FINAL ENVIRONMENTAL ASSESSMENT

Environmental Assessment to Analyze Impacts of NOAA's National Marine Fisheries Service Issuance of an Endangered Species Act Section 10(a)(1)(A) Research/Enhancement Permit for the Nason Creek Spring Chinook Salmon Hatchery Program

Prepared by the
National Marine Fisheries Service, Northwest Region

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Cover Sheet
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Title of Environmental Review:	Environmental Assessment to Analyze Impacts of NOAA's National Marine Fisheries Service Issuance of an Endangered Species Act Section 10(a)(1)(A) Research/Enhancement Permit for the Nason Creek Spring Chinook Salmon Hatchery Program
Distinct Population Segments:	Upper Columbia River Spring Chinook Salmon Upper Columbia River Steelhead
Responsible Agency and Official:	Barry Thom Deputy Regional Administrator National Marine Fisheries Service Northwest Region 7600 Sand Point Way N.E., Building 1 Seattle, WA 98115
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Legal Mandate:	Endangered Species Act of 1973, as amended and implemented – 50 CFR Part 223
Location of Proposed Activities:	Nason Creek, a tributary to the Wenatchee River in Chelan, County, Washington
Activity Considered:	Endangered Species Act Section 10(a)(1)(A) Research/Enhancement Permit for the Nason Creek Spring Chinook Salmon Hatchery Program

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EXECUTIVE SUMMARY

THE FOLLOWING IS NEW TEXT FROM THE DRAFT ENVIRONMENTAL ASSESSMENT AND IS PROVIDED AS AN EXECUTIVE SUMMARY OF THE REVIEW PROCESS AND DEVELOPMENT OF THE FINAL ENVIRONMENTAL ASSESSMENT

A draft Environmental Assessment (EA) to analyze impacts of NOAA's National Marine Fisheries Service (NMFS) issuance of an Endangered Species Act section 10(a)(1)(A) research/enhancement permit for the Nason Creek spring Chinook Salmon hatchery program was released by the National Marine Fisheries Service (NMFS) for a 15-day public comment period on May 30, 2013 (78 FR 32378). Since the draft EA was published, the applicants have requested that NMFS extend the permit duration from 10 years to 13 years to remain consistent with the permit duration for other hatchery programs in the Wenatchee River Basin. NMFS has determined that this change does not affect any of the analysis in the draft EA or warrant further public review. Changes to the text of the draft EA to reflect the new permit duration are indicated in redline/strikeout format. Minor editorial changes to the draft EA are not shown in redline/strikeout format.

The comment period for review of the EA on this action expired on June 13, 2013. NMFS did not receive any comments.

1. PURPOSE OF AND NEED FOR THE PROPOSED ACTION

1.1. Background

The Public Utility District No. 2 of Grant County (Grant PUD) operates the Priest Rapids Hydroelectric Project, which includes operation of both the Priest Rapids and Wanupum Dams. Both dams are located in the Upper Columbia River Basin, where spring Chinook salmon (*Oncorhynchus tshawytcha*) are listed as endangered (70 FR 37160, June 28, 2005), and steelhead (*O. mykiss*) are listed as threatened under the Endangered Species Act (ESA) (71 FR 834, January 5, 2006). The following information summarizes milestones in various activities and decisions related to the Proposed Action. This information is further summarized in Table 1, provided at the end of the Background subsection.

Initially, in 1997, and supplemented in 1998, Grant PUD filed requests with the Federal Energy Regulatory Commission (FERC) to amend its license for the Priest Rapids Hydroelectric Project to implement an Interim Protection Plan for Upper Columbia River steelhead and Upper Columbia River spring Chinook salmon affected by operation of the Priest Rapids Hydroelectric Project. Section 7 of the ESA requires FERC to ensure, in consultation with NMFS, that the action of amending Grant PUD's operating license as proposed is not likely to jeopardize the continued existence of any listed species, or destroy or adversely modify any designated critical habitat for those species. Accordingly, on January 20, 1999, FERC requested a consultation under the ESA with NMFS on Grant PUD's proposed Interim Protection Plan.

During the course of evaluating implementation of the Interim Protection Plan, NMFS determined that the action, as proposed, was likely to jeopardize the continued existence of Upper Columbia River spring Chinook salmon and Upper Columbia River steelhead. NMFS, in consultation with Grant PUD, Washington Department of Fish and Wildlife (WDFW), the Confederated Tribes and Bands of the Yakama Nation, the Confederated Tribes of the Colville Reservation, and the U.S. Fish and Wildlife Service (co-managers), developed a Reasonable and Prudent Alternative[1] to the proposed Interim Protection Plan that, if implemented with the Interim Protection Plan, would not jeopardize the continued existence of Upper Columbia River spring Chinook salmon and Upper Columbia River steelhead. The Reasonable and Prudent Alternative included development and operation of the White River and Nason Creek spring Chinook salmon hatchery programs. The biological opinion with its Reasonable and Prudent Alternative was issued in 2004 (NMFS 2004).

Subsequent to NMFS issuance of the biological opinion on the Interim Protection Plan, FERC issued an order amending Grant PUD's license to include the Interim Protection Plan on December 16, 2004 (FERC 2004).

At the same time that FERC was considering an amendment to Grant PUD's existing license, Grant PUD submitted a second application for a new license for operation of the Priest Rapids

[1] The regulations implementing section 7 of the ESA (50 CFR 402.02) define Reasonable and Prudent Alternatives as alternative actions, identified during formal consultation, that (1) can be implemented in a manner consistent with the intended purpose of the action, (2) can be implemented consistent with the scope of the action agency's legal authority, (3) are economically and technologically feasible, and (4) would, NMFS believes, avoid the likelihood of jeopardizing the continued existence of listed species and avert the destruction or adverse modification of critical habitat.

Hydroelectric Project (GPUD 2003). Subsequent to filing the relicense application, Grant PUD filed two settlement agreements regarding fishery resources in the proceeding: (1) the Hanford Reach Fall Chinook Protection Program Agreement (Hanford Agreement), and (2) the Priest Rapids Salmon and Steelhead Settlement Agreement (Salmon Agreement).

Under the Salmon Agreement, filed February 10, 2006, Grant PUD proposed to achieve and maintain "no net impact" from the project on spring, summer, and fall Chinook salmon, sockeye salmon, steelhead, and coho salmon. Grant PUD would accomplish this objective through a combination of fish passage measures, fish passage survival performance standards, improvements to the Priest Rapids Fish Hatchery, operation of hatchery programs (e.g., the White River and Nason Creek spring Chinook salmon hatchery programs), implementation of the Hanford Agreement, and the establishment of and contribution to two funds (a habitat conservation fund and a no-net-impact fund) to be used to mitigate for project effects on anadromous salmonids that pass through the project area or are affected by project operations. Signatories to the Salmon Agreement were Grant PUD, NMFS, U.S. Fish and Wildlife Service, WDFW, the Yakama Nation, and the Confederated Tribes of the Colville Reservation.

On November 17, 2006, FERC released its final Environmental Impact Statement (EIS) on issuance of a new license for the Priest Rapids Hydroelectric Project (FERC 2006). This EIS is hereby incorporated by reference. Construction of an acclimation facility and operation of the Nason Creek spring Chinook salmon hatchery program were included as part of the Proposed Action and the preferred alternative. The EIS analyzed the benefits of operating a Nason Creek spring Chinook salmon hatchery program in conjunction with operation of the Priest Rapids Hydroelectric Project, but because specific plans for the construction and operation of the facility had not been developed, the analysis of effects was general.

On February 1, 2008, NMFS issued a biological opinion that concluded that issuing a new license for the Priest Rapids Hydroelectric Project would not likely jeopardize the continued existence of Upper Columbia River spring Chinook salmon and steelhead, and would not be likely to destroy or adversely modify designated critical habitat of these species (NMFS 2008a).

On April 17, 2008, FERC issued a new license to Grant PUD for operation of the Priest Rapids Hydroelectric Project (FERC 2008). The license required Grant PUD to implement the Nason Creek spring Chinook salmon hatchery program, as described in the preferred alternative of its 2006 EIS (FERC 2006).

On September 15, 2009, Grant PUD submitted an application to NMFS for an ESA permit to operate the Nason Creek spring Chinook salmon hatchery program (GPUD 2009). NMFS seeks to consider, through National Environmental Policy Act (NEPA) analysis, how issuance of an ESA permit may affect the natural and physical environment and the relationship of people with that environment. The NEPA analysis provides an opportunity to consider, for example, how the action may affect conservation of non-listed species and socioeconomic objectives.

Table 1. Major milestones in the relicensing of the Priest Rapids Hydroelectric Project.

Date	Milestone
1997 and 1998	Grant PUD files requests with the FERC to amend its license for the Priest Rapids Hydroelectric Project to implement an Interim Protection Plan for Upper Columbia River steelhead and Upper Columbia River spring Chinook salmon.
1999	Upper Columbia spring Chinook salmon and steelhead are listed under the ESA.
October 29, 2003	Grant County PUD files with the FERC an application for a new license for the operation of the Priest Rapids Hydroelectric Project.
May 2004	NMFS issues a biological opinion on the proposed Interim Protection Plan and requires the development and implementation of the Nason Creek and White River spring Chinook salmon hatchery program to avoid jeopardy under the ESA (NMFS 2004).
December 16, 2004	FERC issues an order amending Grant PUD's license to include the Interim Protection Plan (FERC 2004).
February 10, 2006	Subsequent to filing the relicense application, Grant PUD files two settlement agreements regarding fishery resources in the proceeding: (1) the Hanford Reach Fall Chinook Protection Program Agreement, and (2) the Priest Rapids Salmon and Steelhead Settlement Agreement, the latter of which includes operation of the White River and Nason Creek spring Chinook salmon hatchery programs.
August 27, 2006	Grant PUD, WDFW, and the Yakama Nation submit to NMFS an application for an ESA permit to operate the White River and Nason Creek spring Chinook salmon hatchery programs.
November 17, 2006	FERC publishes its final EIS on issuance of a new license to the Priest Rapids Hydroelectric Project. Operation of the White River and Nason Creek spring Chinook salmon hatchery program is part of the Proposed Action described in this EIS (FERC 2006).
February 1, 2008	NMFS issues a biological opinion that concludes the Priest Rapids Hydroelectric Project is not likely to jeopardize the continued existence of Upper Columbia River spring Chinook salmon and steelhead. Operation of the White River and Nason Creek spring Chinook salmon hatchery programs is part of the proposed project (NMFS 2008a).
April 17, 2008	FERC issues a new license to Grant PUD for operation of the Priest Rapids Hydroelectric Project (FERC 2008). Operation of the White River and Nason Creek spring Chinook salmon hatchery program is a license requirement.
September 15, 2009	Grant PUD submits to NMFS an application for an ESA permit to operate the Nason Creek spring Chinook salmon hatchery program (GPUD 2009).
February 20, 2013	Grant PUD submits to NMFS an addendum to their HGMP for the Nason Creek spring Chinook salmon hatchery program (GPUD 2013).

1.2. Description of the Proposed Action

Grant PUD and WDFW (applicants) have applied for an ESA section 10(a)(1)(A) permit to operate the Nason Creek spring Chinook salmon hatchery program. The hatchery program does

not currently operate. Construction of an acclimation facility to support this program will begin in the spring of 2013. The NEPA review for construction of the acclimation facility was completed by the United States Corps of Engineers. NMFS will consider the Nason Creek Acclimation Facility as part of baseline conditions for this NEPA analyses. The cumulative effects of construction and operation of the facility will be evaluated in the cumulative impacts analyses.

The Nason Creek hatchery program would have two components:

1) A conservation component intended to rebuild the natural populations using a fully integrated broodstock

2) A "safety-net" stepping stone component that would be used to meet the full mitigation production level: it would be genetically linked to the natural-origin population and guard against catastrophic run failure but these fish would be marked separately[2]

Under the Proposed Action, NMFS would issue a ~~10~~13-year permit for operation of the Nason Creek spring Chinook salmon hatchery program. The proposed permit would authorize a suite of activities associated with the operation of the hatchery program, including broodstock collection, rearing, acclimation, and release of juveniles, monitoring and evaluation, and the potential installation and operation of a weir on Nason Creek (Table 2). The proposed activities are described in greater detail in Subsection 2.2, Alternative 2.

[2] The safety-net adults from the Nason Creek spring Chinook salmon hatchery program may be harvested in the Wenatchee River in the future as a mechanism to control the number of hatchery-origin fish on the spawning grounds.

Table 2. Hatchery facilities associated with the proposed Nason Creek spring Chinook salmon hatchery program.

Activity	Facility	Location	Does Facility Exist under Baseline Conditions?	Is Facility Operated under Baseline Conditions?
Broodstock collection	Tumwater Dam	River-mile 30.8 Wenatchee River	Yes	Yes
	Nason Creek weir[1]	River-mile 2 Nason Creek	No	No
Adult holding and identification	Eastbank Hatchery	River-mile 491 Columbia River mainstem (near Rocky Reach Dam, 7 miles north of Wenatchee, Washington).	Yes	Yes
Spawning	Eastbank Hatchery	River-mile 491 Columbia River mainstem	Yes	Yes
Incubation	Eastbank Hatchery	River-mile 491 Columbia River mainstem	Yes	Yes
Rearing	Nason Creek Acclimation Facility[2]	River-mile 9 Nason Creek	Yes	No
	Eastbank Hatchery	River-mile 491 Columbia River mainstem	Yes	Yes

[1]Although the Grant PUD and WDFW plan to collect broodstock at Tumwater Dam, they propose the option of collecting broodstock in Nason Creek also, which would require the installation and operation of a weir and fish trap at river-mile 2, upstream of the Nason Creek Campground.

[2] Construction of the Nason Creek Acclimation Facility will begin in the spring of 2013. NMFS completed section 7 formal consultation for the construction of the Nason Creek Acclimation Facility on May 18, 2012 (NMFS 2012).

1.3. Purpose of and Need for the Action

The purpose of and need for the Proposed Action is (1) to ensure that the proposed Nason Creek spring Chinook salmon hatchery program, as described in the submitted application, complies with the requirements of the ESA – specifically with section 10(a)(1)(A), and (2) for Grant PUD to comply with the terms of the Priest Rapids Project Salmon and Steelhead Settlement Agreement and its FERC license for the operation of the Priest Rapids Hydroelectric Project, which includes a requirement that hatchery production levels result in no net impact on listed salmonids.

1.4. Action Area

The action area (or project area) is the geographic area where the Proposed Action would take place. It includes the places where Nason Creek spring Chinook salmon would be collected,

spawned, incubated, reared, acclimated, and released under the proposed HGMP and addendum. The following facilities would be used by the Nason Creek spring Chinook salmon hatchery program:

1. The Nason Creek Acclimation Facility, which is located at river-mile 9 on Nason Creek, a tributary to the Wenatchee River (Boyce/Youngsman site);
2. The Eastbank Hatchery, which is located at river-mile 491 on the Columbia River, near Rocky Reach Dam (Figure 1); and
3. The Tumwater Dam, which is where broodstock would be collected. Tumwater Dam is a remnant diversion dam located on the Wenatchee River 4 miles west of Leavenworth and is owned by Chelan PUD.

Although the Grant PUD and WDFW plan to collect broodstock at Tumwater Dam, they propose the option of collecting broodstock at a Nason Creek weir at river-mile 2, if needed. All facilities associated with the Proposed Action are in Chelan County, Washington.

The analysis area is the geographic extent that is being evaluated for a particular resource. For some resources, the analysis area may be larger than the action area, since some of the effects of the alternatives may occur outside the action area.

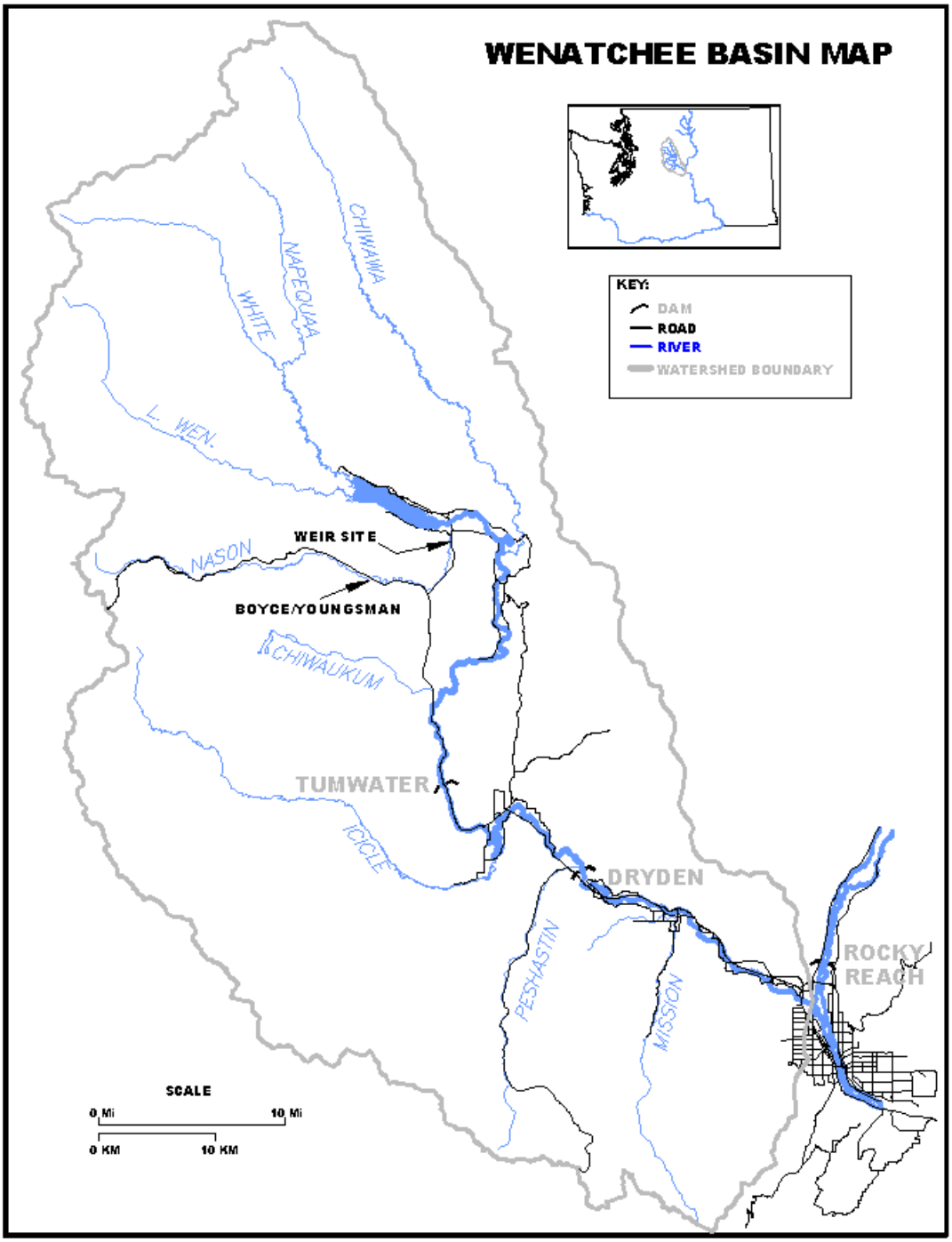

Figure 1. Action area for Nason Creek spring Chinook salmon hatchery program.

