FINAL ~~DRAFT~~ SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT

Supplemental Environmental Assessment to Analyze Impacts of NOAA's National Marine Fisheries Service Determination that Five Hatchery Programs for Elwha River Salmon and Steelhead as Described in Joint State-Tribal Hatchery and Genetic Management Plans and One Tribal Harvest Plan Satisfy the Endangered Species Act Section 4(d) Rule

Prepared by the
National Marine Fisheries Service, West Coast Region

In Cooperation with the
National Park Service, Olympic National Park
and
Bureau of Indian Affairs, Northwest Region

December ~~June~~ 2014

Cover Sheet

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Title of Environmental Review:	Supplemental Environmental Assessment to Analyze Impacts of NOAA's National Marine Fisheries Service Determination that Five Hatchery Programs for Elwha River Salmon and Steelhead as Described in Joint State-Tribal Hatchery and Genetic Management Plans and One Tribal Harvest Plan satisfy the Endangered Species Act Section 4(d) Rule
Distinct Population Segments:	Puget Sound Chinook Salmon, Puget Sound Steelhead, and Southern Pacific Eulachon
Responsible Agency and Official:	Barry Thom Deputy Regional Administrator National Marine Fisheries Service West Coast Region 7600 Sand Point Way N.E., Building 1 Seattle, WA 98115
Contacts:	Allyson Purcell Sustainable Fisheries Division National Marine Fisheries Service West Coast Region 1201 NE Lloyd Blvd, Suite 1100 Portland, OR 97232
Legal Mandate:	Endangered Species Act of 1973, as amended and implemented – 50 CFR Part 223
Location of Proposed Activities:	Elwha River Basin, Washington
Activity Considered:	Endangered Species Act section 4(d) Rule determinations for five Hatchery Genetic Management Plans and one Tribal Harvest Plan

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Executive Summary

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

On August 1, 2012, NMFS received four HGMPs for hatchery programs in the Elwha River (LEKT 2012a; LEKT 2012b; LEKT 2012c; LEKT and WDFW 2012). On August 31, 2012, NMFS received one additional HGMP for hatchery programs in the Elwha River (WDFW 2012a). All five HGMPs were submitted pursuant to limit 6 of the 4(d) Rule. On August 27, 2012, The Lower Elwha Klallam Tribe submitted a tribal resource management plan for harvest (Tribal Harvest Plan) of Elwha River winter steelhead (LEKT 2012d). The Tribal Harvest Plan was submitted pursuant to the Tribal 4(d) Rule.

A Draft Environmental Assessment on the effects of the proposed plans was released for a 30-day public comment period on October 16, 2012 (77 FR 63294). A Final Environmental Assessment and a Finding of No Significant Impact were completed by NMFS on December 11, 2012.

A Draft Supplemental Environmental Assessment was prepared in response to the court order in *Wild Fish Conservancy, et al. v. National Park Service, et al.*, NO. C12-5109 BHS (W.D. Wash.), wherein the court held that, to be legally sufficient, the Environmental Assessment should either analyze in detail an alternative involving reduced releases of hatchery smolts, or adequately explain why such an alternative is unreasonable. Specifically, the court expressed concern that the alternatives in the 2012 Final Environmental Assessment did not adequately consider whether smaller-sized hatchery programs would result in fewer impacts to naturally-spawning salmonid species. The court also raised questions about how the alternatives fit the purpose and need. These concerns are addressed by the inclusion of a reduced release alternative and by additional clarifications in the Draft Supplemental Environmental Assessment.

The Draft Supplemental Environmental Assessment was released for a 30-day public comment period on June 20, 2014 (79 FR 35318). During the public comment period, NMFS received two comment letters on the Draft Supplemental Environmental Assessment.

The Final Supplemental Environmental Assessment reflects changes from the Draft Supplemental Environmental Assessment based on comments received. To assist the reader with identification of changes to the Final Supplemental Environmental Assessment, all new text is

indicated in redline/strikeout format to show changes from the Draft Supplemental Environmental Assessment, or includes a statement indicating the inclusion of new text. Comment letters and corresponding responses are located in Appendix A of this Final Supplemental Environmental Assessment.

