equal to, or greater than, passage survival through an existing unit. The results of the study were statistically evaluated using Analysis of Deviance (ANODEV) to test for differences in turbine passage survivals under alternative treatment conditions. Average turbine passage survivals across all discharges (9,000, 11,000, 15,000 and 17,000 cfs) and both release depths (i.e., 10 and 30 feet below the turbine intake ceiling) was 96.95 percent for the new turbine and 97.5 percent for the existing turbine. Statistical analysis showed the difference to be insignificant. However, when Grant PUD looked at vertical distribution data collected in 1984 and compared it with the two release depths used for the new turbine evaluation, it was found that about 78 percent of naturally migrating fish could be lumped into the 10-foot release group and 22 percent lumped into the 30-foot release group. Grant PUD then weighted the results with known distribution data and found the survival results to change from 96.9 percent to 97.2 percent for the new turbine and from 97.5 percent to 97.1 percent for the existing turbine (Skalski and Townsend 2005).

In addition, Grant PUD has used Hill curves, Theoretical Avoidable Losses calculations, turbine discharge rates, head, and fish survival curves (based on 1996 balloon tag evaluation for existing turbines) to determine the operating range where fish survival is 95 percent or better. Once this range was established, the turbines were then operated in what is referred to as "fish mode" during the juvenile salmonid outmigration. This same analysis was conducted for the new Advanced Turbines. These operations appear to be accomplishing good juvenile fish survival rates through the turbines. As previously stated, survival through the turbines ranges between 91.2 and 98.3 percent; as more advanced turbines are installed, NMFS believes that survival will likely trend toward the higher end of this range. In addition, the Advanced Turbines produce less boil in the tailrace. As more Advance Turbines are installed (a process that takes about 9 months for each turbine), NMFS expects that the tailrace will become less turbulent with more flow being directed from the draft tubes in the downstream direction, allowing juvenile fish to reorient and exit the tailrace faster and reducing the risk of predation. Therefore, while powerhouse operations will continue to cause mortality of juvenile Chinook salmon and steelhead, those effects will likely remain in the acceptable range and potentially decrease over time.

Priest Rapids Dam. As directed under NMFS (2004) and a December 16, 2004 FERC Order, Grant PUD conducted a turbine evaluation at Priest Rapids Dam in 2005. The objectives of the Priest Rapids turbine evaluation were to estimate direct survival probabilities and evaluate the relationship between turbine discharges (9,000, 11,000, 15,000 and 17,000 cfs) and survival and condition of fish entrained at depths of 10 feet and 30 feet below the intake ceiling. Ultimately, the goal was to use the resulting data to operate the turbine units in a manner that ensures the highest survival rate for juvenile salmonid turbine passage.

Normandeau Associates and Skalski (2005) reported that virtually all 48-hour survival probabilities estimates were ≥ 95.6 percent; only one estimate (at 15 kcfs for the 10-foot entrained fish) was slightly lower (94.4 percent). No strong statistical relationship between survival and turbine discharge was noted. Some small differences in survival occurred between entrainment depths at specific discharges. The difference in survival was slightly higher (0.8 percent) for fish entrained at 10-foot depth than for those released 30 feet below the intake ceiling at 9,000 and 11,000 cfs discharge. However, this trend was reversed at 15,000 and 17,000 cfs discharge with lower survival (1.7 percent and 3.2 percent, respectively) for fish entrained at 10 feet below the intake ceiling than at 30 feet. Nevertheless, it was concluded that a relatively high fish passage direct survival rate may be expected across a broad range of turbine discharges at the Priest Rapids Dam (Normandeau Associates and Skalski 2005).

An important part of the "fish mode" operation at the Priest Rapids Dam powerhouse is that two or more adjacent turbines are operated together to reduce the total amount of "edge" in the tailrace. This appears to reduce predation as predatory birds tend to focus their efforts along the edges of the turbine boil. Grant PUD began this type of operation for the 2003 outmigration season. Radiotelemetry evaluations resulted in a powerhouse passage survival estimate of 98 percent in 2003. Before Grant PUD started operating blocks of adjacent units, survival rates through and the Priest Rapids powerhouse was estimated to be between 81 and 87 percent. Thus NMFS believes that the current operation standards instituted by Grant PUD for fish passage has improved overall passage survival at this development. Grant PUD will also be replacing the Priest Rapids turbines with the Advanced Turbines which should further improve passage at this development. Therefore, while powerhouse operations will continue to cause mortality of juvenile Chinook salmon and steelhead, those effects will likely remain in the acceptable range and potentially decrease over time.

Predator Controls

Avian Predation. It is estimated that tens of thousands of salmon smolts are consumed at Columbia and Snake River dams each year (NMFS 2000a). Ruggerone (1986) estimated that avian predators annually consume up to 2 percent of the smolts passing Wanapum Dam. To address this problem, NMFS (2004) and FERC (2004b) required Grant PUD to develop a program for reducing avian predation (i.e., by gulls) at the Project.

Grant PUD has entered into a 10-year cooperative service agreement with the United States Department of Agricultural Animal and Plant Health Inspection Service-Wildlife Services (WS). Under this agreement, WS uses hazing and lethal control measures on avian predators to reduce losses of downstream juvenile salmonids caused by gulls, cormorants, terns, and other piscivorous birds at Priest Rapids and Wanapum Dams.

During the 2006 smolt outmigration period, WS performed control actions on 23,226 avian predators at Priest Rapids Dam and 10,669 avian predators and Wanapum Dam. These numbers represented a 450 percent and 150 percent increase in the number of gulls hazed at Priest Rapids and Wanapum Dams, respectively, between 2005 and 2006. A total of 384 avian predators were lethally taken at Priest Rapids Dam and 286 avian predators were lethally taken at Wanapum Dam. It was observed that periodic lethal control actions (used to reinforce non-lethal hazing) reduced predatory activity at both developments. At Priest Rapids Dam, lethal control actions increased predation interruption time by 49 percent and by 18 percent at Wanapum Dam (Grant PUD 2006a).

Of the 559 avian predator stomachs examined in 2006, 85 percent contained salmonid smolts. The abundance of avian predators at the Project was significantly related to the abundance of out-migrating salmonids traveling through the Project, which was correlated with Smolt Index Counts at Rock Island Dam (next dam upstream of Wanapum Dam). A total of 353 coded-wire tags, 19 PIT tags, and two hydroacoustic tags were found in the stomach samples of 559 birds. These tags were used to identify salmonid remains to species.

In addition to the service agreement with WS, NMFS (2004) also directed Grant PUD to maintain their wire arrays across the Project tailraces to discourage feeding behavior by avian predators. Grant PUD was also directed to evaluate the feasibility of installing additional wire arrays across the spillway tailraces. Observations by WS and Grant PUD staff indicated that the wire arrays were effective at deterring avian predators. However, most avian predators concentrated feeding efforts below the mid-river whitewater spill plume, where spill merged with the powerhouse discharge (i.e., downstream of the wire arrays). Grant PUD therefore proposes to continue to contract with WS to perform avian predator control efforts at the project. Grant PUD also proposes to identify areas for the construction of future wire arrays, evaluate depredation measure effectiveness, and collect stomach samples that will be used comparatively to evaluate avian predator diet for future avian impact evaluations.

It is likely that the current avian predation control and monitoring program is lessening salmon and steelhead losses at the Project. This program will continue to be implemented in consultation with NMFS and the PRCC.

Northern Pikeminnow Predation. Grant PUD's northern pikeminnow population reduction program has been underway since 1995 and will continue as part of Grant PUD's fish passage program. A total of 275,387 northern pikeminnow have been caught and removed from the Project area since 1999.

Until 2006, the pikeminnow population within the Project area had not been quantified. Estimates of the northern pikeminnow population in the Project area were made in past years based on observations of fish-per-acre and fish-per-river-kilometer; however, population estimates based on mark-recapture studies were needed. In 2005, Grant PUD captured 406 northern pikeminnow that were tagged with PIT tags and marked with a fin clip and then released. During the 2006 removal program, Grant PUD focused on systematic removal of as many pikeminnow as possible in an attempt to capture a sufficient number of marked fish to establish a population estimate. In 2006, Grant PUD removed 4,344 pikeminnow from the Project area. Of these, just 10 pikeminnow marked in 2005 were recaptured. A Jolly-Seber open population model and Schnabel Multiple Census Estimate were used to calculate a northern pikeminnow population of 161,134 (± 167,725). The high variance in the estimate is attributable to the low number of fish initially tagged and the low number of recaptures. Based on these results, Grant PUD estimated that in order to reduce predation on migrating salmonid smolts by 50 percent, an estimated exploitation rate of 14,502 to 27,393 northern pikeminnow must be achieved annually.

Grant PUD also analyzed stomach contents from 869 pikeminnow captured in 2006. Of these, 573 were empty. Some of this was attributed to regurgitation. Dietary analysis demonstrated crayfish to be the dominant prey item consumed. Juvenile salmonids made up just 1.3 percent of all stomach contents analyzed (Grant PUD 2006b).

Based on the high uncertainty, the PRCC (including NMFS) concluded that the results from the 2005-2006 population estimate were unreliable and determined that Grant PUD should return to removing as many pikeminnow as possible during the fish passage season. This program is likely to reduce losses of listed species at the Project.

To summarize, while predation is expected to cause continued losses of juvenile salmonids, the programs described above are expected to reduce those losses.