1.5. Relationship to Other Plans, Regulations, Agreements, Laws, Secretarial Orders, and Executive Orders

In addition to NEPA and ESA, other plans, regulations, agreements, treaties, laws, and Secretarial and Executive Orders also affect hatchery operations in Nason Creek. They are summarized below to provide additional context for the Nason Creek hatchery program.

1.5.1. Final EIS for Relicensing the Priest Rapids Hydroelectric Project in Washington

On October 29, 2003, Grant PUD filed with the Federal Energy Regulatory Commission (FERC) an application for a new license for the 1,768.8-megawatt Priest Rapids Hydroelectric Project No. 2114-116 , located in portions of Grant, Yakima, Kittitas, Douglas, Benton, and Chelan Counties, Washington. FERC published a final EIS on November 24, 2006 that evaluated the potential environmental effects associated with the relicensing, including effects from measures that would be taken to achieve no net impact on salmon and steelhead species through a combination of fish passage improvements, hatchery supplementation, and habitat enhancements.

1.5.2. Clean Water Act

The Clean Water Act (33 USC 1251, 1977, as amended in 1987), administered by the U.S. Environmental Protection Agency and state water quality agencies, is the principal Federal legislation directed at protecting water quality. Each state implements and carries forth Federal provisions, as well as approves and reviews National Pollutant Discharge Elimination System applications, and establishes total maximum daily loads for rivers, lakes, and streams. The states are responsible for setting the water quality standards needed to support all beneficial uses, including protection of public health, recreational activities, aquatic life, and water supplies.

The Washington State Water Pollution Control Act, codified as Revised Code of Washington Chapter 90.48, designates the Washington Department of Ecology (Ecology) as the agency responsible for carrying out the provisions of the Federal Clean Water Act within Washington State. The agency is responsible for establishing water quality standards, making and enforcing water quality rules, and operating waste discharge permit programs. These regulations are described in Washington Administrative Code (WAC) 173. Hatchery operations are required to comply with the Clean Water Act.

1.5.3. Bald Eagle and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (16 USC 668-668c), enacted in 1940, and amended several times since then, prohibits the taking bald eagles, including their parts, nests, or eggs. The act defines “take” as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb." The U.S. Fish and Wildlife Service, who is responsible for carrying out provisions of this Act, define “disturb” to include a “decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior.” Changes in hatchery production have the potential to affect eagle productivity through changes in its prey source (salmon and steelhead).

1.5.4. Marine Mammal Protection Act

The Marine Mammal Protection Act of 1972 (16 USC 1361) as amended, establishes a national policy designated to protect and conserve wild marine mammals and their habitats. This policy was established so as not to diminish such species or populations beyond the point at which they cease to be a significant functioning element in the ecosystem, nor to diminish such species below their optimum sustainable population. All marine mammals are protected under the Marine Mammal Protection Act.

The Marine Mammal Protection Act prohibits, with certain exceptions, the take of marine mammals in United States waters and by United States citizens on the high seas, and the importation of marine mammals and marine mammal products into the United States. The term "take," as defined by the Marine Mammal Protection Act, means to "harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal." The Marine Mammal Protection Act further defines harassment as "any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing a disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering but which does not have the potential to injure a marine mammal or marine mammal stock in the wild."

NMFS is responsible for reviewing Federal actions for compliance with the Marine Mammal Protection Act. Changes in fish production can indirectly affect marine mammals by altering the number of available prey (salmon and steelhead).

1.5.5. Executive Order 12898

In 1994, the President issued Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority and Low-income Populations*. The objectives of the Executive Order include developing Federal agency implementation strategies, identifying minority and low-income populations where proposed Federal actions could have disproportionately high and adverse human health and environmental effects, and encouraging the participation of minority and low-income populations in the NEPA process. Changes in hatchery production have the potential to affect the extent of harvest available for minority and low-income populations.

1.5.6. *U.S. v. Oregon*

U.S. v. Oregon was originally a combination of two cases, *Sohappy v. Smith* and *U.S. v. Oregon* (302 F. Supp. 899, 1978), which legally upheld the Columbia River Treaty Tribes' reserved fishing rights and tribal entitlement to a fair share of fish runs. Although the Sohappy case was closed in 1978, *U.S. v. Oregon* remains under the Federal court's continuing jurisdiction. In his 1969 decision, Judge C. Belloni ruled that state regulatory power over Indian fishing is limited because the 1855 treaties between the United States and the Nez Perce, Umatilla, Warm Springs, and Yakama Tribes preserved their reserved rights to fish at all usual and accustomed places whether on or off reservation. In 1974, Judge George Boldt decided in *U.S. v. Washington* that Belloni's citing of the tribes' fair and equitable share was 50 percent of all of the harvestable fish

destined for the tribes' traditional fishing places. The following year, Judge Belloni applied the 50 percent standard to *U.S. v. Oregon*. In 1977, under the jurisdiction in *U.S. v. Oregon*, the Federal court ordered a 5 year plan to develop an in river harvest sharing formula between non-Indian and Indian fisheries. In 1988, the cooperatively negotiated Columbia River Fish Management Agreement (Management Agreement) was adopted by the Federal court, which included a detailed harvest and fish production process. The most current Management Agreement was adopted by the Federal court in 2008 and will be in place for 10 years.

Fisheries in the Columbia River are carefully designed to be consistent with Federal court rulings related to treaty Indian fishing rights. The governing Management Agreement has been cooperatively negotiated by the Federal and state governments and the involved treaty Indian tribes under the continuing jurisdiction of the Federal court to ensure implementation of the tribe's fishing rights. The agreement includes important and substantive commitments related to hatchery production that are "intended to ensure that Columbia River fish runs continue to provide a broad range of benefits in perpetuity." The Management Agreement also includes provisions to "facilitate cooperative action by the Parties with regard to fishing regulations, policy issues or disputes, and the coordination of the management of fisheries on Columbia River runs and production and harvest measures."

1.5.7. Secretarial Order 3206

Secretarial Order 3206 (*American Indian Tribal Rights, Federal-Tribal Trust Responsibilities and the ESA*) issued by the secretaries of the Departments of Interior and Commerce, clarifies the responsibilities of the agencies, bureaus, and offices of the departments when actions taken under the ESA and its implementing regulations affect, or may affect, Indian lands, tribal trust resources, or the exercise of American Indian tribal rights as they are defined in the order. Secretarial Order 3206 acknowledges the trust responsibility and treaty obligations of the United States toward tribes and tribal members, as well as its government-to-government relationship when corresponding with tribes. Under the order, NMFS and the U.S. Fish and Wildlife Service (Services) "will carry out their responsibilities under the [ESA] in a manner that harmonizes the Federal trust responsibility to tribes, tribal sovereignty, and statutory missions of the [Services], and that strives to ensure that Indian tribes do not bear a disproportionate burden for the conservation of listed species, so as to avoid or minimize the potential for conflict and confrontation."

More specifically, the Services shall, among other things, do the following:

- Work directly with Indian tribes on a government-to-government basis to promote healthy ecosystems (Sec. 5, Principle 1)
- Recognize that Indian lands are not subject to the same controls as Federal public lands (Sec. 5, Principle 2)
- Assist Indian tribes in developing and expanding tribal programs so that healthy ecosystems are promoted and conservation restrictions are unnecessary (Sec. 5, Principle 3)
- Be sensitive to Indian culture, religion, and spirituality (Sec. 5, Principle 4)

1.5.8. The Federal Trust Responsibility

The United States government has a trust or special relationship with Indian tribes. The unique and distinctive political relationship between the United States and Indian Tribes is defined by statutes, executive orders, judicial decisions, and agreements and differentiates tribes from other entities that deal with, or are affected by the Federal government. Executive Order 13175, *Consultation and Coordination with Indian Tribal Governments,* states that the United States has recognized Indian tribes as domestic dependent nations under its protection. The Federal government has enacted numerous statutes and promulgated numerous regulations that establish and define a trust relationship with Indian tribes. The relationship has been compared to one existing under common law trust, with the United States as trustee, the Indian tribes or individuals as beneficiaries, and the property and natural resources of the United States as the trust corpus (Cohen 2005). The trust responsibility has been interpreted to require Federal agencies to carry out their activities in a manner that is protective of Indian treaty rights. This policy is also reflected in the March 30, 1995, document, *Department of Commerce - American Indian and Alaska Native Policy* (U.S. Department of Commerce 1995).

1.5.9. Washington State Endangered, Threatened, and Sensitive Species Act

This EA will consider the effects of the hatchery program and related harvest actions on state endangered, threatened, and sensitive species. The State of Washington has species of concern listings (Washington Administrative Code Chapters 232-12-014 and 232-12-011) that include all state endangered, threatened, sensitive, and candidate species. These species are managed by WDFW, as needed, to prevent them from becoming endangered, threatened, or sensitive. The state-listed species are identified on WDFW's website (*http://wdfw.wa.gov/conservation/endangered/*); the most recent update occurred in June 2008.

The criteria for listing and de-listing and the requirements for recovery and management plans for these species are provided in Washington Administrative Code Chapter 232-12-297. The state list is separate from the Federal ESA list; the state list includes species status relative to Washington state jurisdiction only. Critical wildlife habitats associated with state or federally listed species are identified in Washington Administrative Code Chapter 222-16-080. Species listed under the state endangered, threatened, and sensitive species list are reviewed in this EA if the Proposed Action or its alternatives may affect these species.

1.5.10. Hatchery and Fishery Reform Policy

WDFW's Hatchery and Fishery Reform Policy (Policy C-3619) was adopted by the Washington Fish and Wildlife Commission in 2009 (WFWC 2009). Its purpose is to advance the conservation and recovery of wild salmon and steelhead by promoting and guiding the implementation of hatchery reform. The policy applies to state hatcheries, and its intent is to improve hatchery effectiveness, ensure compatibility between hatchery production and salmon recovery plans and rebuilding programs, and support sustainable fisheries.

1.5.11. Recovery Plans for Upper Columbia Spring Chinook Salmon and Steelhead

Federal recovery plans are in place for the ESA-listed Upper Columbia River spring Chinook salmon and steelhead ((NOAA 2007). The recovery plan was a joint project developed by the Upper Columbia Salmon Recovery Board and NMFS. The Upper Columbia Salmon Recovery Board includes representatives from Chelan, Douglas, and Okanogan Counties, the Colville Confederated Tribes, and the Yakama Nation. The comprehensive recovery plan includes conservation goals and proposed habitat, hatchery, and harvest actions needed to achieve the conservation goals for each watershed within the geographic boundaries of the listed Evolutionarily Significant Unit (ESU).

1.5.12. Wild and Scenic Rivers Act

The Wild and Scenic Rivers Act of 1968 provides federal protection for the most outstanding of our country's free-flowing rivers; preserving them and their immediate environments for the use and enjoyment of present and future generations. Identifying rivers is a two-step process. First, eligibility is determined based on whether the river or stream is free flowing and has one or more outstandingly remarkable values. This creates an inventory of rivers. The second step is to determine suitability. Suitability examines a number of factors such as compatibility with resources uses, impacts on non-federal lands, and the costs of land acquisition. This information informs an agency decision on whether or not to recommend designation of a river. The stretch of Nason Creek above Whitepine Creek (RM 14.6) has been proposed by the U.S. Forest Service as eligible for wild and scenic designation (USFS 2011). None of the activities or facilities that are part of the Proposed Action would occur in this stretch of Nason Creek.

1.5.13. White River Spring Chinook Salmon Hatchery Program

On September 15, 2009, Grant PUD submitted an HGMP to NMFS for its White River spring Chinook salmon hatchery program. Development of the White River HGMP occurred in consultation with the Priest Rapids Coordinating Committee, which is composed of the following entities: NMFS, USFWS, WDFW, the Confederated Tribes and Bands of the Yakama Nation, the Confederated Tribes of the Colville Reservation, and Grant PUD. On February 8, 2013, the Priest Rapids Coordinating Committee contemplated and approved the following program changes to the White River hatchery program (GPUD 2013):

- Continue the White River spring Chinook salmon captive brood program until the last release of juveniles in 2016.
- Transfer the spring Chinook salmon mitigation obligation of up to 75,000 smolts on the White River to the Nason Creek program stating in brood year 2013.
- Maintain an active monitoring and evaluation program in the White River until 2026.
- By 2026, oversee the assemblage of all relevant technical information and an independent scientific review. This review will inform the Priest Rapids Coordinating Committee who will then determine the future of the White River spring Chinook salmon hatchery program.

Since the submittal of the Nason Creek HGMP to NMFS, the Priest Rapids Coordinating Committee has undertaken the required hatchery production adjustment process. This adjustment reduced the Nason Creek hatchery program from 250,000 to 149,114 smolts. Moving the White River mitigation obligation to the Nason Creek spring Chinook salmon hatchery program would result in the annual release of 224,114 smolts into Nason Creek, which is consistent with the submitted HGMP for the Nason Creek spring Chinook salmon hatchery program (GPUD 2009). All Nason Creek fish would be collected, spawned, reared, acclimated, and released consistent with the submitted Nason Creek spring Chinook salmon HGMP and addendum.

2. ALTERNATIVES INCLUDING THE PROPOSED ACTION

Two alternatives are considered in this EA: (1) NMFS would not issue a section 10(a)(1)(A) permit, and (2) NMFS would issue a section 10(a)(1)(A) permit for operation of the proposed hatchery program. No other alternatives that would meet the purpose and need were identified that would be appreciably different from the two alternatives described below.

2.1. Alternative 1 (No Action) – Do Not Issue a Section 10(a)(1)(A) Permit

Under Alternative 1 (No Action), NMFS would not issue an ESA section 10(a)(1)(A) permit to the applicants for operation of the Nason Creek spring Chinook salmon hatchery program. As a result, Grant PUD and WDFW would not initiate the hatchery program, and Grant PUD would be in violation of the Priest Rapids Hydroelectric Project's Salmon and Steelhead Settlement Agreement and one of its FERC license requirements.

Under Alternative 1, no broodstock would be collected, held, spawned, incubated, reared, or released for the proposed Nason Creek spring Chinook salmon hatchery program. Further, no hatchery-origin adults from the Nason Creek spring Chinook salmon hatchery program would be outplanted. Under Alternative 1, the proposed weir on Nason Creek would not be needed, and the proposed adult management of hatchery-origin Nason River spring Chinook salmon would not be applicable. Likewise, proposed monitoring and evaluation activities to determine the effects of the proposed hatchery program would no longer be applicable.

2.2. Alternative 2 (Proposed Action) – Issue a Section 10(a)(1)(A) Permit

Under Alternative 2 (Proposed Action), NMFS would issue an ESA section 10(a)(1)(A) permit to WDFW and Grant PUD for operation of the proposed Nason Creek spring Chinook salmon hatchery program, and the Nason Creek spring Chinook hatchery program would be implemented as described in the submitted HGMP and addendum.

The Nason Creek hatchery program would have two components:

- A conservation component intended to rebuild the natural populations using a fully integrated broodstock
- A "safety-net" stepping stone component that would be used to meet the full mitigation production level: it would be genetically linked to the natural-origin population and guard against catastrophic run failure but these fish would be marked separately[3]

Under the Proposed Action, NMFS would issue a ~~10~~13-year permit for operation of the Nason Creek spring Chinook salmon hatchery program. The proposed permit would authorize the following activities:

[3] Safety-net adults from the Nason Creek spring Chinook salmon hatchery program may be harvested in the Wenatchee River in the future as a mechanism to control the number of hatchery-origin fish on the spawning grounds.

- Collection of adult spring Chinook salmon at Tumwater Dam
- Holding and identification of adult fish at Eastbank Hatchery
- Transfer and release of non-target fish intercepted at Tumwater Dam (i.e., spring Chinook from the White, Little Wenatchee, or Chiwawa rivers)
- Spawning, incubation, and early juvenile rearing at Eastbank Hatchery
- Marking of juvenile fish
- Overwinter acclimation of juvenile fish at the Nason Creek Acclimation Facility
- Release of up to 250,000 juvenile spring Chinook salmon into Nason Creek
- Adult management to minimize genetic and productivity impacts on natural-origin spring Chinook salmon and steelhead populations (e.g., through removal at Tumwater Dam, a Nason Creek weir, or through a conservation fishery)[2]
- Seasonal installation and operation of a floating Nason Creek weir[4]
- Monitoring and evaluation activities (e.g., spawning ground surveys, broodstock sampling, hatchery juvenile sampling, smolt trapping, precocity sampling, tagging, genetic sampling, disease sampling, and snorkel surveys)
- Outplanting of returning adults that are in excess of what is needed for spawning or broodstock collection into minor spawning areas that have few to no adult spawners (e.g., Peshastin Creek)
- Outplanting of returning adults that are in excess of what is needed for spawning or broodstock collection for nutrient enhancement.

Although the Grant PUD and WDFW plan to collect broodstock at Tumwater Dam, they propose the option of collecting broodstock in Nason Creek also, which would require the installation and operation of a weir and fish trap at river-mile 2, upstream of the Nason Creek Campground (Table 2). The Nason Creek weir would only be installed and operated if broodstock cannot successfully be collected from Tumwater Dam. The Nason Creek weir would be a floating weir, which would be seasonally installed and operated during spring months when adult spring Chinook salmon return to Nason Creek to spawn. The weir would have a picket panel and trap, which would be removable. The only permanent structures associated with the weir would be a sill (cobble), abutments, and operations landing (J. Pyper, pers. comm., Grant County PUD, Manager, August 1, 2012). The weir would not be operated continually over any 24-hour period, nor would it be operated 7 days a week. The weir would be closely monitored consistent with ESA permit conditions, which would also specify that the weir design would be consistent with NMFS fish passage criteria.

[4] Although the Grant PUD and WDFW plan to collect broodstock at Tumwater Dam, they would like the option of collecting broodstock in Nason Creek also, which would require the installation and operation of a weir and fish trap at river-mile 2, upstream of the Nason Creek Campground.