Changes to the Draft Supplemental Environmental Assessment

The Final Supplemental Environmental Assessment reflects changes from the Draft Supplemental Environmental Assessment based on comments received as well as new information collected since the draft was published. All new text is indicated in redline/strikeout format to show changes from the Draft Supplemental Environmental Assessment, or includes a statement indicating the inclusion of new text, as described under this Executive Summary.

The following summarizes key changes to the Draft Supplemental Environmental Assessment:

- Additional information has been added on monitoring and evaluation techniques (Subsection 1.2, Description of Proposed Action, and Subsection 1.5.5, Monitoring and Adaptive Management for the Elwha Restoration Project).
- Additional sections have been added on the Man and Biosphere Program (Subsection 1.5.18, Man and Biosphere Program) and the World Heritage Convention (Subsection 1.5.19, World Heritage Convention).
- Additional information has been added on steelhead and coho salmon spawning in tributaries above the Elwha Dam (Subsection 3.4, Salmon and Steelhead).
- Citations have been added, and are reflected in Section 7, References.
- Comments received and subsequent responses have been added as Appendix A.

1. PURPOSE OF AND NEED FOR THE PROPOSED ACTION

1.1. Background

NOAA's National Marine Fisheries Service (NMFS) is the lead agency responsible for administering the Endangered Species Act (ESA) as it relates to listed salmon and steelhead. Actions that may affect listed species are reviewed by NMFS under section 7 or section 10 of the ESA or under section 4(d), which can be used to limit the application of take prohibitions described in section 9. NMFS issued a final rule pursuant to ESA section 4(d) (4(d) Rule), adopting regulations necessary and advisable to conserve threatened species (50 CFR 223.203). The 4(d) Rule applies the take prohibitions in section 9(a)(1) of the ESA to salmon and steelhead listed as threatened, and also sets forth specific circumstances when the prohibitions will not apply, known as 4(d) limits. With regard to hatchery programs described in Hatchery and Genetic Management Plans (HGMPs), NMFS declared under limit 6 of the 4(d) Rule that section 9 take prohibitions would not apply to activities carried out under those HGMPs when NMFS determines that the HGMPs meet the requirements of limit 6.

On August 1, 2012, NMFS received four HGMPs for hatchery programs in the Elwha River (LEKT 2012a; LEKT 2012b; LEKT 2012c; LEKT and WDFW 2012)[1]. On August 31, 2012, NMFS received one additional HGMP for hatchery programs in the Elwha River (WDFW 2012a). All five HGMPs were submitted pursuant to limit 6 of the 4(d) Rule. On August 27, 2012, The Lower Elwha Klallam Tribe submitted a tribal resource management plan for harvest (Tribal Harvest Plan) of Elwha River winter steelhead (LEKT 2012d). The Tribal Harvest Plan was submitted pursuant to the Tribal 4(d) Rule.

[1] In this document, NMFS makes a distinction between "program" – the actual set of activities carried out to achieve objectives for the given group of fish – and "HGMP" – the written plan describing the program. This distinction is useful, since the program causes the effects considered in this analysis, while the HGMP is the subject of NMFS' potential approval for compliance with the ESA.

Table 1. Permit applications for Elwha River salmon and steelhead hatchery programs.

Hatchery Program	Operator
Lower Elwha Fish Hatchery Native Steelhead Program	Lower Elwha Klallam Tribe
Lower Elwha Fish Hatchery Coho Salmon Program	Lower Elwha Klallam Tribe
Elwha River Pink Salmon Odd and Even Year Preservation and Restoration Program	Lower Elwha Klallam Tribe and Washington Department of Wildlife
Lower Elwha Fish Hatchery Fall Chum Salmon Program	Lower Elwha Klallam Tribe
Elwha Channel Facility Summer/Fall Chinook Salmon Fingerling and Yearling Program	Washington Department of Wildlife
Harvest Management Plan for Elwha River Winter Steelhead	Lower Elwha Klallam Tribe

A Draft Environmental Assessment on the effects of the proposed plans was released for a 30-day public comment period on October 16, 2012 (77 FR 63294). The comment period for review of the Draft Environmental Assessment on the proposed plans expired on November 15, 2012. A Final Environmental Assessment and a Finding of No Significant Impact were completed by NMFS on December 11, 2012.