Fish Evaluations

Under NMFS (2004) and FERC (2004b), Grant PUD is conducting juvenile salmon and steelhead survival studies. As previously stated in this Opinion, Grant PUD has satisfied the juvenile survival standard for stream-type Chinook salmon which includes UCR spring-run Chinook salmon. The device used to conduct the yearling Chinook evaluations was the PIT tag. NMFS believes that this technology provides a reliable measure of Project survival. It does not, however, provide any comparative assessment of passage routes and requires the use of very large numbers of fish in order to obtain a statistically valid result. This is because the first place PIT-tagged fish are detected is in the McNary Dam juvenile bypass and collection facility about 105 miles downstream of the Project. There is currently no way to detect PIT-tagged fish at spillways and during the outmigration season, McNary Dam is required to spill substantial volumes of water. So, large numbers of PIT-tagged fish pass McNary Dam via its spillway and therefore are not detected. For that reason, very large numbers of fish must be PIT-tagged so that enough are captured at McNary Dam's juvenile collection facility to provide a statistically valid estimate of survival.

In recent years, the acoustic tag has emerged, which allows for both a Project-level and route-specific survival estimate for juvenile salmonids; and it provides a detailed 3-D image of individual fish behavior as it migrates through a dam. Additionally, far fewer fish are needed for evaluation because detection occurs within the Project boundary and specific routes of passage can be evaluated. Thus, with the survival testing concluded for stream-type Chinook salmon, and the need for more detailed behavioral information on juvenile steelhead—both for performance of steelhead passing the Wanapum development and for developing a new bypass at the Priest Rapids development—the PRCC concurred with Grant PUD's request to use acoustic tags for their steelhead evaluations.

The use of acoustic tags, while still expected to cause some harm to listed fish, will impact far fewer fish (about 2,000 fish are needed for acoustic tag work versus roughly 100,000 fish that are need for a comparable PIT tag study) and will provide valuable data on behavior, route of passage, route-specific survival, design of a new passage facility at Priest Rapids Dam, and performance of the new Wanapum FUB. The juvenile survival evaluations are essential to understanding the Project's impact on listed anadromous fish species.

2.4.2 Adult Fish Passage

In consultation with NMFS and the PRCC, Grant PUD made changes to adult fish entrances and flow channels at Priest Rapids Dam in 2005. Preliminary results indicate that collection channel and slotted entrance velocity targets have been improved, achieving fishway operational targets the majority of the time. A removable velocity meter was installed in the collection channel which greatly assists with monitoring collection channel velocity. The sluiceways at both developments are being operated for steelhead kelts and adult fallbacks. It is anticipated that the Wanapum FUB and a potential top spill facility at Priest Rapids Dam will provide a safe route for adult fallbacks and steelhead kelts when these facilities are operated during the spring and summer fish passage season. Finally, Grant PUD completed an adult off-ladder trapping facility during the spring of 2007 and operations started in the summer of 2007. Grant PUD has also installed and is operating video adult fish counting equipment and adult fish PIT tag detectors at both developments.

It has been some time since adult passage has been evaluated at the Project. NMFS believes that another evaluation is needed to determine fallback rates, passage survival, and overall performance of passage through the Project. While the adult PIT tag detectors provide a picture of overall project passage, and are very useful for other purposes, it does not provide any data on fallback. Continued operations and existence of the project will continue to impact adult salmonid migrations, but taken as a whole, the measures implemented by Grant PUD appear to be successful and should generally improve passage at the Project.

2.4.3 Supplementation

NMFS et al. (1998a) identifies stock propagation goals for rebuilding at-risk anadromous fishery resources including UCR spring-run Chinook salmon and UCR steelhead. While this plan identifies production goals and responsibilities relevant to Grant PUD, the fisheries resource

managers define the specific goals of the program and their appropriate use. The overall objectives pertaining to the BAMP are (1) to help recover natural populations to self-sustaining and harvestable levels throughout the mid-Columbia region, and (2) to compensate for a portion of the continuing mortality from hydroelectric operations.

Production of 100,000 steelhead juveniles and 600,000 juvenile spring-run Chinook salmon by Grant PUD is required under NMFS (2004). NMFS finds that these artificial propagation programs are necessary to prevent extinction and immediately bolster numbers in these systems. It is important to note that these are maximum production numbers which may be adjusted downward if determined appropriate by the PRCC Hatchery Subcommittee.

The ICTRT (2007) determined that the Wenatchee River basin spring-run Chinook population is at high risk for genetic variation due to a persistent homogenization from previous fish management programs. Analyses on allozymes collected in the 1980s suggested that there was some differentiation between subpopulations consistent with the level of differentiation expected in that time frame, particularly in the White River Subbasin. However, microsatellite samples collected in the late 1990s and early 2000s do not show this same differentiation, suggesting that more recent management practices may have disrupted natural gene flow. For example, since 1993, a total of 56 percent of the spawners in tributaries above Tumwater Canyon on the Wenatchee River have originated from the Chiwawa supplementation program. This high proportion of hatchery fish on the spawning grounds places the viability of the population at high risk in terms of lost genetic variation. Individuals from the Chiwawa River integrated hatchery program stray to other non-target major spawning aggregates, commonly making up greater than 10 percent of the spawners in Nason Creek and the White and Little Wenatchee rivers (ICTRT 2007). However, changes in the Chiwawa Hatchery program funded by Chelan County PUD have been implemented to address the straying concern.

After examining both allozyme and microsatellite data collected by WDFW and analyzed in Ford et al. (2000), the ICTRT genetic subgroup found evidence that past management practices have caused a high degree of homogenization within the Wenatchee spring-run Chinook population and with other UCR populations. Their findings conclude that there is no apparent structure between populations, or with minor exceptions, within populations. The metrics for genotypic and phenotypic variation were the determining factors for their "high risk of extinction" rating for the Wenatchee Basin spring-run Chinook salmon. Continued efforts to maintain natural levels of exchange within and among populations and further evaluation could lead to an improved risk rating (ICTRT 2007).

In response to analyses of allozyme data from the 1980s, a captive brood program was initiated in the late 1990s as a stopgap measure to preserve and rebuild genetic variation within the Wenatchee Basin population of UCR spring-run Chinook salmon. This program focused on the White River, a headwater tributary to the Wenatchee River. A similar supplementation program was initiated for Nason Creek and for the Twisp River in the Methow River basin. The Nason Creek and Twisp River captive broodstock programs were discontinued when spring Chinook salmon returns increased in recent years; as such supplementation programs would be implemented as adult broodstock based programs. NMFS finds that maintaining and rebuilding relatively isolated spawning subpopulations in multiple tributaries within an ESU population is

essential to meeting VSP criteria for diversity. The use of diverse spawning and rearing habitats coupled with the high homing fidelity of Pacific salmon and steelhead promotes a level of genetic, demographic, and phenotypic variation that assures resilience in the face of natural, anthropogenic, and catastrophic disruptions. The fundamental goal of conserving and rebuilding the White River and Nason Creek spawning aggregates contributes directly to maintaining diversity within the Wenatchee River population of UCR spring-run Chinook salmon. In addition, these same goals are in place for supplementation programs in the Methow River basin.

2.4.4 Habitat

The mere existence and operation of the Project will continue to impact habitat in the mainstem Columbia River. However, under NMFS (2004) Grant PUD contributes $288,600 annually to an account for habitat projects that contribute to recovery of UCR spring-run Chinook salmon and UCR steelhead. FERC proposes that Grant PUD contribute an additional $1,096,552 each year to a general habitat account. This larger sum is a measure already agreed to in the settlement agreement. As required in NMFS (2004), a final Habitat Plan was completed by the PRCC Habitat Subcommittee. The Habitat Plan calls for priority to be given to projects that help restore habitat functions in drainages important to UCR steelhead and UCR spring-run Chinook salmon. The Plan states that priority will be given to projects that can be implemented before 2010 and that will produce benefits into the future. The Habitat Subcommittee agreed that it may solicit review of project proposals as necessary by technical experts including the Upper Columbia Regional Technical Team, which would employ the Upper Columbia Salmon Recovery Plan or its accompanying technical documents as the framework to rate the biological and technical merit of project proposals. Thus, the proposed annual contribution will benefit listed anadromous fish species and should contribute to recovery of these stocks.

In 2006, the PRCC Habitat Subcommittee awarded a total of $655,000 for four projects (Grant PUD 2007). These projects satisfied the criteria set out in the Habitat Plan in that they are aimed directly at benefitting UCR spring-run Chinook salmon and UCR steelhead and should contribute to these species' recovery in the long term. These projects are briefly described below. More detail can be found in Grant PUD (2007).

Light Detection and Ranging (LiDAR) and Orthoimagery

This project was awarded $124,000 by the Habitat Subcommittee and is producing imagery information for designated reaches within the Methow, Okanogan, and Wenatchee basins. LiDAR is a laser system mounted to aircraft that emits laser pulses toward the ground. The laser pulses that reflect from terrestrial surfaces are received by the sensor that records the time elapsed. LiDAR points can be processed to generate digital terrain models, vegetation canopy surfaces, and building surfaces. These surfaces are then used for stream channel, hydrology and floodplain analysis, forestry mapping, riparian and wetland mapping and restoration project design. An orthoimage is a geo-referenced image prepared from an aerial photograph or other remotely sensed data from which displacements caused by sensor orientation and terrain relief have been minimized. The LiDAR digital information can be conjoined with orthoimages to

produce a three-dimensional, high resolution image of geographic features. These images will be used for planning and design of restoration projects, especially for proposals to reconnect side channels to the mainstem river, as well as for modeling habitat capacity and identifying other sites with the potential for improved habitat complexity and protection.