2.3. Alternatives Considered but not Analyzed in Detail

2.3.1. An Alternative that Incorporates Alternative Hatchery Strategies

NMFS considered whether to evaluate an alternative with different broodstock collection, rearing, and/or adult management. However, it was determined that this alternative would not be meaningfully different from the Proposed Action since the Proposed Action includes a monitoring and adaptive management component that would allow the hatchery program to incorporate different hatchery strategies as needed to minimize adverse impacts and to maximize benefits of the hatchery program on ESA-listed spring Chinook salmon.

2.3.2. An Alternative that Changes the Hatchery Production Level

NMFS considered whether to evaluate an alternative with higher or lower production levels. However, this alternative would not meet the purpose and need for action (Subsection 1.3, Purpose of and Need for the Action). Production levels for the proposed Nason Creek spring Chinook salmon hatchery program would be set to result in no net impact from the hydroelectric project, which is a condition of the Priest Rapids Project Salmon and Steelhead Settlement Agreement. Operating the Nason Creek spring Chinook salmon hatchery program at higher or lower production levels would not allow Grant PUD to meet its FERC license requirements for the Priest Rapids Hydroelectric Project, which is a component of the purpose and need for this action.

2.3.3. An Alternative that Implements the Proposed HGMP with a Sunset Permit Term

NMFS assessed whether an alternative that "sunsets" the proposed hatchery program (ends the program after a set period of time) should be evaluated. However, since the Proposed Action is for issuance of a 13~~10~~-year permit, NMFS and the applicant would consider a sunset of the hatchery program at that time. Operating the Nason Creek spring Chinook salmon hatchery program for less than 10 years would not comply with the terms of the Priest Rapids Project Salmon and Steelhead Settlement Agreement and Grant PUD's FERC license for the operation of the Priest Rapids Hydroelectric Project. Consequently, this alternative would not meet the purpose and need for action.

3. AFFECTED ENVIRONMENT

3.1. Introduction

Section 3, Affected Environment, describes baseline conditions for ten resources that might be affected by implementation of the EA alternatives:

- Water quantity (Subsection 3.2)
- Water quality (Subsection 3.3)
- Salmon, steelhead, bull trout, and their habitat (Subsection 3.4)
- Other fish and their habitat (Subsection 3.5)
- Wildlife (Subsection 3.6)
- Socioeconomics (Subsection 3.7)
- Environmental justice (Subsection 3.8)
- Cultural resources (Subsection 3.9)
- Noise (Subsection 3.10)
- Aesthetics and recreational value (Subsection 3.11)

No other resources were identified during internal scoping that would potentially be impacted by the Proposed Action or alternatives.

The action area (or project area) is the geographic area where the Proposed Action would take place. It includes the places where Nason Creek spring Chinook salmon would be collected, spawned, incubated, reared, acclimated, released, or harvested under the proposed HGMP and addendum(Subsection 1.4, Action Area). It includes the Eastbank Hatchery, the Nason Creek Acclimation Facility, and Tumwater Dam. Each resource's analysis area includes the action area as a minimum area but may include locations beyond the action area if some of the effects of the alternatives on that resource would be expected to occur outside the action area (Subsection 1.4, Action Area).

Currently, the Nason Creek spring Chinook salmon hatchery program is not operating, so the Nason Creek Acclimation Facility is not operating. Although the Eastbank Hatchery rears fish for other hatchery programs, it is not currently rearing Nason Creek spring Chinook salmon.

The Tumwater fish trap is located in the adult fishways of Tumwater Dam. The trap is operated by WDFW for a portion of the year (April through September) to implement HGMP goals, conduct research, and to collect broodstock for Chelan PUD HCP hatchery programs (e.g., the Chiwawa spring Chinook salmon hatchery program). The Yakama Tribe operates the trap from September through November to capture broodstock for a tribal coho program. WDFW and NOAA's Science Center use the Tumwater fish trap to capture 100 percent of returning spring Chinook (June and July) for a reproductive success study that began in 2004. The USFWS also utilizes the Tumwater fish trap to remove adult spring Chinook adults that stray from its Leavenworth National Fish hatchery program on Icicle Creek.

3.2. Water Quantity

Hatchery programs can affect water quantity when they take water from a well (groundwater) or a neighboring tributary streams (surface water) to use in the hatchery facility for broodstock holding, egg incubation, juvenile rearing, and juvenile acclimation. All water, minus evaporation, that is diverted from a river or taken from a well is discharged to the adjacent river or bay from which the water was appropriated after it circulates through the hatchery facility (non-consumptive use). When hatchery programs use groundwater, they may reduce the amount of water for other users in the same aquifer. When hatchery programs use surface water, they may lead to dewatering of the stream between the water intake and discharge structures, which may impact fish and wildlife if migration is impeded or dewatering leads to increased water temperatures. Generally, hatchery water intake and discharge structures are located as close together as possible to minimize the area of the stream that may be impacted by a water withdrawal.

The Eastbank Hatchery only uses groundwater. The Nason Creek Acclimation Facility will use both surface water and groundwater. Traditionally, the Eastbank Hatchery has accounted for approximately 70 percent of the Eastbank Aquifer's total amount of water withdrawal (Wenatchee World 2008). However, because evidence suggested that the Eastbank Hatchery's draw was exceeding the aquifer's ability to replenish itself, the Eastbank Hatchery initiated a pilot study in 2008 for a water reuse that uses nearly 90 percent less water than traditional hatchery facilities. Although only around 10 percent of the Eastbank Hatchery has reuse capability currently, this may be expanded in the future. The Eastbank Hatchery has an existing water right.

The Nason Creek Acclimation Facility's has a pending water right with the Washington Department of Ecology. Water rights ensure that water removal does impair instream flows or other water rights. Under baseline conditions, Nason Creek has a minimum mean daily flow of 50 cubic feet per second (in September) and a maximum mean daily flow of 1120 cubic feet per second (in June) (GPUD 2010).

3.3. Water Quality

Hatchery programs could affect several water quality parameters in the aquatic system. Concentrating large numbers of fish within hatcheries could produce effluent with ammonia, organic nitrogen, total phosphorus, biological oxygen demand, pH, and suspended solids (Sparrow 1981; Ecology 1989; Kendra 1991; Cripps 1995; Bergheim and Åsgård 1996; Michael 2003). Chemical use within hatcheries could result in the release of antibiotics, fungicides, and disinfectants into receiving waters (Boxall et al. 2004; Pouliquen et al. 2008; Martinez-Bueno et al. 2009). Other chemicals and organisms that could potentially be released by hatchery operations are polychlorinated biphenyls (PCBs), dichlorodiphenyltrichloroethane (DDT) and its metabolites (Missildine 2005; HSRG 2009), fish disease pathogens (HSRG 2005; HSRG 2009), steroid hormones (Kolodziej et al. 2004), anesthetics, pesticides, and herbicides. Additionally, hatchery facilities may cause short-term increases in sedimentation when maintaining instream structures (e.g., protecting banks from erosion or clearing debris from water intake structures) or installing weirs.

The direct discharge of hatchery facility effluent is regulated by the Environmental Protection Agency under the Clean Water Act through National Pollutant Discharge Elimination System (NPDES) permits. For discharges from hatcheries not located on Federal or tribal lands within Washington, the Environmental Protection Agency has delegated its regulatory oversight to the State. Washington Department of Ecology is responsible for issuing and enforcing NPDES permits that ensure water quality standards for surface waters remain consistent with public health and enjoyment, and the propagation and protection of fish, shellfish, and wildlife (WAC 173-201A). The Environmental Protection Agency administers NPDES permits for all projects on Federal and tribal lands. NPDES permits are not needed for hatchery facilities that release less than 20,000 pounds of fish per year or feed fish less than 5,000 pounds of fish feed per year. The Eastbank Hatchery is in compliance with their NPDES permit. The Nason Creek Acclimation Facility does not require a NPDES permit because proposed production is less than 20,000 pounds of fish per year[5]. However, the Nason Creek Acclimation Facility has been designed to operate under the Statewide Upland Fin-Fish NPDES General Permit regarding effluent water quality and receiving water quality controls (GPUD 2011). Water quality monitoring in Nason Creek has been on-going since 2009 for comparison purposes.

As part of administering elements of the Clean Water Act, the Washington Department of Ecology is required to assess water quality in streams, rivers, and lakes. These assessments are published in what are referred to as the 305(d) report and the 303(d) list (the numbers referring to the relevant sections of the original Clean Water Act text). The 305(d) report reviews the quality of all waters of the state, while the 303(d) list identifies specific water bodies considered impaired (based on a specific number of exceedances of state water quality criteria in a specific segment of a water body).

The EPA reviewed and approved Washington Department of Ecology's 2008 303(d) list on January 29, 2009. Nason Creek and the segment of Columbia River neighboring the Eastbank Hatchery are on the 303(d) list (Ecology 2013), both for high temperature. High temperatures occur in Nason Creek because it has lost valuable cool water inputs from valley wall springs and tributaries as a result of being disconnected from its floodplain (USBOR 2008). High temperatures in the Columbia River near Eastbank Hatchery occur because of hydroelectric development (Table 3).

[5] The Nason Creek Acclimation Facility is estimated to have a net production of approximately 10,062 pounds of fish per year, which is less than the 20,000 pound threshold and, therefore, it is anticipated that a NPDES permit is not required for the Nason Creek Acclimation Facility.

Table 3. Hatchery facility effluent and applicable 303(d) listings.

Hatchery Facility	Compliant with NPDES Permit	Discharges Effluent into a 303(d) Listed Water Body[1]	Impaired Parameters	Cause of Impairment
Eastbank Hatchery	Yes	Yes	Temperature	Hydropower development
Nason Creek Acclimation Facility	N/A	N/A	Temperature	Loss of connectivity with floodplain

[1]Source: Ecology 2013; USBOR 2008
N/A: Not applicable because the Nason Creek Acclimation Facility is not yet operating. However, the facility is designed to release effluent into Nason Creek, which is a 303(d) listed water body.

3.4. Salmon, Steelhead, Bull Trout, and their Habitat

Hatchery programs can adversely affect natural-origin salmon and steelhead and their habitat through genetic risks, competition and predation, facility effects, natural population status masking, incidental fishing effects, and disease transfer (Table 4). The extent of adverse effects depends on the design of hatchery programs, the condition of the habitat, and the current status of the species, among other factors. Hatchery programs can benefit natural-origin salmon and steelhead through marine-derived nutrient cycling effects, by preserving and increasing abundance and spatial structure, retaining genetic diversity, and potentially increasing productivity of a natural-origin population if natural-origin abundance is low enough that they are having difficulty finding mates.

Regarding genetic risk, most of the empirical evidence of fitness depression due to hatchery-induced selection comes from studies of species that are reared in the hatchery environment for an extended period – 1 to 2 years – prior to release (Berejikian and Ford 2004). Two especially well-publicized steelhead studies showed dramatic fitness declines in the progeny of naturally spawning hatchery-origin steelhead (Araki et al. 2007; Araki et al. 2008). However, the data and theory are insufficient to predict the magnitude and duration of loss in any particular situation. Recently, studies of hatchery supplementation have also documented demographic benefits to natural production from hatchery fish spawning in the wild (Anderson et al. 2012; Berejikian et al. 2008; Hess et al. 2012). On balance, the benefits of hatchery programs for reducing extinction risk and for rebuilding severely depressed fish populations in the near-term may outweigh the risks of fitness loss over longer periods in certain circumstances.

Hatchery supplementation also has the potential to increase competition with and predation on wild fish. However, hatchery programs may be designed to limit opportunities for co-occurrence and interaction between hatchery-origin fish and migrating natural-origin fish, reducing potential adverse effects from competition and predation. Although poorly managed hatchery programs can increase disease and pathogen transfer risks, compliance with applicable protocols for fish health can effectively minimize this risk.

Monitoring and evaluation to determine impacts on listed fish from hatchery programs can themselves have potential adverse impacts on listed fish through injuries incurred during marking and handling. Some of the monitoring is conducted for the purpose of evaluating the

hatchery program, but salmon and steelhead are also handled for stock status monitoring. Sampling within the hatchery can lead to direct mortalities (e.g., genetic analysis, disease pathology, smolt condition) and incidental take (e.g., capture, sorting, and handling).

A more detailed discussion of the general effects of hatchery programs on salmon, steelhead and their habitat can be found in the draft Environmental Impact Statement to Inform Columbia River Basin Hatchery Operations and the Funding of the Mitchell Act hatchery programs (NMFS 2010). Information from the draft Environmental Impact Statement specific to effects of hatchery programs on fish is hereby incorporated by reference.

The Wenatchee subbasin supports several runs of anadromous fish including spring Chinook salmon (*O. tshawytscha*), summer Chinook salmon (*O. tshawytscha*), sockeye salmon (*O. nerka*), and summer steelhead (*O. mykiss*). Coho salmon (*O. kisutch*) were recently reintroduced into the Wenatchee subbasin, but abundance of this species is still heavily dependent on hatchery releases. Since 1991, NMFS has identified one ESU (Upper Columbia River spring-run Chinook salmon) and one distinct population segment (DPS; Upper Columbia River steelhead) in the analysis area that require protection under the ESA (70 FR 37160, June 28, 2005; 74 FR 42605, August 24, 2009). In addition, the USFWS has identified bull trout (*Salvelinus confluentus*) as requiring protection under the ESA (63 FR 31647, June 10, 1998). Species-specific effects on ESA-listed species are discussed in the following subsections.

Table 4. General mechanisms through which hatchery programs can affect natural-origin salmon and steelhead populations.

Effect Category	Description of Effect
Genetic risks	• Interbreeding with hatchery-origin fish can change the genetic character of the local salmon or steelhead populations. • Interbreeding with hatchery-origin fish may reduce the reproductive performance of the local salmon or steelhead populations.
Competition and predation	• Hatchery-origin fish can increase the number of fish in a system and thus increase competition for food and space. • Hatchery-origin fish can increase predation on natural-origin salmon and steelhead. • Juvenile hatchery-origin fish can be a food source for other species, including but not limited to ESA-listed bull trout.

Facility effects	• Hatchery facilities can reduce water quantity or quality in adjacent streams through water withdrawal and discharge.
	• Weirs and traps for broodstock collection or to control the number of hatchery-origin fish on the spawning grounds can have the following unintentional consequences:
	  o Isolation of formerly connected populations
	  o Limiting or slowing movement of migrating fish species, which may enable poaching or increase predation
	  o Alteration of stream flow
	  o Alteration of streambed and riparian habitat
	  o Alteration of the distribution of spawning within a population

Effect Category	Description of Effect
	o Increased mortality or stress due to capture and handling o Impingement of downstream migrating fish o Forced downstream spawning by fish that do not pass through the weir o Increased straying due to either trapping adults that were not intending to spawn above the weir, or displacing adults into other tributaries
Masking	• Hatchery-origin fish can increase the difficulty in determining the status of the natural-origin component of a salmon or steelhead population.
Incidental fishing effects	• Fisheries targeting hatchery-origin fish have incidental impacts on natural-origin fish.
Disease transfer	• Concentrating salmon and steelhead for rearing in a hatchery facility can lead to an increased risk of carrying fish disease pathogens. When hatchery-origin fish are released from the hatchery facilities, they may increase the disease risk to natural-origin salmon and steelhead.
Population viability benefits	• Abundance: Preservation of, and possible increases in, the abundance of a natural-origin fish population resulting from implementation of a hatchery program. • Spatial Structure: Preservation or expansion of the spatial structure of a natural-origin fish population resulting from implementation of a hatchery program. • Genetic diversity: Retention of within-population genetic diversity of a natural-origin fish population resulting from implementation of a hatchery program. • Productivity: Hatchery programs could increase the productivity of a natural-origin population if naturally spawning hatchery-origin fish match natural-origin fish in reproductive fitness and when the natural-origin population's abundance is low enough to limit natural-origin productivity (i.e., they are having difficulty finding mates).
Nutrient cycling	• Returning hatchery-origin adults can increase the amount of marine-derived nutrients in freshwater systems.

3.4.1. Upper Columbia River Spring-run Chinook Salmon (ESA-listed)

Upper Columbia River spring-run Chinook salmon were listed under the ESA as endangered in 1999 and reaffirmed in 2005 (70 FR 37160, June 28, 2005). The Upper Columbia River Spring-run Chinook Salmon ESU consists of three extant populations that spawn and rear in the Wenatchee, Entiat, and Methow River Basins, including spring Chinook salmon propagated in six hatchery programs. Spring Chinook salmon spawning in Nason Creek are part of the Wenatchee River spring Chinook salmon population and are considered a subpopulation. Murdoch et al. (2006) conducted population genetic analysis of spring Chinook salmon spawning aggregates in the Upper Wenatchee River Basin for brood years 2004 and 2005 and concluded that population genetic structure appears within the Wenatchee River spring Chinook salmon population.

Abundance has been stable or increasing on average for populations in the ESU over the last 10 years (Ford 2011). However, all three populations are still considered at high risk for extinction (Table 5). The most recent status review cited extremely low productivity as a primary concerns for the populations within the analysis area (Ford 2011).

Designated critical and essential fish habitat for Upper Columbia River spring-run Chinook salmon includes all Columbia River estuarine areas and river reaches proceeding upstream to the Rock Island Dam as well as specific stream reaches in the Wenatchee, Entiat, and Methow River Basins (70 FR 52630, September 2, 2005). Essential habitat for spring-run Chinook salmon consists of (1) spawning and juvenile rearing areas; (2) juvenile migration corridors; (3) areas for growth and development to adulthood, and (4) adult migration corridors. Essential features of these habitats include adequate substrate (especially spawning gravel), water quality, water quantity, water temperature, water velocity, cover/shelter, food, riparian vegetation, space, and suitable migration conditions.

Artificial propagation of spring Chinook in the Wenatchee Basin began in 1941. Since 1948, hatchery spring Chinook have been released by the Leavenworth National Fish Hatchery into Icicle Creek. More recently, a supplementation program was initiated in 1989 on the Chiwawa River as part of the Rock Island Mitigation Agreement between Chelan County Public Utility District and the fishery management parties (RISPA 1989). The program is designed to mitigate for smolt mortality as a result of the operation of Rock Island Hydroelectric Project. Broodstock for the Chiwawa spring Chinook salmon hatchery program is collected at the Tumwater fish trap at Tumwater Dam. The USFWS also utilizes the Tumwater fish trap to remove adult spring Chinook adults that stray from its Leavenworth National Fish hatchery program on Icicle Creek. WDFW and NOAA's Science Center use the Tumwater fish trap to capture 100 percent of returning spring Chinook (June through July) for a reproductive success study that began in 2004. Operation of the Tumwater fish trap has led to migrational delays in the past, but impacts have been mitigated through changes in operational protocols beginning in 2011 (WDFW 2013).