Fulton Dam Fish Passage Barrier Removal Project

This project was awarded $80,000 by the Habitat Subcommittee. The existing Fulton Dam, a crumbling water diversion structure on the lower Chewuch River in Okanogan County, Washington, was a partial passage barrier for UCR spring-run Chinook salmon, UCR steelhead, bull trout, and non-listed summer Chinook. The dam height of 7 feet effectively blocked fish passage at low flows. Reconstruction of the diversion dam and a roughened stream channel provides improved passage for listed species at all flow levels while maintaining the ability to withdraw water for irrigation.

Omak Creek Culvert Replacements

This project was awarded $51,000 by the Habitat Subcommittee. Omak Creek is one of the few tributaries in the Okanogan River basin that currently supports UCR steelhead. Since 1997, a number of actions have been taken which has greatly improved access to Omak Creek for UCR steelhead. Furthermore, considerable effort has gone into improving habitat conditions in this subbasin and results have been encouraging.

One of the remaining significant impacts is the amount of fine sediment in the streambed. In an effort to diminish the amount of fine sediment delivered to defined waterways within this watershed, over 50 miles of road have been decommissioned (road bed ripped, water bars constructed and culverts removed) and three undersized culverts have been replaced in the past 5 years.

In the ongoing effort to reduce the amount of fine sediment delivered to Omak Creek, this project replaced two 6-foot diameter culverts at RM 15 and RM 17 during November and December 2006. As a result of this project, an estimated 100 cubic yards of road fill will be kept out of downstream reaches. This continues to increase the quality of spawning habitat and instream productivity for UCR steelhead.

Skookumchuck Land Purchase

This project was awarded $400,000 by the Habitat Subcommittee. The Trust for Public Land (TPL) and WDFW purchased 5,100 acres in the Skookumchuck Creek (a tributary to the Columbia River near Vantage, Washington) watershed for $1.8 million. As a result of this acquisition, land in the lower Skookumchuck Creek Watershed, except the small private ranch owned by the Cruz family who intend to manage their lands for their ecological values, is in public ownership. TPL and WDFW continue to seek funds for the purchase of all remaining lands in the upper watershed and recently scored first among all projects competing for Washington Wildlife and Recreation Program funds. In total, this project will encompass 17,500 acres at a cost of $7.1 million of combined funds from the State of Washington, Energy Facility Site Evaluation Council, TPL, and Grant PUD. Grant PUD funding is approximately 6 percent of the total purchase price. The lands acquired would be owned and managed by the WDFW for the purpose of shrub steppe habitat protection and enhancement. Although very limited cattle

grazing will be allowed on the upper portions of the property, the lower reaches of Skookumchuck Creek will be rested at least for the next several years. This change in management is expected to hasten recovery of riparian vegetation and improve base flows in the creek, which will be beneficial to the UCR steelhead/rainbow trout (*Oncorhynchus mykiss*) population that uses this creek. The purchase will also afford the opportunity to monitor the biological responses of the fish population to the changes in management. Currently, this land purchase is being administered by WDFW.

Projects like these funded in 2006 will continue and are expected to contribute to recovery of UCR spring-run Chinook salmon and UCR steelhead.

2.4.5 Water Quality

As described in Section 2.4.1 (Spill), the Project's primary impact on water quality is the production of waters supersaturated with TDG. Water highly supersaturated with TDG (>110 percent saturation in water less than 13 feet deep) can produce a hazardous condition for aquatic organisms. Fish relying on dissolved oxygen for their life processes become equilibrated with the gaseous state of the river. Gas is absorbed through the gill filaments into the bloodstream during respiration. Supersaturated gases in fish tissues tend to pass from the dissolved state back to a gaseous state as internal bubbles or blisters. This condition is called GBT and can be debilitating and even fatal to the afflicted organism, including upstream and downstream migrating salmonids (Ebel and Raymond 1976, Mesa et al. 2000). Susceptibility to GBT is highest near the water surface where reduced hydrostatic pressure allows dissolved gases to come out of solution.

The onset and effect of GBT on fish can vary even between individuals and is dependent upon many factors including saturation level, depth of fish in the water column, water temperature, and length of exposure. Research suggests that individuals can begin showing signs of GBT at 110 to 115 percent saturation, but typically are not killed until saturation reaches about 130 percent (Mesa and Warren 1997, Backman and Evans 2002).

Spill at the Project is managed for both fish passage and TDG criteria. As previously discussed in Section 2.4.1, Grant PUD reduces spill volumes when necessary to stay within state TDG criteria. These criteria can be exceeded during periods when river flows exceed powerhouse hydraulic capacity and spill is forced at both developments. With the addition of the future unit bypass, which will become operational for the 2008 outmigration season, involuntary spill volumes at Wanapum Dam will be reduced by about 20,000 cfs and about another 10,000 cfs once all advanced turbines are installed. These measures will significantly reduce the frequency of involuntary spill events at Wanapum Dam, which are the primary producers of TDG at the Project. Similar measures are expected to be put into operation at Priest Rapids Dam which should reduce the frequency of involuntary spill at this development as well.

2.4.6 Critical Habitat

Designated critical habitat within the Project boundary includes two PCEs and their essential physical and biological features as listed below. The essential features of the PCEs that could potentially be affected include water quality and quantity, cover, forage, and safe passage (i.e., absence of man-made obstructions). The Project is located within an important juvenile and adult migration corridor for both UCR spring-run Chinook salmon and UCR steelhead. While this area does not provide any significant level of rearing habitat for juvenile spring-run Chinook salmon, it is likely to provide some rearing habitat for juvenile steelhead. NMFS uses reach survival as an index of safe passage, in this case represented by achievement of the Project survival standards set in NMFS (2004) and the Settlement Agreement.

Freshwater Rearing Sites

Water quantity. The Project can store some water, but the Proposed Action is not likely to measurably affect water quantity or flows, particularly during the spring outmigration season when juvenile steelhead would be most likely to rear in the mainstem Columbia River. Spring runoff significantly increases flow volumes during that period.

Floodplain connectivity. The Proposed Action is not likely to affect floodplain connectivity.

Water quality. The Proposed Action will have adverse effects on water quality due to short-term excursions above state TDG criteria during periods of involuntary spill. The frequencies of involuntary spill events at the Project will significantly decrease beginning in 2008 and continue to diminish over the next decade as powerhouse hydraulic capacity increases and a new bypass is constructed at Priest Rapids Dam. However, spill will not be completely eliminated.

Forage. The Proposed Action is not likely to affect forage.

Natural cover. Some natural cover may have been lost due to Project reservoirs but very little riparian cover existed naturally within the Project boundary.

Freshwater Migration Corridors

Safe passage. The Proposed Action does result in some passage delay and mortality for both adult and juvenile life stages. The installation of the Wanapum FUB and new Advanced Turbines should improve passage conditions for juvenile migrants, adult fall backs, and steelhead kelts during spring and summer months. Similar improvements will be carried out at Priest Rapids Dam. NMFS does not anticipate any significant difference in adult fish migrations rates (miles per day) between the expected condition and a hypothetical reach without the Project. NMFS (2000b) compared the migration rates of adult Chinook salmon and steelhead 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 in impounded reaches versus 6 to 19 miles/day in non-impounded reaches).

Water quantity. The Proposed Action is not likely to measurably affect water quantity or flows.

Water quality. The Proposed Action will have adverse effects on water quality due to short-term excursions above state TDG criteria during periods of involuntary spill. The frequency of involuntary spill events at the Project will significantly decrease beginning in 2008 and continue to decrease over the next decade as powerhouse hydraulic capacity increases and a new bypass is constructed at Priest Rapids Dam. However, spill will not be completely eliminated.

Natural cover. Some natural cover may have been lost due to Project reservoirs but very little riparian cover existed naturally within the Project boundary.

2.5 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.

As part of the collaborative remand process for the FCRPS, the State of Washington provided information on various ongoing and future or expected projects that are reasonably certain to occur and will affect recovery efforts in the Interior Columbia Basin (Corps et al. 2007). A number of these projects were described as having a positive effect on the status of UCR spring Chinook salmon and steelhead. All of these actions are either completed, ongoing, or planned with a high likelihood of implementation. They address protection and/or restoration of existing or degraded fish habitat, instream flows, water quality, fish passage and access, and watershed or floodplain conditions that affect stream habitat. Significant actions and programs include growth management programs (planning and regulation), a variety of stream and riparian habitat projects, watershed planning and implementation, acquisition of water rights and sensitive areas, instream flow rules, stormwater and discharge regulation, Total Maximum Daily Load (TMDL) implementation, and hydraulic project permitting. Responsible entities include cities, counties, and various state agencies.

Similarly, for all State, Tribal, and local governments there are programs that harm salmon habitat through legislation, administrative rules, policy initiatives, or permitting activities. Despite the fact that none of the States (or Tribes) provided evidence of specific harmful programs in their responses to the request for information from NMFS, it is self evident that many of these programs have existed and contribute to the currently degraded status of the species. At least some of these harms will continue to degrade salmon habitat for some period of time until their respective authorizations expire. Given the broad range of these activities, NMFS has not presumed that the authorization for any specific activity will be renewed once it

expires and, therefore, assumes that the habitat will gradually approach a better functioning condition at some point in the future (i.e., as these harmful activities cease). Such eventual habitat improvements could affect the status of UCR spring Chinook salmon and steelhead or their designated critical habitat during the term of this Opinion.

2.6 Conclusion

NMFS (2004) required a number of actions that were necessary for the Project to avoid jeopardizing UCR spring-run Chinook salmon and UCR steelhead. Accordingly, FERC issued an order amending the Project's existing license by incorporating the mandatory conditions in NMFS (2004). These measures were later included as Appendix A in the Priest Rapids Project Salmon and Steelhead Settlement Agreement, filed with FERC on February 10, 2006. While working with NMFS on its development of the Biological Opinion for the interim protection plan (NMFS 2004) and in preparation of its Final License Application (Grant PUD 2003), Grant PUD began to carry out the proposed action and the measures in NMFS (2004), e.g., juvenile passage survival evaluations, Wanapum Dam future unit bypass, Priest Rapids Dam juvenile bypass evaluation, spill management, advanced turbine replacement, predator control measures, and etc.

NMFS concluded that the actions required in NMFS (2004) would not jeopardize UCR spring-run Chinook salmon and UCR steelhead. These same measures for these species are proposed, and currently being implemented, for the Project's new license. In this case, NMFS concludes that the Proposed Action, issuance of a new license for the Project, would not jeopardize the continued existence of UCR spring-run Chinook salmon and UCR steelhead, or destroy or adversely modify designated critical habitat for these species based on the following:

- The juvenile survival standards established in NMFS (2004) have already been satisfied for UCR spring-run Chinook salmon. It is likely that this survival rate will, at a minimum, be sustained, but also that juvenile survival rates will improve as Grant PUD installs additional advanced turbines, builds and operates the FUB, is able to reduce involuntary spill at Wanapum Dam, continues predator control , and installs a bypass system and Advanced Turbines at Priest Rapids Dam. NMFS expects that these measures will also lead to achievement of the required juvenile survival standard for UCR steelhead.

- Per the proposed FERC license, Grant PUD will continue to implement long-term habitat protection and restoration measures, which are designed to support natural spawning populations of UCR spring-run Chinook salmon and UCR steelhead, over the term of the new license.

- Grant PUD has already implemented operational improvements at the adult fishway at Priest Rapids Dam that provides better compliance with fishway operation criteria.

- Grant PUD has completed construction of the trap off the adult fishway at Priest Rapids Dam and began operations in the summer of 2007. The newly designed trap allows for significantly less handling and therefore less stress which should result in better survival and spawning success.

- Per the proposed FERC license, Grant PUD will operate the Wanapum future unit bypass in spring 2008, which will provide a safe route of passage for adult fallbacks and steelhead kelts during the juvenile fish passage season (spring and summer). It is evaluating a similar top-spill type of facility for Priest Rapids Dam with the goal of providing the same level of benefit at that development.

- The adaptive management process contained within the proposed FERC license and in the Settlement Agreement will allow NMFS and the PRCC to adjust the various fish programs in response to research and monitoring results if warranted. In the long term, this should contribute to better survival for listed species.

2.6.1 Conclusions Regarding Critical Habitat

NMFS concludes that the Proposed Action is not likely to adversely modify or destroy designated critical habitat. Designated critical habitat within the Project boundary includes two PCEs: *freshwater rearing sites* and *freshwater migration corridors*. Table 2, below, summarizes the effects of the Proposed Action on the essential features of these two PCEs of designated critical habitat and NMFS' conclusions regarding the effects.

TABLE 2. Summary of effects on the essential features of freshwater rearing and juvenile and adult migration areas in designated critical habitat within the action area.

CRITICAL HABITAT PCE ESSENTIAL FEATURES	PROJECT EFFECT	UPPER COLUMBIA RIVER SUBBASIN DESIGNATED AREA AFFECTED	EXPOSURE OVER 50-YEAR DURATION OF PROPOSED ACTION	RESPONSE	LIMITING TO CONSERVATION VALUE AT 5TH-FIELD HUC
Spawning, incubation and larval development	Project operations, including reservoir impoundment, reservoir fluctuation, maintenance, and hydropower generation	Upper Columbia River Unit 5[11]. Columbia River Corridor	None. No spawning of UCR spring-run Chinook salmon or steelhead occurs in affected area	NA	No
Mainstem rearing	Project operations, including reservoir impoundment, reservoir fluctuation, maintenance and hydropower generation	Upper Columbia River Unit 5. Columbia River Corridor	Entire juvenile migration period (April through June; both species)	Reduced TDG accept for periods of involuntary spill during spring runoff, reduced predator exposure due to continued controls on predators.	Unlikely
Safe passage through project reservoir and past dam	Upstream adult fish passage	Columbia River Corridor	Entire migration period (April through November; both species)	Passage times and survival are comparable to conditions without the project	Unlikely
	Kelt passage	Columbia River Corridor	Post-spawning migration, steelhead only	Could reduce number of repeat spawners, but this is expected to improve by 2013 due to implementation of measures also designed to improve juvenile survival	Unlikely
	Adult fallback	Columbia River Corridor	Entire migration period (April through November; both species)	Some mortality occurs through turbines and spillway passage, but survival is expected to improve with measures implemented by 2013	Unlikely

[11] Unit 5, as described in NMFS (2005b), is the portion of the Columbia River downstream of Rock Island Dam.

Safe passage through project reservoir and past dam, cont'd.	Downstream Juvenile Passage	Columbia River Corridor	Entire downstream migration period (April through June; both species)	Reduced TDG accept for periods of involuntary spill, reduced passage mortality, reduced exposure to predators, and survival standards ensure that survival will be at or above 93% per development by 2013.	Unlikely
	Predator removal	Columbia River Corridor	Entire downstream migration period (April through June; both species)	Potential for injury or death is limited to long line angling, and historically, incidental catch of listed fish is very small, with all fish released.	Unlikely
Water Quality (TDG)	Project operations, including reservoir impoundment, reservoir fluctuation, maintenance and hydropower generation	Columbia River Corridor	Entire adult and juvenile migration period (April through November; both species)	Reduced exposure to TDG accept for periods of involuntary spill when spring runoff exceeds hydraulic capacity of the powerhouse and Wanapum FUB	Unlikely
Water Quantity	Project operations, including reservoir impoundment, reservoir fluctuation, maintenance and hydropower generation	Columbia River Corridor	Entire adult and juvenile migration period (April through November; both species)	Project can store some water in the Wanapum pool but is largely operated in a run-of-river mode during spring runoff, with water quantity largely dependent on incoming river flows	Unlikely
Natural Cover and Forage	Project operations, including reservoir impoundment, reservoir fluctuation, maintenance and hydropower generation	Columbia River Corridor	Entire adult and juvenile migration period (April through November; both species)	Proposed Action will have no impact on the limited natural riparian cover, which is not typically used by these species during mainstem migration.	Unlikely

2.7 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 the 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, to prevent future listings of stocks under NMFS' jurisdiction or to develop additional information for use in developing further protective measures. NMFS has no recommendations at this time.

2.8 Reinitiation of Consultation

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 (or is authorized by law) and if: 1) the amount or extent of incidental take is exceeded, 2) new information reveals effects of the agency action that may affect listed species in a manner or to an extent not considered in this Opinion, 3) the agency action is subsequently modified in a manner that causes an effect to the listed species not considered in this Opinion, or 4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, FERC must notify NMFS and reinitiate consultation (50 CFR §402.14(i)(4)).

2.9 Incidental Take Statement

Section 9 of the ESA and Federal regulations under 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.

Incidental take resulting from actions carried out under the Habitat Plan are not included in this incidental take statement. NMFS cannot reasonably predict or determine the types of projects that will occur, or the activities necessary to execute the projects. Therefore, habitat actions shall be covered in separate ESA consultations.

The measures described in this section are nondiscretionary and must be included by FERC in its amendment of the Project license. FERC has a continuing duty to regulate the activities of Grant PUD covered by this incidental take statement pursuant to the license as amended. If FERC fails to include these conditions in the license or Grant PUD fails to assume and implement the terms and conditions of this incidental take statement, the protective coverage of Section 7(a)(2) may lapse. To monitor the effect of incidental take, Grant PUD must report the progress of the action and its effect on each listed species to NMFS, as specified in this incidental take statement (50 CFR §402.14(i)(3)).

2.9.1. Amount or Extent of Take for Juveniles

NMFS (2004) required that the survival standard for juvenile passage be accomplished by 2013. Grant PUD is currently evaluating juvenile steelhead survival through the Project, and has previously demonstrated that it is meeting the Project (both developments combined) survival standard of 13.51 percent for juvenile spring-run Chinook salmon. Therefore, lethal take of juvenile UCR spring-run Chinook salmon shall not exceed 13.51 percent for both developments combined. This corresponds to a survival standard of 86.49 percent for the Project or 93.0 percent per development.

Beginning in 2013, lethal take of juvenile UCR steelhead shall not exceed 13.51 percent. Until 2013, lethal take shall not exceed 23.2 percent for the Project (both developments combined) which is the level of allowed lethal take established in NMFS (2004). If Grant PUD satisfies the juvenile passage standard before 2013, than the allowed lethal take shall not exceed 13.51 percent for the Project (both developments combined) beginning in the first year following achievement of the standard.