Table 5. Abundance thresholds, current abundance, and viability risk ratings for three populations of Upper Columbia River spring-run Chinook salmon.

Population	ICTRT Minimum Abundance Threshold for Natural-origin Spawners	Natural-origin Spawners[2]	Total Spawners[2]	Abundance/ Productivity Risk	Spatial Structure/ Diversity Risk	Overall Viability Rating
Wenatchee	2,000	489	1,554	High	High	High risk
Entiat	500	111	253	High	High	High risk
Methow	2,000	402	1,327	High	High	High risk

[1] ICTRT's recommended minimum abundances are based on a 10-year geometric mean.
[2] 5-year geometric mean
Source: Ford 2011

3.4.2. Upper Columbia River Steelhead (ESA-listed)

Upper Columbia River steelhead were listed under the ESA as endangered in 1997, reclassified as threatened in 2006, and its threatened status was reaffirmed in 2009 (74 FR 42605, August 24, 2009). The Upper Columbia River Steelhead DPS consists of four extant populations that spawn and rear in the Wenatchee, Entiat, Methow, and Okanogan River Basins, including steelhead propagated in six hatchery programs.

Abundance has been increasing on average for populations in the DPS over the last 5 years (Ford 2011). The modest improvements in natural-origin returns in recent years are probably primarily the result if several years of relatively good natural survival in the ocean and tributary habitats (Ford 2011). All four populations are at high risk for extinction (Table 6).

Designated critical and essential fish habitat for Upper Columbia River steelhead includes all Columbia River estuarine areas and river reaches proceeding upstream to the Rock Island Dam as well as specific stream reaches in the Wenatchee, Entiat, Methow, and Okanogan River Basins (70 FR 52630). Essential habitat for steelhead salmon consists of (1) spawning and juvenile rearing areas; (2) juvenile migration corridors; (3) areas for growth and development to adulthood, and (4) adult migration corridors. Essential features of these habitats include adequate substrate (especially spawning gravel), water quality, water quantity, water temperature, water velocity, cover/shelter, food, riparian vegetation, space, and suitable migration conditions.

The Tumwater fish trap generally operates from April through September to collect broodstock for hatchery programs, intercept strays from the Leavenworth National Fish Hatchery program on Icicle Creek, and collect samples for a relative reproductive success study. Operation of the Tumwater fish trap has led to migrational delays in the past, but impacts have been mitigated through changes in operational protocols beginning in 2011 (WDFW 2013).

Table 6. Abundance thresholds, current abundance, and viability risk ratings for four populations of Upper Columbia River steelhead.

Population	ICTRT Minimum Abundance Threshold for Natural-origin Spawners[1]	Natural-origin Spawners[2]	Total Spawners[2]	Abundance/ Productivity Risk	Spatial Structure/ Diversity Risk	Overall Viability Rating
Wenatchee	1,000	819	1,891	High	High	High risk
Entiat	500	116	530	High	High	High risk
Methow	1000	505	3,504	High	High	High risk
Okanogan	750	152	1,832	High	High	High risk

[1] ICTRT's recommended minimum abundances are based on a 10-year geometric mean.
[2] 5-year geometric mean
Source: Ford 2011

3.4.3. Wenatchee Sockeye and Summer Chinook Salmon

Sockeye and summer Chinook salmon populations in the Wenatchee River are considered healthy and support commercial, tribal, and sport fisheries when abundance is expected to exceed spawning escapement requirements. Neither species is listed under ESA.

Sockeye salmon only spawn in the White and Little Wenatchee rivers, and summer Chinook only spawn in the mainstem Wenatchee River (Mosey and Murphy 2002). The Tumwater fish trap generally operates from April through September to collect broodstock for hatchery programs, intercept strays from the Leavenworth National Fish Hatchery program on Icicle Creek, and collect samples for a relative reproductive success study. Extremely low flows have led to migrational delays at Tumwater Dam and fish trap. However, collaborative management has improved passage at Tumwater Dam in recent years.

3.4.4. Bull Trout (ESA-listed)

The USFWS issued a final rule listing the Columbia River and Klamath River populations of bull trout (*Salvelinus confluentus*) as a threatened species under the ESA on June 10, 1998 (63 FR 31647). Bull trout redd counts in Nason Creek ranged from 1 to 15 redds annually from 1996 through 2004 (UCSRB 2007). Assuming 2 to 2.8 fish per redd, there were between 2 and 42 bull trout in Nason Creek annually between 1996 and 2004.

Bull trout, salmon, and steelhead can occur in similar aquatic habitat types; however, bull trout are more sensitive than salmon and steelhead to increased water temperatures, poor water quality, habitat conditions, and low flow conditions and, thus, they more often occur in higher elevations with less disturbed habitats. Bull trout also require colder water temperatures than other salmon and trout; therefore, bull trout are more likely to occur in stream headwaters (where a stream begins – its origin) where temperatures tend to be cooler.

Bull trout feed primarily on fish (a behavior referred to as piscivorous) as subadults and adults – they can be a substantial predator of young salmon and steelhead. Juvenile bull trout feed on prey similar to the prey of salmon and steelhead, so they can also be a competitor with salmon and steelhead (USFWS 2002; USFWS 2008b).

The Tumwater fish trap generally operates from April through September to collect broodstock for hatchery programs and intercept strays from the Leavenworth National Fish Hatchery program on Icicle Creek. In 2010, WDFW incidentally captured 66 bull trout during the Tumwater trapping operations from April through September (Table 7). These fish were not retained or anesthetized to avoid handling effects. All bull trout were released upstream of the dam and fish ladder. No bull trout were injured or killed. However, passage delay was experienced based on radio-telemetry data for one bull trout (CPUD 2011).

Table 7. Number of bull trout trapped at the Tumwater Dam fishway broodstock trap during anadromous trapping operations in 2010.

Month	Bull Trout Trapped and Released
April	1
May	0
June	9
July	47
August	8
September	1
Total	66

Source: CPUD 2011

3.5. Other Fish Species and Their Habitats

This section includes Columbia River Basin fish species that have a relationship with salmon and steelhead either as prey, predators, or competitors (Table 8). Generally, impacts would occur (1) through competition for space or food used by spring Chinook salmon and other fish species in the analysis area, or (2) if spring Chinook salmon are prey for non-listed species or vice-versa.

Spring Chinook salmon eat lamprey, sculpin, pygmy whitefish, trout, rockfish, and forage fish (Table 8). Spring Chinook salmon may become prey for lamprey, sculpin, northern pikeminnow, trout, and rockfish, but none of these species feed exclusively on salmon (Table 8). All non-listed fish species, except mountain sucker, compete with spring Chinook salmon for food or space at some life stage (Table 8). All fish species benefit from the addition of marine-derived nutrients from the decomposition of salmon carcasses (Table 8).

There are several fish species of concern in the State of Washington, including leopard dace, margined sculpin, mountain sucker, Paiute sculpin, river lamprey, and Umatilla dace. Pacific and river lamprey are also a species of concern as identified by the USFWS (USFWS 2013).

Table 8. Range and status of other fish species that may be affected by Upper Columbia River spring Chinook salmon.

Species	Range in Columbia River Basin	Federal/State Listing Status	Type of Interaction with salmon and steelhead
Lamprey (Pacific [*Lampetra tridentata], river [L. ayresi], and brook [L. richardsoni])*	All accessible reaches in the Columbia River Basin	Not listed. Pacific lamprey and river lamprey are Federal species of concern; river lamprey is a Washington State candidate species.	• Potential prey item for adult salmon and steelhead • May compete with salmon and steelhead for food and space • May be a parasite on salmon and steelhead while in marine waters • May benefit from additional marine-derived nutrients provided by hatchery-origin fish
White sturgeon (*Acipenser transmontanus*)	All accessible reaches in the Columbia River Basin	Not federally listed	• May compete with salmon and steelhead for food • May benefit from additional marine-derived nutrients provided by hatchery-origin fish
Margined sculpin (*Cottus marginatus*)	All accessible reaches in the Columbia River Basin	Washington State species of concern	• Predator on salmon and steelhead eggs and fry • Potential prey item for adult salmon and steelhead • May compete with salmon and steelhead for food and space • May benefit from additional marine-derived nutrients provided by hatchery-origin fish
Umatilla dace (*Rhinichthys Umatilla*) and leopard dace (*Rhinichthys falcatus*)	Columbia River Basin	Not federally listed, Washington State candidate species	• May compete with salmon and steelhead for food • May benefit from additional marine-derived nutrients provided by hatchery-origin fish

Species	Range in Columbia River Basin	Federal/State Listing Status	Type of Interaction with salmon and steelhead
Mountain sucker (*Catostomus platyrhynchus*)	Middle Columbia and Upper Columbia River watersheds	Not federally listed, Washington State species of concern	• Occurs in similar freshwater habitats, but is a bottom feeder and has a different ecological niche • May benefit from additional marine-derived nutrients provided by hatchery-origin fish
Northern pikeminnow (*Ptychocheilus oregonensis*)	Throughout the Columbia River Basin	Not listed	• Freshwater predator on salmon and steelhead eggs and juveniles • May compete with salmon and steelhead for food • May benefit from additional marine-derived nutrients
Inland redband trout (*Oncorhynchus mykiss*)	Throughout the Columbia River Basin	Not listed	• Predator of salmon and steelhead eggs and fry • Potential prey item for adult salmon and steelhead • May compete with salmon and steelhead for food and space • May interbreed with steelhead • May benefit from additional marine-derived nutrients provided by hatchery-origin fish
Rockfish[1]	Rocky reef habitats in marine waters	Several species are federally listed as threatened and/or have State Candidate listing status [1]	• Predators of juvenile salmon and steelhead • Juveniles are prey for juvenile and adult salmon • May compete with salmon and steelhead for food

Species	Range in Columbia River Basin	Federal/State Listing Status	Type of Interaction with salmon and steelhead
Forage fish	Most marine waters	Pacific herring is a Federal species of concern and a Washington State candidate species	• Prey for juvenile and adult salmon and steelhead • May compete with salmon and steelhead for food

Sources: Finger 1982; Krohn 1968; Maret et al 1997; Polacek et al 2006; Beamish 1980.

[1] Georgia Basin bocaccio DPS (*Sebastes paucispinis*): Federally listed as endangered and state candidate species; Georgia Basin yelloweye rockfish DPS (*S. ruberrimus*): Federally listed as threatened and state candidate species; Georgia Basin canary rockfish DPS (*S. pinniger*): Federally listed as threatened and state candidate species; black, brown, China, copper, green-striped, quillback, red-stripe, tiger, and widow rockfish are state candidate species.

Weirs installed and operated in streams to collect hatchery broodstock or control the number of hatchery-origin fish on the spawning grounds may impact non-target fish species if the pickets are spaced in a manner that injures non-target species (i.e., impingement) or prevents their passage. Currently, there are no weirs or other artificial impediments in Nason Creek.

The Tumwater fish trap generally operates from April through September to collect broodstock for hatchery programs, intercept strays from the Leavenworth National Fish Hatchery program on Icicle Creek, and collect samples for a relative reproductive success study. During operation, the fish trap may isolate formally connected populations of fish.

3.6. Wildlife

Several species of wildlife feed on adult salmon and steelhead or on decomposing carcasses of spawned adult salmon and steelhead. They include ESA-listed grizzly bear (*Ursus arctos horriblis*), southern resident killer whale (*Orcinus orca*), and Steller sea lion (*Eumetopias jubatus*) (USFWS 2013; NMFS 2010). Fish are not the only component of the diets of these species, although salmon and steelhead may represent a somewhat larger proportion of the diet during the relatively short period of the year that adult salmon return to spawn.

Steller sea lions and California sea lions are known to feed on returning adult salmon when they congregate downstream of Bonneville Dam (USACE 2012). Upper Columbia River spring Chinook salmon migration coincides with the presence of sea lions below Bonneville Dam (NMFS 2008b), and sea lions may intercept spring Chinook salmon, which would be expected to include some small number of fish originating from Nason Creek.

Southern resident killer whales' diet consists of a high percentage of Chinook salmon, with an overall average of 82 percent Chinook salmon (Hanson et al. 2010). Hanson et al. (2010) suggest that Chinook salmon stocks would be consumed at least roughly proportional to their local abundance. Southern resident killer whales reside predominantly in Puget Sound, and would only rarely encounter Upper Columbia River spring Chinook salmon either as Chinook salmon migrate north up the coast, or as killer whales migrate south down the coast.

There are several species of birds that feed on juvenile salmon, including Caspian terns (*Hydroprogne caspia*) and cormorants (*Phalacrocorax auritus*). The nesting and feeding areas of these bird species is in the Lower Columbia River, its estuary, and nearshore marine areas. During the spring, when salmon and steelhead juvenile outmigrate to the Pacific Ocean, they may be major food source for these bird populations.

When weirs are used by hatchery programs to collect broodstock or manage returning adult fish, there is a potential for wildlife to become entrapped in the weir and drown. However, very few wildlife mortalities have been observed at weirs (J. Korth, pers. comm., WDFW, Regional Fish Manager, July 20, 2012).

3.7. Socioeconomics

Socioeconomics is defined as the study of the relationship between economics and social interactions with affected regions, communities, and user groups. In addition to sometimes providing fish for harvest, hatchery programs directly affect socioeconomic conditions in the regions where the hatchery facilities operate. Hatchery facilities generate economic activity (personal income and jobs) by providing employment opportunities and through local procurement of goods and services for hatchery operations. NMFS (2010) found that Columbia River Basin hatchery operations on average contributed almost $7 million annually in personal income and 139 jobs to the Upper Columbia River regional economy between 2002 and 2006.

Fisheries contribute to local economies through the purchase of supplies such as fishing gear, camping equipment, consumables, licenses, and fuel at local businesses. All of these expenditures would be expected to support local businesses, but it is unknown how dependent these businesses are on fishing-related expenditures. Anglers would also be expected to contribute to the economy through outfitter/guide/charter fees.

NMFS (2010) found that harvest-related effects from Columbia River Basin hatchery operations contributed almost $600,000 annually in personal income and 20 jobs to the Upper Columbia River regional economy between 2002 and 2006. Currently, there is not a hatchery program in Nason Creek, and there is no recreational or tribal fishery targeting natural-origin Nason Creek spring Chinook salmon. However, these fish are likely intercepted in the mainstem Columbia River mixed-stock fisheries.

3.8. Cultural Resources

Impacts on cultural resources typically occur when an action disrupts or destroys cultural artifacts, or would disrupt cultural use of natural resources or disrupt cultural practices. Hatchery programs have the potential to affect cultural resources if there is construction or expansion at the hatchery facilities that disrupts or destroys cultural artifacts or if the hatchery programs affect the ability of Native American tribes to use salmon and steelhead in their cultural practices. No known cultural artifacts or sites exist within the project area.

Salmon represent an important cultural resource to Native American Tribes in the Northwest. Salmon are regularly eaten by individuals and families, and served at gatherings of elders and to guests at feasts and traditional dinners (NMFS 2005). It is a core symbol of tribal identity,

individual identity, and the ability of Native American cultures to endure (NMFS 2005). The survival and well-being of salmon is seen as inextricably linked to the survival and well-being of Native American people and the cultures of the tribes (NMFS 2005).

Currently, natural-origin Nason Creek spring Chinook salmon may be intercepted by tribal fisheries in the Columbia River mainstem. There are no tribal fisheries that target Nason Creek spring Chinook salmon in the Wenatchee River or in Nason Creek. However, tribal fisheries in mixed stock areas (e.g., the Zone 6 fishery in the mainstem Columbia River) are limited because of impacts on listed stocks, including Upper Columbia River spring Chinook salmon. There is not currently a hatchery program propagating Nason Creek spring Chinook salmon.

3.9. Noise

Hatchery facilities have the potential to create minor amounts of noise from light vehicle traffic, human activity onsite, operation of pumps, and periodic use of generators during electrical outages. There is currently ongoing noise associated with the operation of the Eastbank Hatchery. This noise has been ongoing since the construction of the hatchery facility in 1989, but is not expected to be distinguishable from noise associated with the operation of Rocky Reach Dam, which is adjacent to Eastbank Hatchery (Figure 1).

The Nason Creek Acclimation Facility is currently not operating. The facility will be located in a rural area with existing background noise associated with Highway 2 and a railroad.

There are no Federal regulations applicable to noise generated by the Proposed Action. Washington has not established state-wide regulations limiting noise emissions from commercial facilities. Similarly, Chelan County, the only county in the action area (Subsection 1.4, Action Area), has not established a noise control ordinance that limits noise emissions from commercial facilities. However, Chelan County has approved a noise ordinance that states it is unlawful to create “loud, raucous, repetitive or continuous sounds that exceed a reasonable person standard so as to disturb or interfere with the peace, comfort, or repose of another.”

3.10. Aesthetics and Recreational Value

Hatchery programs may affect aesthetics if they lead to a physical alteration of the surrounding environment that would affect the human perception of the appearance in the area. Weirs installed to collect broodstock or manage returning hatchery-origin adults may affect the aesthetics or wild and scenic character of a river. The stretch of Nason Creek above Whitepine Creek (RM 14.6), over 5 miles upstream of the Nason Creek Acclimation Facility, has been proposed by the U.S. Forest Service as eligible for wild and scenic designation (Subsection 1.5.12, Wild and Scenic Rivers Act).

Nason Creek is a destination for kayaking, rafting, and canoeing. However, the lower section of Nason Creek is rarely floated because this segment has many mandatory portages around logjams (Wenatchee Outdoors 2013). If needed, Grant PUD has proposed to install a weir in the lower section of Nason Creek (river-mile 2).

3.11. Environmental Justice

This section was prepared in compliance with Presidential Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (EO 12898), dated February 11, 1994, and Title VI of the Civil Rights Act of 1964.

Executive Order 12898 (59 FR 7629) states that Federal agencies shall identify and address, as appropriate "…disproportionately high and adverse human health or environmental effects of [their] programs, policies and activities on minority populations and low-income populations…." While there are many economic, social, and cultural elements that influence the viability and location of such populations and their communities, certainly the development, implementation and enforcement of environmental laws, regulations and policies can have impacts. Therefore, Federal agencies, including NMFS, must ensure fair treatment, equal protection, and meaningful involvement for minority populations and low-income populations as they develop and apply the laws under their jurisdiction.

Both EO 12898 and Title VI address persons belonging to the following target populations:

- Minority – all people of the following origins: Black, Asian, American Indian and Alaskan Native, Native Hawaiian or Other Pacific Islander, and Hispanic[6]
- Low income – persons whose household income is at or below the U.S. Department of Health and Human Services poverty guidelines.