2.9.2. Amount or Extent of Take for Adults

There has been no new information developed regarding adult mortality rates at the Project since NMFS issued its Biological Opinion for interim operations (NMFS 2004). Thus, NMFS assumes that the analysis of amount of take conducted in NMFS (2004) is applicable to this Incidental Take Statement. Based on this analysis, mortality shall not exceed 2 percent per development, or 4 percent combined, for adult UCR spring-run Chinook salmon, and 3 percent per development, or 6 percent combined, for upstream and downstream migrating adult UCR steelhead.

2.9.3. Amount or Extent of Take from Predator Control Measures

NMFS expects the non-lethal take of juvenile and adult UCR spring-run Chinook salmon and UCR steelhead as a result of predator control measures (i.e., capture and handling) to be no more than 20 juveniles and four adults of either species per year and lethal take to be no more than 10 juveniles and two adults of either species per year.

2.9.4. Amount or Extent of Take from Activities Associated with Construction in or Near the Water

The Proposed Action does contain measures that will involve construction (e.g., juvenile bypass structure at Priest Rapids Dam). This incidental take statement shall cover any new construction activities carried out in or near the water. Lethal take resulting from construction activities is expected to be small, if any. Thus, mortality shall not exceed 20 individuals (adults and juveniles combined) of either species per as a result of new construction.

2.9.5. Reasonable and Prudent Measures

NMFS 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, FERC must incorporate into the License, and Grant PUD must comply with, all of the reasonable and prudent measures and terms and conditions set forth below.

1. Measures set forth in Section 9 of NMFS (2004), the Reasonable and Prudent Alternative Actions numbered 1 through 40, as modified in Section 2.9.6 (below), is hereby incorporated as a reasonable and prudent measure to be incorporated into the new FERC license for the Priest Rapids Hydroelectric Project.

2. To minimize the amount and extent of incidental take during the shutdown phase of turbine replacement at both the Wanapum and Priest Rapids developments, FERC shall ensure that Grant PUD salvages any listed species that are entrained in gatewells and draft tubes of any turbine unit being replaced.

3. To minimize the amount and extent of incidental take from construction activities in or near the water, FERC shall ensure that Grant PUD takes measures to minimize sediment suspension and to prevent toxic materials from entering the water.

2.9.6 Terms and Conditions

To be exempt from the prohibitions of Section 9 of the ESA, FERC must ensure that Grant PUD complies with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary.

1. In order to comply with reasonable and prudent measure one, above, the following terms and conditions shall be applied to the new license for the Project.

    1.1. Performance Standards (adapted from Action 1, NMFS 2004). FERC shall require Grant PUD to make steady progress towards achieving a minimum 91 percent combined adult and juvenile salmonid survival performance standard at the Priest Rapids and Wanapum developments (i.e., each dam). The 91 percent standard includes a 93 percent Project-level (reservoir and dam) juvenile performance standard. NMFS recognizes that it is not currently possible to measure the 91 percent combined adult and juvenile survival standard. Grant PUD shall therefore continue to conduct dam and reservoir smolt survival studies, evaluating progress towards meeting a 93 percent juvenile Project passage survival. This standard can be measured at each development individually, or as a composite of survival at the two developments.

NMFS recognizes that the juvenile standard has been already achieved for UCR spring-run Chinook salmon. FERC shall require Grant PUD to at least maintain this level of survival. FERC shall ensure that Grant PUD achieves the juvenile standard for UCR steelhead, as measured after 3 consecutive years of evaluation, by 2013. Grant PUD can compensate for a failure to achieve the performance standard at one of its developments by exceeding the performance standard at the other development (i.e., at a minimum, by the same percentage amount below the survival performance standard at the development failing to meet performance standards). If Project survival exceeds the minimum combined juvenile and adult performance standard specified above, as measured per the specifications listed below, off-site mitigation obligations can be reduced by a commensurate amount.

1.2. Downstream Passage Alternatives Action Plan, Wanapum Development (adapted from Action 2, NMFS 2004). FERC shall require that Grant PUD, in coordination with the PRCC, revise the DPAAP as needed. The DPAAP shall be approved by NMFS and shall consist of the implementation and testing of capital measures designed to achieve the performance standards by 2013.

1.3. Completion of the Wanapum Dam Future Unit Bypass (adapted from Action 3, NMFS 2004). As part of the first phase of the DPAAP described above, FERC shall require Grant PUD to complete construction of the Wanapum FUB by the year 2008. Biological evaluations shall be completed as soon as practicable to ensure that this facility performs to a level that, at a minimum, contributes to achieving and maintaining the survival standards set forth in Action 1 above.

1.4. Advanced Turbines (adapted from Action 4, NMFS 2004). As a second component of the DPAAP, FERC shall require Grant PUD to complete replacement of the remaining turbines with the Advanced Hydro Turbine System at Wanapum Dam. FERC shall require Grant PUD to evaluate powerhouse passage with the new turbines in place. A preliminary schedule describing the timing and nature of future studies shall be completed for approval by the PRCC within 1 year after licensing issuance.

1.5. Primary Juvenile Passage Options, Wanapum Dam (adapted from Actions 5 and 6, NMFS 2004). The primary passage option at Wanapum Dam beginning in 2008 will be 20,000 cfs spill through the Wanapum FUB. If fish evaluations show that the Wanapum FUB is producing fish mortality at rates that impede the achievement and maintenance of the juvenile survival standard, then Grant PUD shall continue to evaluate and pursue solutions to improve FUB passage in order to satisfy the performance standard requirement. The existing spill program shall remain a viable passage alternative if the PRCC determines that it is necessary while solutions to the FUB are being determined.

The spill program shall be as follows: Grant PUD shall implement a spill level beginning at 43 percent of average daily total river flow, or TDG limits, for spring migrants. The spill level shall be managed by a spill team of the PRCC. The spill level will remain in effect for spring migrants until improvements to the Wanapum FUB are completed, or another alternative is developed. This spill level shall be in effect for at least 95 percent of the juvenile spring migration, as determined by in-season monitoring and index counts at Chelan County PUD's Rock Island Dam, and coordinated with the upstream developments. Monitoring of the downstream migration shall begin on or before April 1 each year and spill must commence before more than 2.5 percent of the spring migration has passed, and can conclude when 97.5 percent of the spring migration is complete, or on June 15, whichever occurs first. In consultation with the PRCC and with approval by NMFS, Grant PUD may reduce spill as necessary to remain at or under TDG limits or as determined necessary to optimize juvenile survival, including full termination of spill

1.6. Alternative Spill Patterns, Wanapum Dam (adapted from Action 7, NMFS 2004). Involuntary spill will occur at Wanapum Dam when river flow exceed powerhouse and FUB capacity. Alternative spill patterns may be evaluated as possible alternatives to existing spill patterns for the purpose of improving spillway survival during these events. FERC shall require Grant PUD to consult with the PRCC when changes to spill patterns are deemed necessary to improve survival. Any spill pattern must be approved by NMFS.

1.7. Total Dissolved Gas Abatement, Wanapum Dam (adapted from Action 8, NMFS 2004). FERC shall require Grant PUD to continue to implement a TDG Abatement Plan under the Project's 401 water quality certification and coordinate any changes in the plan with the PRCC.

1.8. Turbine Operations, Wanapum Dam (adapted from Action 9, NMFS 2004). FERC shall require Grant PUD to operate the Wanapum turbines in "fish mode" for 95 percent of the juvenile spring migration, as determined by in-season monitoring and index counts at Chelan County PUD's Rock Island Dam. Monitoring shall begin on or before April 1 each year, and "fish mode" operation must commence before more than 2.5 percent of the spring migrants have passed and can conclude when 97.5 percent of the spring migration is complete, or on June 15, whichever occurs first. Any changes to turbine operations shall require approval from NMFS and consultation with the PRCC. FERC shall require Grant PUD to evaluate powerhouse passage with the new advanced turbines in place. A preliminary schedule describing the timing and nature of future studies shall be completed for approval by the PRCC within 1 year after licensing issuance.

1.9. Avian Predator Control (adapted from Action 10, NMFS 2004). FERC shall require Grant PUD to continue to fund an overall programmatic approach to the reduction of avian-related mortalities to salmon and steelhead populations affected by the Priest Rapids Project. The Avian Predator Control Program shall articulate the goals and objectives of the program, the measures to be undertaken by Grant PUD to achieve those goals and objectives, and the methods by which the success of those measures will be evaluated periodically, as determined by the PRCC.

FERC shall require Grant PUD to maintain the wires across the Wanapum powerhouse tailrace area in good condition to exclude avian predators. FERC shall require Grant PUD to evaluate the feasibility of installing additional wire arrays across the spillway tailrace within 12 months after issuance of the new license for the Project. If NMFS and the PRCC determine that wire installation across the spillway tailrace is feasible, Grant PUD shall install those wires before the 2010 juvenile fish passage season begins.

1.10. Northern Pikeminnow Removal Program (adapted from Action 11, NMFS 2004). FERC shall require Grant PUD to continue both the control and monitoring programs for Northern Pikeminnow. NMFS views these as long-term programs aimed at reducing juvenile salmon and steelhead mortality associated with predation by northern pikeminnow in the Wanapum development. This program will assist in achieving those goals and objectives consistent with other means and measures undertaken by Grant PUD to improve juvenile passage survival under consultation with the PRCC.

1.11. Downstream Passage Alternatives Action Plan, Priest Rapids Development (adapted from Action 12, NMFS 2004). FERC shall require that Grant PUD, in coordination with the PRCC, revise the DPAAP as needed. The DPAAP shall be approved by NMFS and shall consist of the implementation and testing of capital measures designed to achieve the performance standards by 2013.