Definitions of minority and low income areas were established on the basis of the Council on Environmental Quality's (CEQ's) *Environmental Justice Guidance under the National Environmental Policy Act* of December 10, 1997. CEQ's *Guidance* states that "minority populations should be identified where either (a) the minority population of the affected area exceeds 50 percent or (b) the population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographical analysis." The CEQ further adds that "[t]he selection of the appropriate unit of geographical analysis may be a governing body's jurisdiction, a neighborhood, a census tract, or other similar unit that is chosen so as not to artificially dilute or inflate the affected minority population."

The CEQ guidelines do not specifically state the percentage considered meaningful in the case of low-income populations. For this EA, the assumptions set forth in the CEQ guidelines for identifying and evaluating impacts on minority populations are used to identify and evaluate impacts on low-income populations. More specifically, potential environmental justice impacts are assumed to occur in an area if the percentage of minority, per capita income, and percentage below poverty level are meaningfully greater than the percentage of minority, per capita income, and percentage below poverty level in Washington State.

The entire Nason Creek Basin and all hatchery facilities that would support a Nason Creek spring Chinook salmon hatchery program are located in Chelan County, Washington (Subsection

[6] Hispanic is an ethnic and cultural identity and is not the same as race.

1.4, Action Area). Therefore, Chelan County is the only county that would be meaningfully affected by the Nason Creek spring Chinook salmon hatchery program. Chelan County is an environmental justice community of concern because 26.5 percent of the population is of Hispanic or Latino origin, compared to 11.6 percent for the state as a whole (Table 9). Additionally, per-capita income (2007-2011) was $24,944, compared to $30,481 for the state as a whole (Table 9).

Table 9. Percentage minority, per-capita income, and percentage below poverty level in Chelan County and Washington State.

Indicator	Chelan County	Washington State
Black (percent in 2011)	0.5	3.8
American Indian (percent in 2011)	1.6	1.8
Asian (percent in 2011)	1.0	7.5
Pacific Islanders (percent in 2011)	0.2	0.7
Hispanic or Latino origin (percent in 2011)	26.5	11.6
Per capita income (2007-2011)	$24,944	$30,481
Below poverty level (percent in 2006-2010)	12.6	12.5

Shading of cells represents values that meaningfully exceed (greater than 10 percent) those of the reference population, making them environmental justice communities of concern.
Source: http://quickfacts.census.gov/qfd/states/53/53009.html

EPA guidance regarding environmental justice extends beyond statistical threshold analyses to consider explicit environmental justice effects on Native American tribes (EPA 1998). Federal duties under the Environmental Justice Executive Order, the presidential directive on government-to-government relations, and the trust responsibility to Indian tribes may merge when the action proposed by another Federal agency or the EPA potentially affects the natural or physical environment of a tribe. The natural or physical environment of a tribe may include resources reserved by treaty or lands held in trust; sites of special cultural, religious, or archaeological importance, such as sites protected under the National Historic Preservation Act or the Native American Graves Protection and Repatriation Act; and other areas reserved for hunting, fishing, and gathering (usual and accustomed, which may include “ceded” lands that are not within reservation boundaries). Potential effects of concern may include ecological, cultural, human health, economic, or social impacts when those impacts are interrelated to impacts on the natural or physical environment (EPA 1998).

There are two federally-recognized tribes with noted interest in the Nason Creek spring Chinook salmon hatchery programs: the Confederated Tribes and Bands of the Yakama Nation and the Confederated Tribes of the Colville Reservation. Both are members of the Priest Rapids Coordinating Committee, which approves all changes to hatchery operations that are tied to the FERC license for the Priest Rapids hydroelectric dam, including changes that would be made to the Nason Creek spring Chinook salmon hatchery program.

4. ENVIRONMENTAL CONSEQUENCES

4.1. Introduction

The two alternatives being evaluated in this EA are described in Section 2, Alternatives Including the Proposed Action, and are summarized below. The baseline conditions for the 10 resources (water quantity; water quality; salmon, steelhead, and their habitat; other fish and their habitat; wildlife; socioeconomics; environmental justice; cultural resources; noise; and aesthetics and recreational value) that may be affected by the Proposed Action and its alternative are described in Section 3, Affected Environment. This section provides an analysis of the direct and indirect environmental effects associated with the alternatives on these 10 resources. Cumulative effects are presented in Section 5, Cumulative Effects.

Where applicable, the relative magnitude of impacts is described using the following terms:

Undetectable	The impact would not be detectable.
Negligible	The impact would be at the lower levels of detection.
Low	The impact would be slight, but detectable.
Medium	The impact would be readily apparent.
High	The impact would be severe.

4.2. Alternative 1 (No Action) – Do Not Issue a Section 10(a)(1)(A) Permit

Under Alternative 1 (No Action), NMFS would not issue a section 10(a)(1)(A) permit to the applicants for the Nason Creek hatchery program; therefore, as under baseline conditions, the Nason Creek hatchery program would not operate. Under Alternative 1, no broodstock would be collected, held, spawned, incubated, reared, or released for the proposed Nason Creek spring Chinook salmon hatchery program. Further, no hatchery-origin adults from the Nason Creek spring Chinook salmon hatchery program would be outplanted.

Under Alternative 1, the proposed weir and trap on Nason Creek would not be needed, and the proposed adult management of hatchery-origin Nason River spring Chinook salmon would not be applicable. Likewise, both the proposed monitoring and evaluation activities to determine the effects of the proposed hatchery program and implementation of Best Management Practices (BMPs) would no longer be applicable. The only difference between Alternative 1 and baseline conditions (Section 3, Affected Environment) would be that under Alternative 1, the applicants would likely stop monitoring water quality in Nason Creek adjacent to the Nason Creek Acclimation Facility since additional baseline data would not be needed (Subsection 4.2, Water Quantity). Just like under baseline conditions, Eastbank Hatchery would be used to rear fish for other hatchery programs. Because Alternative 1 would not affect the condition of any resource relative to baseline conditions, Section 3, Affected Environment, fully describes the effects of Alternative 1. Accordingly, Section 4, Environmental Consequences, will focus on the effects of Alternative 2, the Proposed Action, compared to the effects of Alternative 1 (i.e., there is no additional analyses of potential effects under Alternative 1 as compared to baseline conditions).

4.3. Alternative 2 (Proposed Action) – Issue a Section 10(a)(1)(A) Permit

Under Alternative 2 (Proposed Action), NMFS would issue an ESA section 10(a)(1)(A) permit to WDFW and Grant PUD for operation of the proposed Nason Creek spring Chinook salmon hatchery program, and the Nason Creek spring Chinook hatchery program would be implemented as described in the submitted HGMP and addendum. Site-specific BMPs would be implemented. The proposed permit would authorize the following activities (Subsection 2.2, Alternative 2):

- Collection of adult spring Chinook salmon at Tumwater Dam
- Holding and identification of adult fish at Eastbank Hatchery
- Spawning, incubation, and early juvenile rearing at Eastbank Hatchery
- Marking of juvenile fish
- Overwinter acclimation of juvenile fish at the Nason Creek Acclimation Facility
- Release of up to 250,000 juvenile spring Chinook salmon into Nason Creek
- Adult management to minimize genetic and productivity impacts on natural-origin spring Chinook salmon and steelhead populations (e.g., through removal at Tumwater Dam, a Nason Creek weir and trap, or through a conservation fishery)
- Seasonal installation and operation of a floating Nason Creek weir and trap[7]
- Monitoring and evaluation activities (e.g., spawning ground surveys, broodstock sampling, hatchery juvenile sampling, smolt trapping, precocity sampling, tagging, genetic sampling, disease sampling, and snorkel surveys)
- Outplanting of returning adults that are in excess of what is needed for spawning or broodstock collection into minor spawning areas that have few to no adult spawners (e.g., Peshastin Creek)
- Outplanting of returning adults that are in excess of what is needed for spawning or broodstock collection for nutrient enhancement

4.3 Resource Analyses

The following resource sections analyze direct and indirect effects of Alternative 2 relative to Alternative 1(recall that conditions under Alternative 1 are described as the continuation of baseline conditions in Section 3, Affected Environment). Some resources will not be affected by certain activities included under the Proposed Action. For example, monitoring and evaluation activities may affect salmon and steelhead but would not reasonably be expected to affect water quantity. Therefore, in this situation, monitoring and evaluation activities are not discussed in the water quantity analyses. Table 10 lists each resource and the activities within the Proposed

[7] Although the Grant PUD and WDFW plan to collect broodstock at Tumwater Dam, they would like the option of collecting broodstock in Nason Creek also, which would require the installation and operation of a weir and fish trap at river-mile 2, upstream of the Nason Creek Campground (Table 2).

Action that may affect it. Further, each resource subsection in Section 3, Affected Environment, describes how, in general, hatchery programs may affect each particular resource.

Table 10. Resources potentially affected by activities under the Proposed Action (Subsection 2.2, Alternative 2).

	Water Quantity	Water Quality	Salmon, Steelhead, Bull Trout and their Habitat	Other fish and their habitat	Wildlife	Socio-economics and Env. Justice	Cultural Resources	Noise, Aesth., and Rec. Value
Collection of adult spring Chinook salmon at Tumwater Dam			X			X		
Holding and identification of adult fish at Eastbank Hatchery and transfer and release of non-target fish intercepted at Tumwater Dam	X	X	X			X		
Spawning, incubation, and early juvenile rearing at Eastbank Hatchery	X	X	X			X		
Marking of juvenile fish			X			X		
Overwinter acclimation of juvenile fish at the Nason Creek Acclimation Facility	X	X	X			X		

	Water Quantity	Water Quality	Salmon, Steelhead, Bull Trout and their Habitat	Other fish and their habitat	Wildlife	Socio-economics and Env. Justice	Cultural Resources	Noise, Aesth., and Rec. Value
Release of up to 250,000 juvenile spring Chinook salmon into Nason Creek			X	X	X	X		
Adult management to minimize genetic and productivity impacts on natural-origin spring Chinook salmon and steelhead populations[1]			X		X	X	X	
Seasonal installation and operation of a floating Nason Creek weir and trap		X	X	X	X	X	X	X
Monitoring and evaluation activities[2]			X	X		X		

	Water Quantity	Water Quality	Salmon, Steelhead, Bull Trout and their Habitat	Other fish and their habitat	Wildlife	Socio-economics and Env. Justice	Cultural Resources	Noise, Aesth., and Rec. Value
Outplanting of returning adults that are in excess of what is needed for spawning or broodstock collection into minor spawning areas that have few to no adult spawners (e.g., Peshastin Creek)			X	X	X	X		
Outplanting of returning adults that are in excess of what is needed for spawning or broodstock collection for nutrient enhancement			X	X	X	X		

[1] e.g., through removal at Tumwater Dam, a Nason Creek weir and trap, or through a conservation fishery

[2] e.g., spawning ground surveys, broodstock sampling, hatchery juvenile sampling, smolt trapping, precocity sampling, tagging, genetic sampling, disease sampling, and snorkel surveys

4.3.1. Water Quantity

Under Alternative 2, NMFS would issue a ESA section 10(a)(1)(A) permit to WDFW and Grant PUD for operation of the proposed Nason Creek spring Chinook salmon hatchery program, and the Nason Creek spring Chinook hatchery program would be implemented as described in the submitted HGMP and addendum. Eastbank Hatchery would be used to hold, identify, spawn, incubate, and partially rear Nason Creek spring Chinook salmon. However, because current production levels at Eastbank Hatchery would be reduced before being used to hold, identify, spawn, incubate, and partially rear Nason Creek spring Chinook salmon, no change to current groundwater use would be expected, and there would be no impacts on the Eastbank Aquifer relative to Alternative 1 (Subsection 3.2, Water Quantity). Like under Alternative 1, Eastbank Hatchery would continue to use 100 percent groundwater under Alternative 2, and all water would be withdrawn consistent with existing water rights to ensure that water removal does not impair instream flows or other water rights (Subsection 3.1, Water Quantity).

Under Alternative 2, the Nason Creek Acclimation Facility would be used for overwinter acclimation of juvenile fish, and it would use surface and groundwater. The Nason Creek Acclimation Facility would not operate under Alternative 1. The peak surface water use for the Nason Creek Acclimation Facility would be expected to be less than 10.2 cubic feet per second (GPUD 2011). Water use would peak in May just before juveniles were released, and it would be as low as 2 cubic feet per second in the summer (GPUD 2010). As described in Subsection 3.2, Water Quantity, Nason Creek has a minimum mean daily flow of 50 cubic feet per second (in September) and a maximum mean daily flow of 1120 cubic feet per second (in June). The percentage of water that would be diverted from Nason Creek between the acclimation facility's water intake and discharge structure would range from less than 1 percent in June and up to 11 percent in September (GPUD 2010). The effects of the surface water withdrawal would be partially mitigated through (1) the addition of groundwater (from wells) that would be discharged into Nason Creek, and (2) the small distance (less than 300 feet) between the water intake and outflow structures. Alternative 2 would not lead to any noticeable short- or long-term change in flow conditions within Nason Creek relative to Alternative 1. All water (included up to 800 gallons per minute from wells) would be removed in compliance with water removal permit conditions that avoid impairment to instream flows and other water rights. Consequently, Alternative 2 would have a negligible adverse effect on groundwater relative to Alternative 1. Effects would be localized and continue as long as the hatchery program operates.

4.3.2. Water Quality

Under Alternative 2, Eastbank Hatchery would be used to hold, identify, spawn, incubate, and partially rear Nason Creek spring Chinook salmon. The Nason Creek Acclimation Facility would be used to acclimate and release the fish. Current production levels at Eastbank Hatchery would be reduced before being used to hold, identify, spawn, incubate, and partially rear Nason Creek spring Chinook salmon, so there would be no change in the amount of ammonia, organic nitrogen, total phosphorus, biological oxygen demand, pH, suspended solids, antibiotics, fungicides, disinfectants, PCBs, DDT, fish disease pathogens, steroid hormones, anesthetics, pesticides, or herbicides released in the Eastbank Hatchery effluent. The Eastbank Hatchery would continue to operate in compliance with its NPDES permit, and there would be no change

in the 303(d) listing on the Columbia River near Eastbank Hatchery because Alternative 2 would not affect the temperature of the Columbia River relative to Alternative 1 (Table 2).

Under Alternative 2, the Nason Creek Acclimation Facility would be used for overwinter acclimation of juvenile fish, and it would use surface and groundwater. The Nason Creek Acclimation Facility would not operate under Alternative 1. Therefore, there may be a slight increase in the amount of in the amount of ammonia, organic nitrogen, total phosphorus, biological oxygen demand, pH, suspended solids, antibiotics, fungicides, disinfectants, PCBs, DDT, fish disease pathogens, steroid hormones, anesthetics, pesticides, or herbicides in the immediate vicinity of the water outflow structure from the Nason Creek Acclimation Facility compared to Alternative 1. However, the Nason Creek Acclimation Facility would operate consistent with the Statewide Upland Fin-Fish NPDES General Permit regarding effluent water quality and receiving water quality controls (Subsection 3.3, Water Quality). Baseline monitoring for nutrients has occurred at the acclimation site since 2009 and would be used for comparison with data collected during overwinter acclimation to ensure compliance with these standards (GPUD 2011).

Under Alternative 2, a Nason Creek fish weir and trap may be used to collect broodstock from Nason Creek, which would not be used under Alternative 1, and installation of the weir and trap would have the potential for a short-term, localized increase in sedimentation and disturbance to the stream substrate relative to Alternative 1 because the applicants would construct two anchors on either side of Nason Creek to which the weir would seasonally attach (Section 1.2, Description of the Proposed Action). However, the footprint of the weir and trap would be small, and all construction would be conducted within local, state, and Federal permit conditions, so impacts on water quality would be temporary and localized to the site of weir and trap installation. The zone of influence for water quality effects would not exceed a distance of 300 feet downstream of the location where the in-water work occurs consistent with Washington water quality standards (GPUD 2011).

The Nason Creek Acclimation facility would not operate during summer months when the temperature of Nason Creek rises to levels that have resulted in a 303(d) listing (Subsection 3.3, Water Quality). Consequently, Alternative 2 would not affect the 303(d) listing in Nason Creek relative to Alternative 1.

4.3.3. Salmon, Steelhead, Bull Trout, and their Habitat

Under Alternative 2, NMFS would issue an ESA section 10(a)(1)(A) permit to WDFW and Grant PUD for operation of the proposed Nason Creek spring Chinook salmon hatchery program, and the Nason Creek spring Chinook hatchery program would be implemented as described in the submitted HGMP and addendum. All of the activities under the Proposed Action have the potential to affect salmon, steelhead, bull trout, or their habitat (Table 10). The following analyzes potential effects on salmon, steelhead, bull trout, and their habitat under Alternative 2.

- Collection of adults at Tumwater Dam trap has the potential to delay or impede migration of salmon, steelhead, and bull trout. Adult spring Chinook salmon are collected at Tumwater Dam for other hatchery programs (i.e., the Chiwawa spring Chinook salmon

hatchery program), so the effects of any delays or impeded passage at Tumwater Dam are expected to be similar to those under Alternative 1.

- Holding, identifying, spawning, incubating, and early juvenile rearing, and marking at Eastbank Hatchery may lead to incidental mortalities on the ESA-listed spring Chinook salmon that are being propagated, which would not occur under Alternative 1. Total abundance of Nason Creek spring Chinook salmon would not be adversely affected relative to Alternative 1 because propagating fish within a hatchery facility produces more juveniles per adult than in the natural environment.

- Overwinter acclimation of Nason Creek Acclimation Facility may result in some incidental mortality of the ESA-listed spring Chinook salmon that are being propagated while they are being transported to the acclimation facility and during the acclimation and release of the fish. These effects would not occur under Alternative 1. Total abundance of Nason Creek spring Chinook salmon would not be adversely affected relative to Alternative 1 because propagating fish within a hatchery facility produces more juveniles per adult than in the natural environment.

- Release of up to 250,000 juvenile spring Chinook salmon into the Nason Creek may increase ecological interaction (e.g., competition and predation) with natural-origin spring Chinook salmon relative to Alternative 1. Competition and predation risks would be minimized by releasing hatchery-origin fish that are fully smolted and thus actively outmigrating from the system.

- The release of up to 250,000 juvenile fish may increase exposure of natural-origin spring Chinook salmon to disease relative to Alternative 1. Disease risks would be minimized by following established disease control protocols (GPUD 2011).