1.12. Alternative Top-Spill Concepts, Priest Rapids Dam (adapted from Action 13, NMFS 2004). Grant PUD completed 1 year of biological testing (behavior evaluation) of a prototype top spill fish bypass at Priest Rapids Dam during the 2006 fish passage season. This field study is one component of a comprehensive assessment of design alternatives for non-turbine fish passage at Priest Rapids Dam. Other components include hydraulic and CFD modeling and mechanical engineering.

FERC shall require Grant PUD to develop a bypass facility for the Priest Rapids Development in consultation with NMFS and the PRCC. This facility shall, at a minimum, contribute to achieving and maintaining the survival standards set forth in Action 1 above. Final designs and subsequent evaluations of any new facility shall be done in consultation with, and approved by, the PRCC and NMFS.

1.13. Primary Juvenile Passage Option, Priest Rapids Dam (adapted from Action 14 and Action 15, NMFS 2004). Until a fish passage facility is developed, constructed, evaluated, and demonstrates that it will provide at least equal survival to the existing spill program, spill shall be the primary passage option at Priest Rapids Dam. If fish evaluations show that the current spill regime is causing fish mortality such that the survival standards cannot be achieved, then FERC shall require Grant PUD to evaluate modifications to the spill regime, including evaluation of spill patterns, to determine potential improvements in juvenile survival. Modifications to the spill regime and pattern at Priest Rapids Dam shall require approval of NMFS and the PRCC.

1.14. Spill Program, Priest Rapids Dam (adapted from Action 16, NMFS 2004). FERC shall require Grant PUD to implement a spill level of 61 percent of average daily total river flow, or TDG limits, whichever is less, for spring migrants. This spill level will remain in effect for spring migrants until a better downstream passage alternative is identified, tested, and approved by NMFS and the PRCC. These Priest Rapids spill levels must be in place for 95 percent of the juvenile spring migration, as determined by in-season monitoring and index counts at Chelan County PUD's Rock Island Dam, and coordinated with the upstream projects. Monitoring of the downstream migration shall begin on or before April 1 each year, and Priest Rapids spring migrant passage spill must commence before 2.5 percent of the spring migration has passed. The spring fish passage season will conclude when 97.5 percent of the migrants have passed, or on June 15, whichever occurs first. Grant PUD may reduce spill as necessary to remain at or under the TDG limits after consulting with the PRCC.

1.15. Total Dissolved Gas Abatement, Priest Rapids Dam (adapted from Action 17, NMFS 2004). FERC shall require Grant PUD to continue to implement a TDG Abatement Plan under the Project's 401 water quality certification and coordinate any changes to the plan with the PRCC.

1.16. Turbine Operations, Priest Rapids Dam (adapted from Action 18, NMFS 2004). To maintain optimal powerhouse passage survival, FERC shall require Grant PUD to operate the Priest Rapids turbines in non-cavitation mode and run at least two adjacent turbines at any one time. These turbine operations must be in place for 95 percent of the juvenile spring migration, as determined by in-season monitoring and index counts at Chelan County PUD's Rock Island Dam, and coordinated with the upstream projects. Monitoring of the downstream migration shall begin on or before April 1 each year, and non-cavitation turbine mode operations must commence before 2.5 percent of the spring migration has passed. Non-cavitation turbine mode operations can conclude after 97.5 percent of the spring migration has passed, or on June 15, whichever occurs first. Any changes to turbine operations shall require approval from NMFS and the PRCC.

1.17. Avian Predator Control, Priest Rapids Dam (adapted from Action 19, NMFS 2004). In conjunction with the Avian Predator Control Program developed and implemented under Action 10 above, FERC shall require Grant PUD to maintain the wires across the Priest Rapids powerhouse tailrace area in good condition to exclude avian predators. FERC shall require Grant PUD to evaluate the feasibility of installing additional wire arrays across the spillway tailrace within 12 months after issuance of the new license for the Project. If NMFS and the PRCC determine that wire installation across the spillway tailrace is feasible, Grant PUD shall install those wires before the 2010 juvenile fish passage season begins.

1.18. Northern Pikeminnow Removal, Priest Rapids Development (adapted from Action 20, NMFS 2004). As a component of the Northern Pikeminnow Predator Reduction Program, FERC shall require Grant PUD to continue both the control and monitoring programs for Northern Pikeminnow. NMFS views these as long-term programs aimed at reducing juvenile salmon mortality associated with predation by northern pikeminnow in the Priest Rapids development. This program will achieve those goals and objectives consistent with other means and measures undertaken by Grant PUD to improve juvenile passage survival under consultation with the PRCC and NMFS.

1.19 Adult PIT Tag Detection, Priest Rapids Dam (adapted from Action 21, NMFS 2004). FERC shall require Grant PUD to maintain and operate the PIT tag detection system at Priest Rapids Dam. A PIT tag detection system was established in the Priest Rapids Dam fishways in spring 2003. The system consists of two detection weirs in the non-overflow section of each fishway. Each detection weir has two submerged orifices, each equipped with a PIT tag antenna.

1.20. Adult Fish Trap, Priest Rapids Dam (adapted from Action 22, NMFS 2004). FERC shall require Grant PUD to maintain in good working order the Priest Rapids Dam off-ladder adult fish trap, and ensure that it is operational each year prior to startup for fish collection. Grant PUD shall make necessary repairs and modifications as determined necessary by NMFS and the PRCC. Timing of repairs or modifications shall be determined by Grant PUD in consultation with the PRCC.

1.21. Priest Rapids Adult Fishway Improvements (adapted from Action 23, NMFS 2004). FERC shall require Grant PUD to continue to operate and monitor the adult fishways at Priest Rapids Dam, and maintain all operating criteria established by NMFS. Any modifications or adjustments outside of normal day-to-day operations to adult fishways shall be done in consultation with the PRCC. Major modifications or adjustments shall require approval from NMFS.

1.22. Adult Fish Counting (adapted from Action 24, NMFS 2004). FERC shall require Grant PUD to maintain the video adult fish counting equipment at both developments in good condition and provide reliable fish count information. Grant PUD shall develop and submit annual reports for inclusion in regional databases.

1.23. Adult Steelhead Downstream Passage (adapted from Action 25, NMFS 2004). FERC shall require Grant PUD to operate the project sluiceways at both dams continually from the end of summer spill until November 15 to provide a safer passage route for adult steelhead fallbacks. If in-season monitoring indicates that these time frames could be modified to improve adult downstream fish passage, FERC shall require Grant PUD to discuss in-season study results with the PRCC, and upon approval by NMFS and the PRCC modify the time frame for operating project sluiceways.

1.24. Hatchery Subcommittee (adapted from Action 26, NMFS 2004). FERC shall require Grant PUD to continue to support the Priest Rapids Hatchery Subcommittee. This shall include provision of sufficient facilitation, administration, and clerical support to the Hatchery Subcommittee. This committee shall be the primary forum for implementing and directing supplementation measures for the Project's anadromous fish program. The Hatchery Subcommittee is comprised of NMFS, USFWS, WDFW, Confederated Tribes of the Colville Reservation, Confederated Tribes and Bands of the Yakama Nation, Confederated Tribes of the Umatilla Reservation and Grant PUD.

Since January 2005, the Hatchery Subcommittee has met monthly to undertake and oversee the planning and implementation of the programs described in Actions 27-29 below. The committee operates on consensus regarding decisions directly linked to Project management. Unresolved disputes may be elevated to the PRCC, which shall use the February 10, 2006, Salmon and Steelhead Settlement Agreement process for dispute resolution if necessary. Decisions regarding management of anadromous fishery resources in the UCR basin not directly linked to the Project are the purview of the agencies and Tribes. When carrying out activities that may affect land and water resources within local watersheds, the Hatchery Subcommittee should coordinate with relevant local planning and permitting entities, including the Upper Columbia Salmon Recovery Board.

1.25. UCR Steelhead Supplementation Plan (adapted from Action 27, NMFS 2004). FERC shall require Grant PUD to complete, in consultation with the PRCC Hatchery Subcommittee and subject to NMFS approval, an Artificial Propagation Plan to rear 100,000 yearling UCR steelhead for release in the UCR basin. The plan shall be consistent with recovery criteria for UCR steelhead and other artificial propagation programs. New facilities are anticipated for this program and shall be constructed to rear a minimum of the production level of this plan plus 10 percent. The Hatchery Subcommittee has previously agreed that on an

annual basis Grant PUD steelhead compensation responsibilities may be met by funding the Colville Tribes 20,000 steelhead in Omak Creek (Okanogan River) and the remaining 80,000 steelhead at the WDFW operated program at Wells Hatchery. The Hatchery Subcommittee further agreed that as the Omak Creek program develops, the Subcommittee will decide on appropriate adjustments to the apportionment described above. A comprehensive monitoring and evaluation program shall be included in the plan that includes monitoring in the natural environment and investigating the impacts of the hatchery program on the naturally produced steelhead population. Subject to Hatchery Subcommittee approval, the monitoring and evaluation program may be implemented in conjunction with ongoing or future monitoring and evaluation programs with other entities such as Chelan and Douglas County PUDs through cost-sharing agreements external to this Opinion.