- The release of up to 250,000 juvenile spring Chinook salmon would benefit the population viability of Wenatchee River spring Chinook salmon relative to Alternative 1 by (1) increasing its spatial structure through adult outplants into minor spawning areas that have few or no adult spawners (e.g., Peshastin Creek), and (2) increasing the abundance of natural-origin spring Chinook in Nason Creek as hatchery-origin adults return to Nason Creek and spawn naturally. However, the proposed hatchery program has the potential to reduce genetic diversity and productivity of the population relative to Alternative 1. Genetic risks would be minimized by using native spring Chinook salmon, using large effective breeding size, collecting broodstock across the entire run-timing of the species, and applying proper broodstock selection and mating protocols (GPUD 2009). Additionally, the hatchery program would manage the number of returning adults that would be allowed to spawn naturally by removing fish at the Tumwater Dam, a Nason Creek weir and trap, or through conservation fisheries. Effects of the Proposed Action on productivity would be minimized using these same measures.

- The release of up to 250,000 juvenile spring Chinook salmon would not be expected to mask the status of the natural-origin spring Chinook salmon population, because all hatchery-origin fish released from the proposed hatchery program would be marked so that hatchery-origin fish could be differentiated from natural-origin fish.

- The release of up to 250,000 juvenile fish may change the character of the local spring Chinook salmon population, although genetic risks would be minimized by using native spring Chinook salmon in the hatchery, using large effective breeding size, collecting broodstock across the entire run-timing of the species, and applying proper broodstock selection and mating protocols (GPUD 2009). Additionally, the hatchery program would manage the number of returning adults that would be allowed to spawn naturally by removing fish at the Tumwater Dam, a Nason Creek weir and trap, or through conservation fisheries.

- If a conservation fishery is used to manage the number of adult hatchery-origin fish that spawn naturally, the fishery may lead to low levels of incidental mortality of natural-origin fish incidentally intercepted in the fishery. This adverse effect would not occur under Alternative 1.

- Seasonal installation and operation of a floating Nason Creek weir and trap would increase facility effects on salmon, steelhead, and bull trout relative to Alternative 1. Because the weir and trap would only be operated when adult spring Chinook return to Nason Creek and would not be operated 7 days a week or 24 hours a day during the migration period, migrational delays should be minimized, and monitoring and evaluation activities would occur to ensure that operation of the weir and trap is not leading to forced downstream spawning, isolation of formally connected populations, impingement of downstream migrating fish, or increased spawning by fish that do not pass the weir. The trap would be checked each day to reduce stress on fish from capture.

- Monitoring and evaluation activities may lead to mortality of ESA-listed fish during trapping or sampling. Most of these effects would not occur under Alternative 1 because they are directly applicable to the proposed hatchery program. Monitoring and evaluation activities may include spawning ground surveys, broodstock sampling, hatchery juvenile sampling, smolt trapping, precocity sampling, tagging, genetic sampling, disease sampling, and snorkel surveys (Subsection 2.2, Alternative 2). Sampling within the hatchery can lead to direct mortalities (e.g., genetic analysis, disease pathology, smolt condition) and incidental take (e.g., capture, sorting and handling). Monitoring and evaluation effects under Alternative 2 would not adversely affect the total abundance of Nason Creek spring Chinook salmon relative to Alternative 1 because propagating fish within a hatchery facility produces more juveniles per adult than in the natural environment.

- Outplanting of returning hatchery-origin spring Chinook salmon into minor spawning areas that have few or no adult spawners (e.g., Peshastin Creek) may increase the spatial structure of Wenatchee River spring Chinook salmon relative to Alternative 1.

- Outplanting returning adults for nutrient enhancement would benefit salmon, steelhead, and bull trout relative to Alternative 1 because freshwater systems are generally nutrient-limited and benefit from an influx of marine-derived nutrients (i.e., through the decomposition of a salmon carcass).

Although Nason Creek spring Chinook salmon and other salmon and steelhead in the Columbia River Basin may intermingle with non-listed Wenatchee River Basin salmon (e.g., summer/fall Chinook salmon and sockeye salmon) and other ESA-listed salmon and steelhead (e.g., Lower Columbia River Chinook salmon) while in the mainstem Columbia River and estuary, effects on these species would be low to negligible relative to Alternative 1 for the following reasons:

- The proposed hatchery programs are a small percentage of the total number of fish in the migration corridors and estuary. NMFS estimates that close to 126 million juvenile salmon and steelhead migrate through the Columbia River estuary (NMFS 2010). The proposed program would produce up to 250,000 juvenile Chinook salmon. Many of these fish would die before they reached the estuary (e.g., through predation), so less than 0.2 percent of the fish migrating through the estuary would be fish from the proposed Nason Creek spring Chinook salmon hatchery program, and they would be a similar proportion of the salmon and steelhead in the mainstem Columbia River migration corridor.

- The hatchery-origin spring Chinook salmon released from the Nason Creek hatchery program do not rear in the mainstem Wenatchee or mainstem Columbia rivers, and would only be in the mainstem rivers for a short time while actively outmigrating.

- Once in the estuary, hatchery-origin spring Chinook salmon from the Nason Creek hatchery program would migrate quickly into marine waters and, therefore, would not compete for food or space.

- The influence of density-dependent interactions on growth and survival outside of the action area is likely small compared with the effects of large-scale and regional environmental conditions (NMFS 2013).

Species-specific effects of Alternative 2 on ESA-listed salmon, steelhead, and bull trout are discussed below.

4.3.3.1. Upper Columbia River Spring-run Chinook Salmon (ESA-listed)

Nason Creek spring Chinook salmon are part of the Wenatchee River spring Chinook population, but studies have shown that Nason Creek spring Chinook salmon have a unique genetic structure and are, thus, considered a subpopulation (Subsection 3.4.1, Upper Columbia River spring-run Chinook Salmon). Therefore, the Nason Creek spring Chinook salmon hatchery program would be expected to preserve the genetic diversity of this subpopulation, which may not occur under Alternative 1. Furthermore, the Wenatchee River population is at high risk of extinction, and the Nason Creek spring Chinook salmon hatchery program would be expected to reduce the extinction risk of the Wenatchee River population relative to Alternative 1 by increasing population abundance and serving as a gene bank for the Nason Creek subpopulation. Although Upper Columbia River spring Chinook salmon may recover faster with implementation of the proposed hatchery program, Upper Columbia River spring Chinook salmon would continue to need protection under the ESA in the near-term.

As described in Subsection 3.4, Salmon, Steelhead, Bull Trout, and their Habitat, critical and essential fish habitat for Upper Columbia River spring-run Chinook salmon includes stream reaches where the hatchery facilities are located. Essential features of their habitat include adequate substrate (especially spawning gravel), water quality, water quantity, water temperature, water velocity, cover/shelter, food, riparian vegetation, space, and suitable migration conditions. Alternative 2 would have some adverse effects on water quantity and water quality relative to Alternative 1 (Subsection 4.2, Water Quantity; Subsection 4.3, Water Quality). Alternative 2 would also increase competition for space and food relative to Alternative 1 since under Alternative 2, there would be more fish in Nason Creek and the same amount of food and space.

Under Alternative 2, the applicants might install a weir and trap in Nason Creek to collect broodstock and/or manage the number of hatchery-origin fish on the spawning grounds if they are unable to effectively collect broodstock or manage returning adults at Tumwater Dam. The weir and trap would affect migration of returning spring Chinook salmon to Nason Creek and may have the following related consequences (Table 4):

- Limiting or slowing movement of migrating fish species, which may enable poaching or increase predation
- Alteration of stream flow
- Alteration of streambed and riparian habitat
- Alteration of the distribution of spawning within a population
- Increased mortality or stress due to capture and handling
- Forced downstream spawning by fish that do not pass the weir
- Increased straying due to either trapping adults that were not intending to spawn above the weir, or displacing adults into other tributaries

Potential adverse impacts would be partially mitigated though BMPs. The applicants would not operate the weir 7 days a week. Additionally, they would not operate the weir 24 hours a day. Therefore, the weir would be expected to have low adverse impacts on the migration of spring Chinook salmon relative to Alternative 1. The weir would be closely monitored consistent with ESA permit conditions to ensure adverse effects are low to negligible.

Under Alternative 2, broodstock for the Nason Creek spring Chinook salmon hatchery program would be collected at the Tumwater fish trap. During broodstock collection at Tumwater Dam, non-target spring Chinook salmon (e.g., White River, Little Wenatchee, or Upper Wenatchee River fish) would be collected, transported, and held at Eastbank for up to a week so that their origin could be determined. After identification, they would be returned to the Upper Wenatchee River Basin. Operation of the Tumwater fish trap has led to migrational delays[8] in the past, but impacts have been mitigated through changes in operational protocols beginning in 2011 (Section 3.4.1, Upper Columbia river Spring-run Chinook Salmon). These operation protocols

[8] Migrational delays slow the movement of adult salmon and steelhead when they are returning to spawn. Migrational delays may lead to pre-spawn mortality, forced downstream spawning, or increased straying.

would be in place during broodstock collection for the Nason Creek spring Chinook salmon hatchery program. Although some migrational delays would be expected under Alternative 2, these migrational delays would also be expected under Alternative 1 because the Tumwater fish trap would be operated under Alternative 1 to collect broodstock for other hatchery programs, intercept strays from the Leavenworth National Fish Hatchery program on Icicle Creek, and collect samples for a relative reproductive success study to support other hatchery programs and a relative reproductive effects study. As under Alternative 1, no other habitat features would be affected by Alternative 2.

4.3.3.1. Upper Columbia River Steelhead (ESA-listed)

All populations in the Upper Columbia River steelhead DPS are at high risk for extinction, including the Wenatchee River population (Subsection 3.4.1, Upper Columbia River Steelhead). Alternative 2 would increase the number of salmon in the Wenatchee River Basin, which may increase competition for food and space, but the effects on steelhead abundance and productivity would be undetectable compared to Alternative 1because of the small size of the proposed Nason Creek hatchery program, and (2) because spring Chinook released in Nason Creek would be actively migrating to the ocean instead of rearing in the Wenatchee River or in tributaries to the Wenatchee River where they may compete with natural-origin steelhead for food and space.

As described in Subsection 3.4, Salmon, Steelhead, Bull Trout, and their Habitat, critical and essential fish habitat for Upper Columbia River steelhead includes stream reaches where the hatchery facilities are located. Essential features of their habitat include adequate substrate (especially spawning gravel), water quality, water quantity, water temperature, water velocity, cover/shelter, food, riparian vegetation, space, and suitable migration conditions. Alternative 2 would have some adverse effects on water quantity and water quality relative to Alternative 1 (Subsection 4.2, Water Quantity; Subsection 4.3, Water Quality).

Under Alternative 2, the applicants may install a weir in Nason Creek to collect broodstock and/or manage the number of hatchery-origin fish on the spawning grounds, which would not be installed under Alternative 1. The weir would affect migration of returning steelhead to Nason Creek and may have the following related consequences (Table 4):

- Limiting or slowing movement of migrating fish species, which may enable poaching or increase predation
- Alteration of stream flow
- Alteration of streambed and riparian habitat
- Alteration of the distribution of spawning within a population
- Increased mortality or stress due to capture and handling
- Forced downstream spawning by fish that do not pass through the weir
- Increased straying due to either trapping adults that were not intending to spawn above the weir, or displacing adults into other tributaries

Potential adverse impacts would be partially mitigated though best management practices. The applicants would only operate the weir during spring Chinook salmon migration, which only partially overlaps with steelhead migration. The applicants would not operate the weir 7 days a week. Additionally, they would not operate the weir 24 hours a day. Therefore, the weir would be expected to have low adverse impacts on the migration of steelhead relative to Alternative 1. The weir would be closely monitored consistent with ESA permit conditions to ensure adverse effects are low to negligible.

Under Alternative 2, broodstock for the Nason Creek spring Chinook salmon hatchery program would be collected at the Tumwater fish trap. Operation of the Tumwater fish trap has led to migrational delays in the past, but impacts have been mitigated through changes in operational protocols beginning in 2011 (Subsection 3.4.1, Upper Columbia river Spring-run Chinook Salmon). These operation protocols would be in place during broodstock collection for the Nason Creek spring Chinook salmon hatchery program. Although some migrational delays would be expected under Alternative 2, these migrational delays would also be expected under Alternative 1 because the Tumwater fish trap would be operated under Alternative 1 to collect broodstock for other hatchery programs, intercept strays from the Leavenworth National Fish Hatchery program on Icicle Creek, and collect samples for a relative reproductive success study. As under Alternative 1, no other habitat features would be affected by Alternative 2.

4.3.3.2. Wenatchee Sockeye and Summer Chinook Salmon

Neither Wenatchee sockeye salmon nor summer Chinook salmon spawn in Nason Creek, but they may compete with Nason Creek spring Chinook salmon while in the mainstem Wenatchee River. Alternative 2 would increase the number of salmon in the Wenatchee River Basin, which may increase competition for food and space, but the effects on Wenatchee sockeye and summer Chinook salmon would be undetectable compared to Alternative 1 because of (1) the small production size of the proposed Nason Creek hatchery program would not be expected to lead to detectable increases in competition, and (2) because spring Chinook released in Nason Creek would be actively migrating to the ocean instead of rearing in the Wenatchee River or in tributaries to the Wenatchee River where they may compete with Wenatchee sockeye or summer Chinook salmon.

Under Alternative 2, the applicants may install a weir in Nason Creek to collect broodstock and/or manage the number of hatchery-origin fish on the spawning grounds, which would not be installed under Alternative 1. However, because Wenatchee sockeye and summer Chinook salmon do not spawn in Nason Creek (Subsection 3.4.3, Wenatchee Sockeye and Summer Chinook Salmon), they would not be affected by the weir.

Under Alternative 2, broodstock for the Nason Creek spring Chinook salmon hatchery program would be collected at the Tumwater fish trap. Operation of the Tumwater fish trap has led to migrational delays in the past, especially during extremely low flow conditions, collaborative efforts have improved passage at Tumwater Dam in recent years (Subsection 3.4.3, Upper Columbia River Spring-run Chinook Salmon). Although some migrational delays would be expected under Alternative 2, these migrational delays would also be expected under Alternative 1 because the Tumwater fish trap would be operated under Alternative 1 to collect broodstock for other hatchery programs, intercept strays from the Leavenworth National Fish Hatchery

program on Icicle Creek, and collect samples for a relative reproductive success study. As under Alternative 1, no other habitat features would be affected by Alternative 2.

4.3.3.3. Bull Trout (ESA-listed)

Bull trout are a substantial predator of juvenile salmon and steelhead (Subsection 3.4.3, Bull Trout). Alternative 2 would increase the total number of juvenile salmon in the analysis area, which would benefit bull trout by increasing the amount of food for adult bull trout relative to Alternative 1. However, because juvenile bull trout compete with juvenile salmon (Subsection 3.4.3, Bull Trout), juvenile bull trout may be adversely affected under Alternative 2 relative to Alternative 1 because there would be more juvenile fish competing for food and space.

Under Alternative 2, the applicants may install a weir in Nason Creek to collect broodstock and/or manage the number of hatchery-origin fish on the spawning grounds, which would not be installed under Alternative 1. The weir would affect migration of bull trout in Nason Creek and may have the following related consequences (Table 4):

- Limiting or slowing movement of migrating fish species, which may enable poaching or increase predation
- Alteration of stream flow
- Alteration of streambed and riparian habitat
- Alteration of the distribution of spawning within a population
- Increased mortality or stress due to capture and handling
- Forced downstream spawning by fish that do not pass through the weir
- Increased straying due to either trapping adults that were not intending to spawn above the weir, or displacing adults into other tributaries

Potential adverse impacts would be partially mitigated though best management practices. The applicants would only operate the weir during spring Chinook salmon migration. The applicants would not operate the weir 7 days a week. Additionally, they would not operate the weir 24 hours a day. Therefore, the weir would be expected to have low adverse impacts on bull trout relative to Alternative 1. The weir would be closely monitored consistent with ESA permit conditions to ensure adverse effects are low to negligible.

Under Alternative 2, broodstock for the Nason Creek spring Chinook salmon hatchery program would be collected at the Tumwater fish trap. Operation of the Tumwater fish trap has led to passage delays in the past (Section 3.4.4, Bull Trout). These passage delays would continue under Alternative 2 and would be identical to passage delays under Alternative 1 because the Tumwater fish trap would be operated under Alternative 1 to collect broodstock for other hatchery programs, intercept strays from the Leavenworth National Fish Hatchery program on Icicle Creek, and collect samples for a relative reproductive success study. As under Alternative 1, no other bull trout habitat features would be affected by Alternative 2 including water temperatures, water quality, and flow conditions (Subsection 3.4.4, Bull Trout).

4.3.4. Other Fish Species and Their Habitats

Alternative 2 would increase the number of juvenile and spring Chinook salmon in the Wenatchee River Basin relative to Alternative 1, which would increase competition for space and food among freshwater species relative to Alternative 1 (Subsection 3.5, Other Fish Species and Their Habitats). Similarly, increasing the number of adult spring Chinook salmon in the Wenatchee River Basin would increase the number of predators on lamprey, margined sculpin, trout, rockfish, and forage fish relative to baseline conditions (Subsection 3.5, Other Fish Species and Their Habitats). Additionally, Alternative 2 would increase the number of carcasses in the Wenatchee River Basin relative to Alternative 1, which would increase the amount of marine-derived nutrients and have a low, beneficial impact on all freshwater fish species relative to Alternative 1.

Lamprey, margined sculpin, northern pikeminnow, trout, and rockfish are known to feed on salmon species (Subsection 3.5, Other Fish Species and Their Habitats). However, because Alternative 2 would increase the number of salmon and steelhead produced in the Columbia River Basin by less than 0.5 percent relative to Alternative 1 (Subsection 4.3.3, Salmon, Steelhead, Bull Trout, and Their Habitat), and because none of these species feed exclusively on salmon, Alternative 2 would be expected to have an undetectable effect on lamprey, margined sculpin, northern pikeminnow, trout, and rockfish distribution or survival.

Alternative 2 would not be expected to change any state or Federal species designations, state or Federal species of concern or listings (Subsection 3.5, Other Fish Species and Their Habitats) relative to Alternative 1 because (1) the analysis area is only a small portion of each species range (Subsection 3.5, Other Fish Species and Their Habitats), (2) Alternative 2 would increase the number of hatchery-origin salmon in the Columbia River Basin by less than 1 percent, and (3) salmon and steelhead are not exclusive predators or prey for any of the fish species.

Under Alternative 2, the applicants might install and operate a weir in Nason Creek. However, pickets would be spaced far enough apart to allow passage of non-salmonid fish species, so negligible effects would be expected relative to Alternative 1 (i.e., no expected impingement or prevention of passage).

Under Alternative 2, broodstock for the Nason Creek spring Chinook salmon hatchery program would be collected at the Tumwater fish trap. During operation, the fish trap may isolate formally connected populations of fish (Subsection 3.5, Other Fish Species and their Habitats). These effects would be identical to effects under Alternative 1 because the Tumwater fish trap would be operated under Alternative 1 to collect broodstock for hatchery programs, intercept strays from the Leavenworth National Fish Hatchery program on Icicle Creek, and collect samples for a relative reproductive success study. As under Alternative 1, no other habitat features would be affected by Alternative 2.

4.3.5. Wildlife

Under Alternative 2, NMFS would issue an ESA Section 10(a)(1)(A) permit to WDFW and Grant PUD for operation of the proposed Nason Creek spring Chinook salmon hatchery program, and the Nason Creek spring Chinook salmon hatchery program would be implemented

as described in the submitted HGMP and addendum. Consequently, relative to Alternative 1, more spring Chinook salmon (juvenile and adult) would be available as a food source for predators and scavengers that use salmon as a food source, including federally listed grizzly bear, southern resident killer whale, and Steller sea lion (Subsection 3.6, Wildlife).

Steller sea lions and California sea lions are known to feed on adult salmon returning to the Columbia River Basin downstream of Bonneville Dam. Upper Columbia River spring Chinook salmon migration coincides with the presence of sea lions below Bonneville Dam, and sea lions may intercept spring Chinook salmon, which would be expected to include some small number of fish originating from Nason Creek (Subsection 3.6, Wildlife). Consequently, Alternative 2 would increase the number of salmon and steelhead available to Steller sea lions and California sea lions in the vicinity downstream of Bonneville Dam relative to Alternative 1. However, because Alternative 2 would only lead to a small increase in the total number of salmon and steelhead migrating past Bonneville Dam while the sea lions are present, Alternative 2 is not expected to change sea lion diet, survival, or distribution relative to Alternative 1.

Southern resident killer whales also feed on adult salmon, and prefer Chinook salmon (Hanson et al. 2010). However, because southern resident killer whales have limited spatial overlap with Upper Columbia River spring Chinook salmon, few Upper Columbia River Chinook salmon (and even fewer Nason Creek spring Chinook salmon) are likely to be eaten by southern resident killer whales (Subsection 3.6, Wildlife). Consequently, Alternative 2 would not be expected to change the diet, survival, or distribution of southern resident killer whales relative to Alternative 1.

Alternative 2 would increase the number of juvenile salmon as a food source for bird populations over what would be available under Alternative 1. However, because Alternative 2 would increase the total number of juvenile hatchery-origin salmon by less than 0.5 percent (Section 4.3.3, Salmon, Steelhead, Bull Trout, and their Habitat), it would not be expected to change the diet, survival, or distribution of Caspian terns, cormorants, or other bird populations relative to Alternative 1.

If the Nason Creek weir and fish trap are operated under Alternative 2, there would be potential for wildlife to become entrapped in the weir and drown. However, the likelihood of this occurring would be expected to be low based on low wildlife mortalities at other weirs (Subsection 3.6, Wildlife). Therefore, low adverse effects on wildlife would be expected from installing and operating the Nason Creek weir.

4.3.6. Socioeconomics

Under Alternative 2, NMFS would issue an ESA section 10(a)(1)(A) permit to WDFW and Grant PUD for operation of the proposed Nason Creek spring Chinook salmon hatchery program, and the Nason Creek spring Chinook hatchery program would be implemented as described in the submitted HGMP and addendum. All activities associated with the proposed hatchery program (i.e., broodstock collection, spawning, incubation, rearing, and release of fish) would generate economic activity by providing employment opportunities and through the local procurement of goods and services. Consequently, Alternative 2 would increase personal income and employment in the analysis area relative to Alternative 1. Annual operation of the

Nason Creek spring Chinook hatchery program would be expected to contribute over $1.2 million (through the procurement of local goods and services), two full-time jobs, and two to three seasonal jobs to the regional economy (J. Pyper, pers. comm., Grant PUD, Manager, March 28, 2013). These increases would be in addition to the $7 million contributed annually from Columbia River Basin hatchery operations in personal income and 139 jobs to the Upper Columbia River regional economy between 2002 and 2006 (NMFS 2010) (Subsection 3.7, Socioeconomics).

Under Alternative 2, a conservation fishery would be used in the Wenatchee River to manage the number of hatchery-origin fish spawning naturally in Nason Creek, and there may be an increase in economic value relative to Alternative 1 from the purchase of fishing gear, camping equipment, consumables, licenses, and fuel for this fishery.

The Nason Creek spring Chinook salmon hatchery program would be expected to reduce the extinction risk of Wenatchee River spring Chinook salmon, which may allow the Upper Columbia River ESU to recovery more quickly than under Alternative 1. Consequently, while the eventual success of recovery efforts in the ESU would require increased viability of many other components of the ESU, Alternative 2 may, in the long-term, help increase the number of fish that can be sustainably harvested in mainstem mixed-stock fisheries (e.g., Zone 6 fisheries in the mainstem Columbia River) as the ESU recovers. Therefore, in the long-term, Alternative 2 may lead to an increase in economic value relative to Alternative 1 from the purchase of fishing gear, camping equipment, consumables, licenses, and fuel. Additional economic value may accumulate through the sale of fish.

4.3.7. Cultural Resources

Under Alternative 2, NMFS would issue an ESA section 10(a)(1)(A) permit to WDFW and Grant PUD for operation of the proposed Nason Creek spring Chinook salmon hatchery program, and the Nason Creek spring Chinook hatchery program would be implemented as described in the submitted HGMP and addendum. Under Alternative 2, the applicants could install and operate a weir and fish trap in Nason Creek. If a weir is installed under Alternative 2, the applicants would construct two anchors on either side of Nason Creek to which the weir would seasonally attach (Section 1.2, Description of the Proposed Action; Subsection 4.3.2, Water Quality). Therefore, there is an increase in the potential for disrupting or destroying cultural artifacts relative to Alternative 1; however, no known cultural artifacts or sites are located within the action area. However, if any cultural artifacts were found while installing the anchors, construction would stop immediately.

Under Alternative 2, a conservation fishery would be used in the Lower Wenatchee River to manage the number of naturally spawning hatchery-origin spring Chinook salmon. Recreational anglers would participate in the conservation fishery, and there would no near-term changes to tribal fisheries under Alternative 2 relative to Alternative 1 (Subsection 3.8, Cultural Resources). However, the Nason Creek spring Chinook salmon hatchery program would be expected to reduce the extinction risk of Wenatchee River spring Chinook salmon, which may allow the Upper Columbia River ESU to recovery more quickly than under Alternative 1. Consequently, while the eventual success of recovery efforts in the ESU would require increased viability of many other components of the ESU, Alternative 2 may improve tribal access to spring Chinook

salmon for cultural practices in the future because the tribes would be able to sustainably harvest more fish in mixed-stock tribal fisheries (e.g., Zone 6 fisheries in the mainstem Columbia River) as the ESU recovers. Therefore, Alternative 2 may increase the well-being of tribal members in the future and better protect important aspects of tribal culture (e.g., eating salmon) relative to Alternative 1.

4.3.8. Noise

Under Alternative 2, NMFS would issue an ESA section 10(a)(1)(A) permit to WDFW and Grant PUD for operation of the proposed Nason Creek spring Chinook salmon hatchery program, and the Nason Creek spring Chinook hatchery program would be implemented as described in the submitted HGMP and addendum. The hatchery program would use the Eastbank Hatchery and the Nason Creek Acclimation Facility to propagate fish. Since the Eastbank Hatchery has been operation since 1989, and no new activities would occur at the hatchery under Alternative 2 relative to Alternative 1, this alternative would not affect the amount of noise generated by the Eastbank Hatchery relative to Alternative 1.

Operating the Nason Creek Acclimation Facility would generate minor amounts of noise from light vehicle traffic, human activity at the site, operation of pumps, and periodic use of generators during electrical outages (GPUD 2011). Due to the lack of development in the area and vegetation conditions, it is expected that the operational noise would become indistinguishable from ambient noise levels approximately 2,000 feet from the acclimation facility (GPUD 2011). A quarry, a railroad, a highway, a highway rest stop, and five houses are within 2,000 feet of the acclimation facility. Therefore, low, long-term adverse effects would be expected under Alternative 2 relative to Alternative 1.

Like Alternative 1, Alternative 2 would not be expected to violate Chelan County's noise ordinance since the Nason Creek Acclimation Facility would not be expected to create "loud, raucous, repetitive or continuous sounds that exceed a reasonable person standard so as to disturb or interfere with the peace, comfort, or repose of another" (Subsection 3.10, Noise).

4.3.9. Aesthetics and Recreational Value

Under Alternative 2, NMFS would issue an ESA section 10(a)(1)(A) permit to WDFW and Grant PUD for operation of the proposed Nason Creek spring Chinook salmon hatchery program, and the Nason Creek spring Chinook hatchery program would be implemented as described in the submitted HGMP and addendum. There would be no physical changes at Eastbank Hatchery that would have the potential to affect aesthetics or recreational value in the analysis area.

Under Alternative 2, the applicants may install a weir and fish trap in Nason Creek. Weirs can affect the aesthetics of a river. Although the weir would only be installed and operated during a few months when spring Chinook salmon adults would be returning to Nason Creek to spawn, the effects of the weir on aesthetics would be readily apparent during the months of operation relative to Alternative 1. The stretch of Nason Creek where the weir would be installed is not designated or eligible for wild and scenic designation under the Wild and Scenic Rivers Act (i.e., the potential weir site is nearly 13 miles downstream of Whitepine Creek), so there would be no

effect on the Wild and Scenic Rivers Act proposed eligibility designation of Nason Creek relative to Alternative 1.

If a weir is installed under Alternative 2, there may be an adverse impact on the recreational value of the lower stretch of Nason Creek for kayaking, rafting, and canoeing because boaters would need to portage around the weir. However, because the lower section of Nason Creek is rarely floated due to multiple mandatory portages around logjams (Wenatchee Outdoors 2013), the impact of Alternative 2 on the recreational value of the Lower Nason Creek would likely be at the lower level of detection relative to Alternative 1.

4.3.10. Environmental Justice

Under Alternative 2, NMFS would issue an ESA Section 10(a)(1)(A) permit to WDFW and Grant PUD for operation of the proposed Nason Creek spring Chinook salmon hatchery program, and the Nason Creek spring Chinook hatchery program would be implemented as described in the submitted HGMP and addendum.

As described in Subsection 3.11, Environmental Justice, Chelan County is the only county in the analysis area, and it is an environmental justice community of concern because it meaningfully exceeds thresholds for low income and minority populations (Table 9). Additionally, solely for purposes of environmental justice review, two Native American tribes (Confederated Tribes of the Colville Reservation and the Confederated Tribes and Bands of the Yakama Nation) have been identified as environmental justice communities of concern in the analysis area (Subsection 3.11, Environmental Justice). Because the entire affected area for the Proposed Action has been identified as minority or low income (Section 3.11, Environmental Justice), all effects under Alternative 2 described in Subsection 4.3.2 (Water Quantity) through Subsection 4.3.10 (Aesthetics and Recreational Value) would disproportionately impact minority and low income areas relative to impacts of the Proposed Action on the general population.

Under Alternative 2, the following ecological, cultural, economic, and social effects on environmental justice communities would be expected in both the short- and long-term:

- A small reduction in the amount of surface and ground water that would be available to environmental justice communities relative to Alternative 1 (Subsection 4.3.2, Water Quantity)
- A small reduction in water quality relative to Alternative 1 (Subsection 4.4.3, Water Quality)
- A gain of the local procurement of goods and services to support hatchery facilities relative to Alternative 1 (Subsection 4.3.7, Socioeconomics)
- A gain of two full-time jobs and two to three seasonal jobs in environmental justice communities relative to Alternative 1 (Subsection 4.3.7, Socioeconomics)
- Potentially more opportunity than under Alternative 1 for tribal members to engage in practices that are culturally, economically, and symbolically important to the tribes (Subsection 4.3.8, Cultural Resources)

- An increase in noise within 2,000 feet of the Nason Creek Acclimation Facility relative to Alternative 1 (Subsection 4.3.9, Noise)
- A minor reduction in the aesthetics and recreational value of Nason Creek relative to Alternative 1 (Subsection 4.3.10, Aesthetics and Recreational Value)

5. CUMULATIVE IMPACTS

5.1. Introduction

This section discusses the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7). The purpose of this assessment is to describe the additional impact of the hatchery programs in light of all the other impacts on ESA-listed fish and their habitats.

Section 3, Affected Environment, describes baseline conditions, which reflect the effects of past and existing actions (including hydropower, habitat loss, harvest, and hatchery production). Section 4, Environmental Consequences, evaluates the direct and indirect effects of the Proposed Action on baseline conditions. Section 5, Cumulative Effects, now considers any additional, incremental, cumulative impacts that may result from past, present, and reasonably foreseeable future actions and conditions within the vicinity of the analysis area.

5.2. Other Programs, Plans, and Policies

Other actions are expected to occur within the action area, the Puget Sound, or in the Pacific Ocean that would affect the fish populations considered under the Proposed Action. These include fishing activities that may incidentally intercept Upper Columbia River salmon and steelhead in the Pacific Ocean and habitat restoration actions identified under recovery plans (Subsection 1.5, Relationship to Other Plans, Regulations, Agreements, Laws, Secretarial Orders, and Executive Orders).

All future actions would be managed based on the impacts on ESA-listed salmon and steelhead. These fish are subjected to the cumulative effects of other hatchery programs, fisheries, and ocean conditions. Conservation efforts are in place to assist in salmon and steelhead recovery while providing for the operation of the proposed hatchery programs and to support treaty and non-treaty fisheries. Adjustments to fisheries and to the hatchery production levels and management actions would be done according to the abundance-based hatchery and harvest management frameworks that are, or likely will be, in place for these programs.

If the cumulative effects of salmon management efforts fail to provide for recovery of listed species, then any adverse impacts due to the hatchery programs and any fishing in the analysis area may be substantially diminished – if natural-origin salmon in this area decline in numbers, then hatchery production, which is tied to abundances, would be re-considered and potentially reduced or modified. Management of the hatchery programs and of fishing opportunity is only

one element of a large suite of regulations and environmental factors that may influence the overall health of listed salmon and steelhead populations and their habitat. The proposed hatchery programs are coordinated with monitoring so that hatchery managers can respond to changes in the status of affected listed species. Monitoring and adaptive management would help ensure that the affected ESA-listed species are adequately protected and would help mitigate potential for adverse cumulative impacts.

5.3. Climate Change

The climate is changing in the Pacific Northwest due to human activities, and this is affecting hydrologic patterns and water temperatures. Regionally averaged air temperature rose about 1.5°F over the past century (with some areas experiencing increases up to 4°F) and is projected to increase another 3°F to 10°F during this century. Increases in winter precipitation and decreases in summer precipitation are projected by many climate models, although these projections are less certain than those for temperature (USGCRP 2009).

Higher temperatures in the cool season (October through March) are likely to increase the percentage of precipitation falling as rain rather than snow, and to contribute to earlier snowmelt. The amount of snowpack measured on April 1, a key indicator of natural water storage available for the warm season, has already declined substantially throughout the region. The average decline in the Cascade Mountains, for example, was about 25 percent over the past 40 to 70 years, with most of this due to the 2.5°F increase in cool season temperatures over that period. Further declines in Northwest snowpack are likely due to additional warming this century, varying with latitude, elevation, and proximity to the coast. April 1 snowpack is likely to decline as much as 40 percent in the Cascades by the 2040s (USGCRP 2009).

High and base stream flows are likely to change with warming. Increasing winter rainfall is likely to increase winter flooding in some areas. Earlier snowmelt, and increased evaporation and water loss from vegetation, will increase stream flows during the warm season (April through September). In some sensitive watersheds, both increased flood risk in winter and increased drought risk in summer are likely due to warming of the climate (USGCRP 2009).

In areas where it snows, a warmer climate means major changes in the timing of runoff: increased stream flows during winter and early spring, and decreases in late spring, summer, and fall. Flow timing has shifted over the past 50 years, with the peak of spring runoff shifting from a few days earlier in some places to as much as 25 to 30 days earlier in others. This trend is likely to continue, with runoff shifting 20 to 40 days earlier within this century. Major shifts in the timing of runoff are not likely in areas dominated by rain rather than snow (ISAB 2007; USGCRP 2009).

Fish habitat changes due to climate change are likely to create a variety of challenges for ESA-listed species of fish. Higher winter stream flows can scour streambeds, damaging spawning redds and washing away incubating eggs (USGCRP 2009). Earlier peak stream flows could flush young salmon and steelhead from rivers to estuaries before they are physically mature enough for the transition, increasing a variety of stresses and the risk of predation (USGCRP 2009). Lower summer stream flows and warmer water temperatures will degrade summer

rearing conditions in many parts of the Pacific Northwest for a variety of salmon and steelhead species (USGCRP 2009), and are likely to reduce the survival of steelhead fry in streams with incubation in early summer. Other likely effects include alterations to migration patterns, accelerated embryo development, premature emergence of fry, and increased competition and predation risk from warm-water, non-native species (ISAB 2007). The increased prevalence and virulence of diseases and parasites that tend to tend to flourish in warmer water will further stress salmon and steelhead (USGCRP 2009). Overall, about one-third of the current habitat for the Pacific Northwest's coldwater fish may well no longer be suitable for them by the end of this century as key temperature thresholds are exceeded (USGCRP 2009).

Climate change is also likely to affect conditions in the Pacific Ocean. Historically, warm periods in the coastal Pacific Ocean have coincided with relatively low abundances of salmon and steelhead, while cooler ocean periods have coincided with relatively high abundances (USGCRP 2009). It is likely that, as ocean conditions change, abundances of salmon and steelhead will continue to change accordingly, resulting in changes in abundance of adults returning to freshwater to spawn.

While climate change may well have impacts on the abundance and/or distribution of ESA-listed salmonids that are considered under the Proposed Action, the hatchery program is directly responsive to observed fish abundance, and so, as abundances change, the hatchery program (e.g., broodstock take) would be adjusted accordingly. It is possible that, over a relatively long period, the hatchery program could moderate the effects of climate change – particularly those effects resulting in redd scouring, earlier flushing of juveniles, and increased water temperatures – because of the protective nature of holding fish in the hatchery.