1.26. UCR Spring-run Chinook Salmon Supplementation Plan (adapted from Action 28, NMFS 2004). FERC shall require Grant PUD to complete, in consultation with the PRCC Hatchery Subcommittee and subject to NMFS approval, an Artificial Propagation Plan to rear 600,000 yearling UCR spring-run Chinook salmon for release in the UCR basin. The plan shall be consistent with UCR spring-run Chinook salmon recovery criteria and other UCR spring-run Chinook salmon artificial propagation programs. New facilities are anticipated to be necessary for this program and shall be constructed to rear a minimum of the production level plus 10 percent. A comprehensive monitoring and evaluation program shall be included in the plan that includes monitoring in the natural environment and investigating the impacts of the hatchery program on the naturally produced spring Chinook salmon population. Subject to Hatchery Subcommittee approval, the monitoring and evaluation program may be implemented in conjunction with ongoing or future monitoring and evaluation programs with other entities such as Chelan and Douglas County PUDs through cost-sharing agreements external to this Opinion. If term and conditions 1.27 through 1.29 below are determined by the Hatchery Subcommittee and NMFS to not be implementable, then alternative programs that would achieve a similar purpose shall be developed and implemented as soon as practical, but not later than 2011.

1.27. White River Spring-Run Chinook Salmon Program (adapted from Action 29, NMFS 2004). Consistent with term and condition 1.26 above, FERC shall require Grant PUD to continue to implement the White River spring-run Chinook salmon program. This shall include, but is not limited to, the development of rearing (may be outside the White River Basin) and acclimation (in the White River Basin) facilities. This program shall be implemented to reach a yearling smolt production level of a total of 150,000 fish.

FERC shall require Grant PUD to work in consultation with the PRCC and its Hatchery Subcommittee and with approval by NMFS to develop a phased implementation schedule for the White River spring-run Chinook Program. The schedule shall include deadlines for site identification, facility design, Hatchery and Genetic Management Plan approval, the obtaining of necessary regulatory approvals, and the commencement of construction. The design of the required facilities shall be at the compensation level capacity plus 10 percent.

1.28. Nason Creek Spring-Run Chinook Salmon Program (adapted from Action 30, NMFS 2004). Consistent with term and condition 1.26 above, FERC shall require Grant PUD to continue their work to implement artificial propagation for spring-run Chinook salmon in Nason Creek. This may include, but is not limited to, development of rearing and acclimation facilities. Grant PUD has purchased property in the Nason Creek drainage, which supports incubation, rearing and acclimation facilities. Grant PUD is also in the design process of an adult trapping facility and juvenile acclimation site to rear a total of 250,000 yearling smolts, if determined necessary by the Hatchery Subcommittee and NMFS.

FERC shall require Grant PUD working in consultation with the PRCC Hatchery Subcommittee and with approval by NMFS to develop a phased implementation schedule for these actions. The schedule shall include deadlines for site identification, facility design, the obtaining of necessary regulatory approvals, and the commencement of construction. The design of the required facilities should factor in an additional 10% buffer in production capacity beyond the production levels required above. This program is expected to be fully operational by 2011.

1.29. Methow River Basin Spring-Run Chinook Salmon Program (adapted from Action 31, NMFS 2004). Consistent with term and condition 1.26 above, FERC shall require Grant PUD to implement a supplementation program for spring-run Chinook salmon in the Methow River basin. This may include, but is not limited to, development of rearing and acclimation facilities, and improvements at current hatchery facilities in the Methow basin. Grant PUD may, in consultation with the PRCC and NMFS, work with the HCP and Priest Rapids Hatchery Subcommittees to renew cost sharing agreements for supplementation of Methow River Basin Spring-run Chinook salmon.

1.30. Habitat Subcommittee (adapted from Action 32, NMFS 2004). FERC shall require Grant PUD to continue support of the PRCC Habitat Subcommittee. This shall include provision of sufficient facilitation, administration, and clerical support to the subcommittee. The Habitat Subcommittee shall be the primary forum for implementing and directing habitat protection and restoration measures for the Project's anadromous fish program. This subcommittee is comprised of NMFS, USFWS, WDFW, Confederated Tribes of the Colville Reservation, Yakama Nation, Confederated Tribes of the Umatilla Reservation and Grant PUD.

Since January 2005, the Habitat Subcommittee has met monthly to undertake and oversee the planning and implementation of the necessary program elements to support habitat protection and restoration programs. The committee operates on consensus regarding decisions directly linked to Project management. Unresolved disputes may be elevated to the PRCC, which shall use the February 10, 2006, Salmon and Steelhead Settlement Agreement process for dispute resolution if necessary. Decisions regarding management of anadromous fishery resources in the UCR basin not directly linked to the Project are the purview of the agencies and Tribes. When carrying out activities that may affect local tributary habitat, the Habitat Subcommittee should seek advice from local entities, including the Upper Columbia Salmon Recovery Board in development of such activities

1.31. Habitat Plan (adapted from Action 33, NMFS 2004). FERC shall require Grant PUD, in consultation with the PRCC Habitat Subcommittee, to periodically review and update the Habitat Plan that has been developed by the Habitat Subcommittee. The Habitat Plan is designed to shepherd the development and implementation of UCR spring-run Chinook salmon and UCR steelhead habitat protection and restoration. The Habitat Plan shall be modified from time to time as determined necessary by the Habitat Subcommittee and NMFS.

1.32. Habitat Account (adapted from Action 34, NMFS 2004). FERC shall require Grant PUD to continue to provide $288,600 annually to the Priest Rapids Habitat Conservation Account (specified in 2003 dollars - annually adjusted per the U.S. Department of Labor, Bureau of Labor Statistics CPI for Western Region). These funds are specifically directed toward habitat actions that directly benefit UCR spring-run Chinook salmon and UCR steelhead.

1.33. Performance Evaluation Program (adapted from Actions 35, 36 and 37, NMFS 2004). FERC shall require Grant PUD to prepare an annual summary report of progress under the requirements of this Opinion. The report shall reflect all activities and progress during the pervious calendar year. The purpose of the program is to provide a reliable technical basis to assess the degree to which Grant PUD is improving juvenile and adult passage survivals, habitat productivity improvements, and supplementation for the listed anadromous fishery resources affected by the Project. The annual report shall also include results of monitoring, modeling, or other analyses that take place in the calendar year to evaluate the degree to which the actions are likely to improve juvenile and adult survivals.

Where appropriate, the Performance Evaluation Program shall measure and evaluate individual actions within each category, assess the contribution of the action to the desired objective, and provide a basis for identifying new options and priorities among those options for further progress in meeting objectives. This Performance Evaluation Program shall consist of annual progress and implementation reports and periodic performance evaluations to assess overall performance in meeting the survival standards.

1.34. Program Coordination (adapted from Action 38, NMFS 2004). FERC shall require that Grant PUD coordinate the design of its Performance Evaluation Program with the development of relevant parallel monitoring or evaluation systems by other hydropower operators in the Columbia Basin and the Northwest Power Planning Council. The purpose of such coordination shall be to promote technical consistency and compatibility among these efforts to contribute to a comprehensive evaluation of stock performances throughout the Columbia Basin. This coordination shall also promote the use of the best available science and shall provide opportunities for the efficient sharing of monitoring activities, data management systems, analytical modeling, and other activities.

Grant PUD meets monthly with the Public Utility District No.1 of Chelan County and Public Utility District No. 1 of Douglas County to discuss and coordinate on potential fish evaluations and resource issues. Grant PUD staff also participate in the HCP Hatchery and HCP Habitat subcommittees to coordinate among the various programs. Grant PUD also attends regional meetings and forums to promote technical consistency and compatibility among these efforts to contribute to a comprehensive evaluation of stock performances throughout the Columbia Basin. Grant PUD proposes to continue to coordinate and seek out opportunities for the efficient sharing of monitoring activities, data management systems, analytical modeling, and other activities.

1.35. Priest Rapids Coordinating Committee (adapted from Action 39, NFMS 2004). FERC shall require Grant PUD to continue to support the Priest Rapids Coordinating Committee. The PRCC oversees implementation of the anadromous fish activities associated with the Priest Rapids Project, including the requirements of this opinion. Among other things, it shall approve or modify annual Progress & Implementation Plans; approve or modify the Performance Evaluation Program; review Performance Evaluation Reports; advocate decisions of the Committee in all relevant regulatory forums; establish such subcommittees as it deems useful (in addition to the Habitat and Hatchery Subcommittees required above); resolve disputes elevated from subcommittees; and conduct other business as may be appropriate for the efficient and effective implementation of these measures.

2. In order to comply with reasonable and prudent measure two, above, the following terms and conditions shall be applied to the new license for the Project.

2.1 Prior to dewatering the unit, FERC shall require that the emergency wheel gate gatewells be dip netted twice per slot using best management practices for gatewell dipping and transportation to avoid or minimize stress on listed fish.

2.2 FERC shall require that Grant PUD install the downstream bulkhead as soon as reasonably practicable after installation of the upstream bulkhead to reduce the likelihood that listed species in the tailrace enter the draft tube and become entrapped after the installation of the downstream bulkhead.

2.3 If the downstream bulkhead cannot be installed within 24 hours of the upstream bulkhead, FERC shall require Grant PUD to inspect the draft tube for the presence of listed fish and without delay remove and transport them for prompt reentry into the river using best management practices for dipnetting and transportation to minimize stress on listed species.

2.4 FERC shall require that Grant PUD record and report the number and species, if any, of fish entrained during the shutdown phase.

3. In order to comply with reasonable and prudent measure three, above, the following terms and conditions shall be applied to the new license for the Project.

Pollution and Erosion Control Plan

Prepare and carry out a pollution and erosion control plan to prevent pollution caused by surveying or construction operations. The plan must be available for inspection on request by the permitting agencies and NMFS.