6. AGENCIES CONSULTED

Public Utility District No. 2 of Grant County
Washington Department of Fish and Wildlife
Confederated Tribes and Bands of the Yakama Nation
Confederated Tribes of the Colville Reservation

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8. FINDING OF NO SIGNIFICANT IMPACT FOR NOAA'S ISSUANCE OF AN ESA SECTION 10(a)(1)(A) PERMIT FOR OPERATION OF THE NASON CREEK SPRING CHINOOK SALMON HATCHERY PROGRAM

National Oceanic and Atmospheric Administration Administrative Order 216-6 (NAO 216-6) (May 20, 1999) contains criteria for determining the significance of the impacts of a Proposed Action. In addition, the Council on Environmental Quality regulations at 40 C.F.R. 1508.27 states that the significance of an action should be analyzed both in terms of "context" and "intensity." Each criterion listed below is relevant in making a finding of no significant impact and has been considered individually, as well as in combination with the others.

A Hatchery and Genetic Management Plans (HGMP) was submitted by the Washington Department of Fish and Wildlife (WDFW) and the Public Utility District No. 2 of Grant County (Grant PUD) for an ESA permit to operate the Nason Creek spring Chinook salmon hatchery program. Issuance of an ESA permit for the proposed hatchery program may potentially affect the ESA-listed Upper Columbia River spring Chinook salmon Evolutionarily Significant Unit (ESU) and the Upper Columbia River steelhead Distinct Population Segments (DPS).

Can the Proposed Action reasonably be expected to jeopardize the sustainability of any target species?

The proposed hatchery program intends to produce hatchery-origin spring Chinook salmon. This is the target species. Adverse impacts on this species are expected to be negligible to low, as described below:

- Collection of adults at Tumwater Dam trap has the potential to delay or impede migration of spring Chinook salmon. Adult spring Chinook salmon would be collected at Tumwater Dam for other hatchery programs (i.e., the Chiwawa spring Chinook salmon hatchery program), so the effects of any delays or impeded passage at Tumwater Dam would be similar as under current conditions.
- Holding, identifying, spawning, incubating, early juvenile rearing, and marking at Eastbank Hatchery may lead to incidental mortalities of the ESA-listed spring Chinook salmon that are being propagated, but total abundance of Nason Creek spring Chinook salmon would not be adversely affected because propagating fish within a hatchery facility produces more juveniles per adult than in the natural environment.
- Release of up to 250,000 juvenile spring Chinook salmon into the Nason Creek may increase ecological interaction (e.g., competition and predation) with natural-origin spring Chinook salmon. Competition and predation risks would be minimized by releasing hatchery-origin fish that are fully smolted and thus actively outmigrating from the system.
- The release of up to 250,000 juvenile fish may increase exposure of natural-origin spring Chinook salmon to disease. Disease risks would be minimized by established disease control protocols (GPUD 2012).
- The release of up to 250,000 juvenile spring Chinook salmon would benefit the population viability of Wenatchee River spring Chinook salmon relative to Alternative 1

by (1) increasing its spatial structure through adult outplants into minor spawning areas that have few or no adult spawners (e.g., Peshastin Creek), and (2) increasing the abundance of natural-origin spring Chinook in Nason Creek as hatchery-origin adults return to Nason Creek and spawn naturally.

- The proposed hatchery program has the potential to reduce genetic diversity and productivity of the spring Chinook salmon population. Genetic risks would be minimized by using native spring Chinook salmon in the broodstock, using large effective breeding size, collecting broodstock across the entire run-timing of the species, and applying proper broodstock selection and mating protocols (GPUD 2009). No more than 33 percent of the combined natural-origin adult returns to the Nason Creek and the Chiwawa River would be used as broodstock to prevent mining of the natural-origin component of the population. The hatchery program would manage the number of returning adults that would be allowed to spawn naturally by removing fish at the Tumwater Dam, a Nason Creek weir and trap, or through conservation fisheries.
- The release of up to 250,000 juvenile spring Chinook salmon would not be expected to mask the status of the natural-origin spring Chinook salmon population, because all hatchery-origin fish released from the proposed hatchery program would be marked so that hatchery-origin fish could be differentiated from natural-origin fish.
- If a conservation fishery is used to manage the number of adult hatchery-origin fish that spawn naturally, the fishery may lead to low levels of incidental mortality of natural-origin fish incidentally intercepted in the fishery.
- Seasonal installation and operation of a floating Nason Creek weir and trap would increase potential adverse facility effects on spring Chinook salmon. Impacts would be minimized by only operating the trap when adult spring Chinook return to Nason Creek and operating the trap less than 7 days a week and less than 24 hours a day during the migration period. Monitoring and evaluation activities would occur to ensure that operation of the weir and trap is not forcing downstream spawning, isolation of formally connected populations, impingement of downstream migrating fish, or increased spawning by fish that do not pass the weir. The trap would be checked each day to reduce stress on fish from capture.
- Monitoring and evaluation activities may lead to mortality of spring Chinook salmon during trapping or sampling. Monitoring and evaluation activities may include spawning ground surveys, broodstock sampling, hatchery juvenile sampling, smolt trapping, precocity sampling, tagging, genetic sampling, disease sampling, and snorkel surveys. Sampling within the hatchery can lead to direct mortalities (e.g., genetic analysis, disease pathology, smolt condition) and incidental take (e.g., capture, sorting, and handling). Monitoring and evaluation effects would not adversely affect the total abundance of Nason Creek spring Chinook salmon because propagating fish within a hatchery facility produces more juveniles per adult than in the natural environment.
- Outplanting of returning hatchery-origin spring Chinook salmon into minor spawning areas that have few or no adult spawners (e.g., Peshastin Creek) may increase the spatial structure of Wenatchee River spring Chinook salmon.

- Outplanting returning adults for nutrient enhancement would benefit spring Chinook salmon because freshwater systems are generally nutrient-limited and benefit from an influx of marine-derived nutrients (i.e., through the decomposition of a salmon carcass).

Can the Proposed Action reasonably be expected to jeopardize the sustainability of any non-target species?

There would be some effects on non-target species from the proposed hatchery program. The proposed hatchery program may affect non-target species in Nason Creek in three ways: through obstruction or other behavioral effects of the structures required by the proposed program, through incidental impacts in fisheries targeting fish returning to the hatchery facilities, and through ecological interactions.

Fish: The proposed hatchery program is not expected to jeopardize the sustainability of any of these non-target species because (1) competition and predation risks would be minimized by releasing hatchery-origin fish that are fully smolted and thus actively outmigrating from the system; (2) disease risks would be minimized by following established disease control protocols; (3) the Nason Creek weir and trap would only be operated when adult spring Chinook salmon return to Nason Creek and would not be operated 7 days a week or 24 hours a day during the migration period; and (4) monitoring and evaluation activities would occur to ensure that operation of the weir and trap does not force downstream spawning, isolation of formally connected populations, impingement of downstream migrating fish, or increased spawning by fish that do not pass the weir.

NMFS has coordinated with the United States Fish and Wildlife Service (USFWS) for incidental take of bull trout and other listed species:

- For hatchery facilities, incidental take is authorized under the USFWS joint Biological Opinion for the White River and the Nason Creek Acclimation Facilities (USFWS 01E00000-2012-F-0029; Corps Reference: NWS-2011-416 and NWS-2011-838 for Grant County PUD No. 2; USFWS 2012).

- For hatchery operations, incidental take is authorized under the USFWS biological opinions relevant to HCP hatchery activities, and specifically to the hatchery programs as they relate to the Hydroelectric Project licenses (USFWS 2004; USFWS 2007; USFWS 2008a) . The HCP opinions are relevant to the Nason Creek hatchery program because Grant PUD and WDFW will be using Chelan PUD's facilities (i.e., Eastbank Hatchery and Tumwater Dam) in order to conduct the Nason Creek hatchery program.

- A conservation fishery that may be used to control the number of hatchery-origin spawning naturally would be implemented consistent with the USFWS's special 4(d) rule, and take of bull trout that may occur as a result of the conservation fishery would not be prohibited.

Avian and Terrestrial Wildlife: Avian and terrestrial wildlife are not expected to be harmed at the Nason Creek weir and trap since very few wildlife mortalities have been observed at weirs (J. Korth, pers. comm., WDFW, Regional Fish Manager, July 20, 2012). No habitat disruption is

expected from angler access since no new access points would be created. The proposed hatchery programs would be expected to increase the number of salmon and steelhead in Nason Creek, which would increase the food availability for salmon and steelhead predators and scavengers (e.g., bald eagles) and may have a low beneficial impact on these wildlife populations.

Can the Proposed Action reasonably be expected to cause substantial damage to ocean and coastal habitats and/or essential fish habitat as defined under the Magnuson-Stevens Act and identified in Fisheries Management Plans?

The proposed hatchery program would have little or no effect on ocean and coastal habitats and/or essential fish habitat for any fish species. Although essential fish habitat associated with the migration of salmon would be impacted by the operation of the Nason Creek weir, the impacts would be expected to be low because the trap would only be operated when adult spring Chinook salmon return to Nason Creek and would not operate 7 days a week or 24 hours a day during the migration period. Monitoring and evaluation activities would occur to ensure that operation of the weir and trap does not force downstream spawning, isolation of formally connected populations, impingement of downstream migrating fish, or increased spawning by fish that do not pass the weir. The trap would be checked each day to reduce stress on fish from capture. The proposed hatchery programs would provide small benefits to essential fish habitat by providing marine-derived nutrients through the decomposition of hatchery-origin salmon carcasses.

Can the Proposed Action be reasonably expected to have a substantial adverse impact on public health or safety?

The discharge of hatchery effluent could result in the release of chemicals into downstream receiving waters, which could pose a risk to human health if the downstream receiving waters become toxic. However, chemical concentrations downstream of hatcheries are usually well below levels toxic to fish and invertebrates (Boxall et al. 2004).

Under the proposed action, hatchery facility employees would follow Occupational Safety and Health Administration regulations and all safety precautions, including the use of personal protective equipment to protect themselves from chemicals and disease. Effluent monitoring would occur on a regularly scheduled basis to verify compliance with applicable water quality standards. Therefore, negligible adverse effects to human health would be expected from the proposed hatchery program.

Can the Proposed Action reasonably be expected to adversely affect endangered or threatened species, marine mammals, or critical habitat of the species?

The proposed hatchery program would result in minimal risks to ESA-listed spring Chinook salmon and steelhead as a result of genetic effects, competition and predation, facility effects, natural population status masking, incidental fishing effects, or disease transfer. The hatchery program would continue to benefit population viability and nutrient cycling.

The Tumwater trap and Nason Creek weir and trap may intercept or delay the passage of ESA-listed bull trout. Potential adverse impacts would be partially mitigated though best management practices. The traps would be closely monitored consistent with ESA permit conditions to ensure adverse effects are low to negligible.

Steller sea lions and California sea lions are known to feed on adult salmon returning to the Columbia River Basin downstream of Bonneville Dam. Upper Columbia River spring Chinook salmon migration coincides with the presence of sea lions below Bonneville Dam, and sea lions may intercept spring Chinook salmon, which would be expected to include some small number of fish originating from Nason Creek. Consequently, the proposed hatchery program would increase the number of salmon and steelhead available to Steller sea lions and California sea lions in the vicinity downstream of Bonneville Dam. However, because the proposed hatchery program would only lead to a small increase in the total number of salmon and steelhead migrating past Bonneville Dam while the sea lions are present, the proposed hatchery program is not expected to change sea lion diet, survival, or distribution.

Southern resident killer whales feed on adult salmon, and prefer Chinook salmon (Hanson et al. 2010). However, because southern resident killer whales have limited spatial overlap with Upper Columbia River spring Chinook salmon, few Upper Columbia River Chinook salmon (and even fewer Nason Creek spring Chinook salmon) are likely to be eaten by southern resident killer whales. Consequently, the proposed hatchery program would not be expected to change the diet, survival, or distribution of southern resident killer whales.

Designated critical habitat for the ESA-listed Upper Columbia River spring Chinook salmon, steelhead, and bull trout is within the affected area; however, all habitat impacts would be small under the proposed hatchery program as described in Section 4.0, Environmental Consequences, and are not considered significant. The Proposed Action would not impact critical habitat for sea lions or southern resident killer whales.

Can the Proposed Action be expected to have a substantial impact on biodiversity and/or ecosystem function within the affected area (e.g., benthic productivity, predator-prey relationships)?

The proposed hatchery program is not expected to have a substantial impact on biodiversity within the affected area. Although spring Chinook salmon produced in the proposed hatchery programs would interact with other species through predator/prey interactions, they would not be expected to affect biodiversity because the number of hatchery-origin salmon produced in the proposed hatchery programs would only represent a small portion of the total number of predator or prey species within the affected area.

Because the proposed hatchery program would contribute marine-derived nutrients to Nason Creek, the proposed hatchery program would be expected to improve ecosystem function within the affected area.

Are significant social or economic impacts interrelated with natural or physical environmental effects?

There are no significant social or economic impacts interrelated with the natural or physical environmental effects of the Proposed Action. Annual operation of the Nason Creek spring Chinook hatchery program would be expected to contribute over $1.2 million (through the procurement of local goods and services), two full-time jobs and two to three seasonal jobs to the regional economy. These socioeconomic benefits would be expected to have a negligible effect on the regional economy.

Are the effects on the quality of the human environment likely to be highly controversial?

The use of hatcheries can be controversial, and NMFS must carefully consider potential adverse effects of a hatchery program on listed fish. However, there is no known controversy surrounding the proposed Nason Creek hatchery program. No comment letters were received on the draft Environmental Assessment (EA) during the public comment period. NMFS takes this as an indication that the methodology and best available information used to analyzed effects are not "highly controversial" to the public.

Can the Proposed Action reasonably be expected to result in substantial impacts on unique areas, such as historic or cultural resources, park land, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas?

The proposed hatchery program is not expected to result in substantial impacts on unique areas, such as historical or cultural resources, park land, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas, because none of the proposed activities would occur in such areas. Designated critical habitat for the ESA-listed Upper Columbia River spring Chinook salmon and steelhead is within the affected area; however, all habitat impacts would be small under the proposed hatchery program as described in Section 4.0, Environmental Consequences, and are not considered significant.

Are the effects on the human environment likely to be highly uncertain or involve unique or unknown risks?

The effects on the human environment are not highly uncertain and do not involve unique or unknown risks. Although there are some uncertainties involved in the on-going operation of hatchery programs, the risks are understood, and the proposed hatchery program includes explicit steps to monitor and evaluate these uncertainties in a manner that allows timely adjustments to minimize or avoid adverse impacts. The proposed operation of the hatchery program is similar to other recent hatchery operations in many areas of the Pacific Northwest, and the procedures and effects are well known.

Is the Proposed Action related to other actions with individually insignificant, but cumulatively significant, impacts?

The cumulative impacts of the proposed hatchery program have been considered in the EA. The take of ESA-listed species will be limited to a level considered to result in a no-jeopardy ESA

determination when considering all existing conditions, all other permits, and other actions in the area affecting these conditions and permits. Monitoring and evaluation activities associated with the proposed hatchery program will ensure that these take levels are not exceeded. The proposed hatchery program is coordinated with monitoring so that fish managers can respond to changes in the status of affected listed species. If the cumulative effects of salmon management efforts fail to provide for recovery of listed species, adjustments to fisheries and to the hatchery production levels would likely be proposed.

The action is related to other hatchery production programs, many of which are guided by the same legal agreements, mitigation responsibilities, and managed by the same agencies. Though the action is related to those other activities, the affected environment considers many of the ongoing impacts associated with other programs such as water withdrawals and release numbers throughout the basin. Any cumulative impacts are not expected to rise to the level of significance.

Is the Proposed Action likely to adversely affect districts, sites, highways, structures, or objects listed or eligible for listing in the National Register of Historic Places or to cause loss or destruction of significant scientific, cultural, or historical resources?

The proposed hatchery program would not impact districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places. The proposed hatchery programs would not destroy or modify any scientific, cultural, or historical resources.

Can the Proposed Action reasonably be expected to result in the introduction or spread of non-indigenous species?

The proposed hatchery program would not result in the introduction or spread of a non-indigenous species because the proposed hatchery program is limited to production of spring Chinook salmon, which are indigenous to the Nason Creek. Although some non-indigenous fish species may benefit from the additional prey available from the hatchery production, the proposed hatchery program would not introduce new species or expand their current range.

Is the Proposed Action likely to establish a precedent for future actions with significant effects or represent a decision in principle about a future consideration?

The proposed hatchery program is not likely to establish a precedent for future actions with significant effects or to represent a decision in principle about a future consideration because the proposed hatchery program is similar in nature and scope to similar hatchery actions over the past several years. Other HGMPs involving captive breeding or supplementation in the Pacific Northwest (e.g., Snake River fall Chinook salmon and Hood Canal Summer Chum salmon hatchery programs) have been analyzed through similar ESA determinations and NEPA reviews. Like other similar hatchery programs already reviewed, implementation monitoring is a key element of the proposed hatchery program, which would inform co-managers of the effects of the program. The proposed hatchery program would support precedence already set for monitoring and adaptive management, which reduces any risk of significant effects occurring now or in the future.

Can the Proposed Action reasonably be expected to threaten a violation of Federal, state, or local law or requirements imposed for the protection of the environment?

The proposed hatchery program is not expected to threaten a violation of Federal, state, or local law or requirements imposed for the protection of the environment because the proposed hatchery program was developed in the broader context of recovery planning and implementation of the ESA. The proposed hatchery program would comply with other applicable local, state, and Federal laws. National Pollution Discharge Elimination System permits related to this action have been issued under Federal laws implemented by the states that are consistent with Federal and local laws related to environmental protection.

Can the Proposed Action reasonably be expected to result in cumulative adverse effects that could have a substantial effect on the target species or non-target species?

The proposed hatchery program would not result in substantial cumulative adverse effects on target or non-target species because the take of ESA-listed species would be limited to a maximum level considered to result in a no-jeopardy ESA determination when considering all existing fishery conditions, all other permits, and other actions in the area affecting these conditions and permits. The cumulative impacts of the proposed hatchery program have been considered in the EA and in the associated biological opinion (NMFS 2013).

8.1 List of Reviewers

- Kate Hawe, NWR NEPA Coordinator
- Christopher Fontecchio, General Counsel
- Robert Bayley, NWR Salmon Management Division QA/QC Coordinator

8.2 References

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8.3 Determination

In view of the information presented in the EA and analysis prepared for the proposed hatchery programs, it is hereby determined that issuance of an ESA Section 10 permit for the proposed

hatchery program will not significantly impact the quality of the human environment. In addition, all beneficial and adverse impacts of the proposed hatchery program have been considered in reaching a finding of no significant impact. Accordingly, preparation of an Environmental Impact Statement is not necessary to further analyze the potential for significant impacts resulting from issuance of a Section 10 permit by NMFS for the proposed hatchery programs.

Barry A. Thom, Deputy Regional Administrator
Northwest Region, NMFS

Date 7/2/2013