1. Plan Contents. The pollution and erosion control plan will contain the pertinent elements listed below, and meet requirements of all applicable laws and regulations.
    a. The name and address of the party(s) responsible for accomplishment of the pollution and erosion control plan.
    b. Practices to prevent erosion and sedimentation associated with access roads, stream crossings, drilling sites, construction sites, borrow pit operations, haul roads, equipment and material storage sites, fueling operations, staging areas, and roads being decommissioned.
    c. Practices to confine, remove, and dispose of excess concrete, cement, grout, and other mortars or bonding agents, including measures for washout facilities.
    d. A description of any regulated or hazardous products or materials that will be used for the project, including procedures for inventory, storage, handling, and monitoring.
    e. A spill containment and control plan with notification procedures, specific cleanup and disposal instructions for different products, quick response containment and cleanup measures that will be available on the site, proposed methods for disposal of spilled materials, and employee training for spill containment.
    f. Practices to prevent construction debris from dropping into any stream or water body, and to remove any material that does drop with a minimum disturbance to the streambed and water quality.

2. Inspection of erosion controls. During construction, monitor instream turbidity and inspect all erosion controls daily during the rainy season and weekly during the dry season, or more often as necessary, to ensure the erosion controls are working adequately.[12]
    a. If monitoring or inspection shows that the erosion controls are ineffective, mobilize work crews immediately to make repairs, install replacements, or install additional controls as necessary.
    b. Remove sediment from erosion controls once it has reached ⅓of the exposed height of the control.

3. Construction discharge water. Treat all discharge water created by construction (*e.g.*, concrete washout, pumping for work area isolation, vehicle wash water, drilling fluids) as follows.
    a. *Water quality*. Design, build and maintain facilities to collect and treat all construction discharge water, including any contaminated water produced by drilling, using the best available technology applicable to site conditions. Provide treatment to remove debris, nutrients, sediment, petroleum hydrocarbons, metals and other pollutants likely to be present.
    b. *Discharge velocity*. If construction discharge water is released using an outfall or diffuser port, velocities may not exceed 4 feet per second, and the maximum size of any aperture may not exceed 1 inch.
    c. *Pollutants*. Do not allow pollutants including green concrete, contaminated water, silt, welding slag, sandblasting abrasive, or grout cured less than 24 hours to contact any wetland or the 2-year floodplain.
    d. *Drilling discharge*. All drilling equipment, drill recovery and recycling pits, and any waste or spoil produced, will be completely isolated to prevent drilling fluids or other wastes from entering the stream.
        i. All drilling fluids and waste will be completely recovered then recycled or disposed to prevent entry into flowing water.
        ii. Drilling fluids will be recycled using a tank instead of drill recovery/recycling pits, whenever feasible.
        iii. When drilling is completed, attempts will be made to remove the remaining drilling fluid from the sleeve (e.g., by pumping) to reduce turbidity when the sleeve is removed.

[12] Working adequately means that project activities do not increase ambient stream turbidity by more than 10 percent above background 100 feet below the discharge, when measured relative to a control point immediately upstream of the turbidity causing activity.

3. MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

3.1 Background

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

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

- NMFS 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 NMFS 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 NMFS 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 Section 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).

Essential Fish Habitat consultation with NMFS 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 would adversely affect designated EFH and to recommend conservation measures to avoid, minimize, or otherwise offset potential adverse effects to EFH

3.2 Identification of EFH

Under the MSA, the Pacific Fisheries Management Council (PFMC) has designated EFH for three species of Federally-managed Pacific salmon: Chinook (*Oncorhynchus tshawytscha*); coho (*O. kisutch*); and Puget Sound pink salmon (*O. gorbuscha*) (PFMC 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 the 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 EFH for Chinook and coho salmon from the proposed action is based, in part, on this information.[13]

3.3 Proposed Actions

The Proposed Action and action area are described in Sections 1.4 and 1.5 of this Opinion. The action area includes habitats that have been designated as EFH for various life-history stages of Chinook salmon (*O. tshawytscha*) and coho salmon (*O. kisutch*).

3.4 Effects of Proposed Action

As described in Section 2.4 of this Opinion, the Proposed Action may result in short- and long-term adverse effects to a variety of habitat parameters. These adverse effects are:

Mainstem Spawning Habitat

- Inundation of mainstem summer and fall Chinook salmon spawning habitat upstream of both the Priest Rapids and Wanapum developments.

- Altered mainstem summer and fall Chinook salmon spawning habitat substrate within the Priest Rapids Hydroelectric Project (reduced proportion of gravels and cobbles).

Juvenile Rearing Habitat and Juvenile and Adult Migration Corridors

- 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 dams that comprise the Priest Rapids Hydroelectric Project.

- Higher than natural predation rates resulting from the enhancement of predator habitat or foraging opportunities at the Priest Rapids Hydroelectric Project

[13] Pink salmon do not occupy the action area for this consultation.

- 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.

3.5 Conclusion

NMFS concludes that the Proposed Action would adversely affect designated EFH for Chinook salmon.

3.6 EFH Conservation Recommendations

Pursuant to Section 305(b)(4)(A) of the MSA, NMFS is required to provide EFH conservation recommendations to Federal agencies regarding actions that may adversely affect EFH. The reasonable and prudent measures (Section 2.9.5) and the terms and conditions (Section 2.9.6) are generally applicable to designated EFH for Chinook salmon and coho salmon and address these adverse effects to the extent practical. Consequently, NMFS recommends that the terms and conditions in Section 2.9.6 be adopted as EFH conservation measures.

3.7 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 NMFS 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.

3.8 Supplemental Consultation

FERC must reinitiate EFH consultation with NMFS if the Proposed Action is substantially revised in a manner that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH conservation recommendations (50 CFR 600.920(k)).

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EXHIBIT A: Section 7 Consultations Completed Since May 3, 2004

SUBJECT	NMFS RESPONSE DATE
Proposed License for the Rocky Reach Hydroelectric Project License (FERC No. 2145)	01-MAY-07
Issuance of Two Section 10(a)1(A) Research Permits Affecting Upper Columbia River and Middle Columbia River Steelhead	04-AUG-06
Washington State Forest Practices Habitat Conservation Plan	05-JUN-06
Dock Replacement Pasco Boat Basin - Cascade Marina	17-APR-06
Reinitiation for Adoption of Critical Habitat - Forest Service Fish Passage/Culvert Programmatic, Oregon and Washington	14-MAR-06
Reinitiation for Adoption of Critical Habitat, Pacific Northwest Region Invasive Plant Program	29-DEC-05
City of Richland, Columbia Point Marina Expansion	06-DEC-05
Clover Island Marina Float Replacement (200400936 Port of Kennewick) Benton County	03-NOV-05
Relicensing of the Lake Chelan Hydroelectric Project (FERC No. 637), Chelan River, WA	14-OCT-05
Pacific Northwest Region Invasive Plant Program	08-SEP-05
Reinitiation of the 2005-2007 Fisheries in the Columbia River Basin by the States of Oregon and Washington	01-SEP-05
Peshastin Irrigation District Diversion Dam Fish Passage Facilities Enhancement, Chelan County	20-JUL-05
Aspen Meadows Diversion Enhancement Project, Okanogan County	18-JUL-05
Installation of Dock (Mathison 200401526) Douglas County	28-JUN-05
Issuance of 3 Scientific Research Permits (1519, 1525, 1532) and 3 modifications (1119, 1322, 1410) on listed UCR, SR, and MCR salmonids	15-JUN-05
2005-2007 Fisheries in the Columbia River Basin by the States of Oregon and Washington	09-MAY-05
Dock Expansion, (Richland Yacht Club 200301066) Benton County	22-APR-05
Issuance of 3 scientific research permits, 1403, 1500, 1502 for UCR and SR ESUs	12-APR-05
Wolf Creek Diversion Enhancement, Okanogan County	02-FEB-05
Ramp Installation and Mitigation Planting (200401116 Wenatchee Row and Paddle Club) Chelan County	20-JAN-05
Boat Launch, Ramp, and Float Installation (Garka 200400048) Douglas County	14-JAN-05
Operation of the Federal Columbia River Power System (FCRPS) including 19 Bureau of Reclamation Projects in the Columbia Basin (Revised and reissued pursuant to court order, NWF v. NMFS, Civ. No. CV 01-640-RE (D. Oregon))	30-NOV-04
Wanapum Recreation Area Boat Launch Replacement (Washington State Parks 200400296) Kittitas County	03-NOV-04

Smolt Trap Operation in Nason Creek to Monitor Populations of Upper Columbia River (UCR) Spring-run Chinook Salmon and UCR Steelhead	15-SEP-04
Pier, Ramp and Float Placement, Chelan County (Campbell, 200100020)	13-SEP-04
Streambank Stabilization and Fish Habitat Improvement Projects in Salmon Creek, Okanogan County	27-AUG-04
Treaty Indian and Non-Indian Fall Season Fisheries in the Columbia River Basin in Year 2004, on Salmon and Steelhead Listed Under the Endangered Species Act	06-AUG-04
Lake Entiat EStates Pier, Ramp and Float, Douglas County, 200100764 & 200301010	22-JUL-04
Omak Creek Bridge Replacement (Okanogan County)	22-JUL-04
Seven Scientific Research Permits in the Upper Columbia river	16-JUN-04
SR 20 Mazama Area Fish Passage, Okanogan County	24-MAY-04