This Draft Supplemental Environmental Assessment is being prepared in response to the court order in Wild Fish Conservancy, et al. v. National Park Service, et al., NO. C12-5109 BHS (W.D. Wash.), wherein the court held that, in order to be legally sufficient, the Environmental Assessment should either analyze in detail an alternative involving reduced releases of hatchery smolts, or adequately explain why such an alternative is unreasonable. Specifically, the court expressed concern that the alternatives in the 2012 Final Environmental Assessment did not adequately consider whether smaller-sized hatchery programs would result in fewer impacts to naturally-spawning salmonid species. The court also raised questions about how the alternatives fit the purpose and need. These concerns are addressed by the inclusion of a reduced release alternative and by additional clarifications in this Draft Supplemental Environmental Assessment.

NMFS is evaluating the five HGMPs and the Tribal Harvest Plan collectively in one Environmental Assessment because they overlap in geography, were submitted to NMFS around the same time, and rely on a common approach based upon the Elwha River Fish Restoration Plan (Ward et al. 2008). The final decisions on the hatchery and harvest plans are pursuant to separate authorities and will be made in separate ESA decision documents.

1.2. Description of the Proposed Action

The Lower Elwha Klallam Tribe and the Washington Department of Fish and Wildlife (WDFW) have submitted to NMFS five jointly operated hatchery programs in the Elwha River Basin. The

plans were submitted pursuant to limit 6 of the 4(d) Rule for the listed Puget Sound Chinook salmon evolutionarily significant unit (ESU) and listed Puget Sound steelhead distinct population segment (DPS). Two of the hatchery programs release ESA-listed Chinook salmon and steelhead, and three hatchery programs release non-ESA listed coho, fall chum, and pink salmon into the Elwha River watershed. All of the programs are currently operating for Elwha River salmon and steelhead conservation purposes, and all five hatchery programs raise fish native to the Elwha River Basin.

Under the Proposed Action, NMFS would make a determination that the submitted HGMPs meet the requirements of limit 6 of the 4(d) Rule. NMFS's determination would apply for the duration of the preservation and recolonization phases of fish restoration in the Elwha River Basin, as defined in the HGMPs. These phases would encompass the periods during removal of the two Elwha River dams (Elwha Dam and Glines Canyon Dam), and for a period following that removal as river habitat, and the productivity of salmon and steelhead populations, recover from dam removal effects. Activities included in the plans are as follows:

- Broodstock collection at Elwha Channel Facility, Lower Elwha Fish Hatchery, Morse Creek Facility, and through opportunistic seining, gaffing, and gill-netting in the lower Elwha River (Table 2)
- Holding, identification, and spawning of adult fish at WDFW's Elwha Channel Facility and Lower Elwha Klallam Tribe's Lower Elwha Fish Hatchery (Table 2)
- Egg incubation and fish rearing at Hurd Creek, Sol Duc, Elwha Channel, and Morse Creek Facilities (Elwha Channel Facility program), Lower Elwha Fish Hatchery (all other species programs), and Manchester Research Station (captive broodstock pink salmon program) (Table 2)
- Release of up to 2.5 million subyearling and 200,000 yearling Chinook salmon from Elwha Channel Facility; 200,000 yearling Chinook salmon from Morse Creek Facility (Elwha genetic reserve program); and 175,000 steelhead, 425,000 coho salmon, 1,025,000 fall chum salmon, and 3,000,000 pink salmon from Lower Elwha Fish Hatchery (Table 2)
- Upstream transport and release of adult salmon and steelhead surplus to hatchery broodstock needs via truck
- Implementation of measures to minimize risks to listed fish species, including use of only native salmon and steelhead as broodstock, maintenance of effective breeding population sizes, and application of appropriate mating protocols to minimize genetic risks; release of smolts only, release of all juvenile fish into the lowest portion of the Elwha River, and release of juvenile fish at times that minimize interactions with juvenile natural-origin

fish to minimize ecological risks; and, compliance with water withdrawal, screening, and effluent discharge permits to minimize facility operation risks

- Monitoring and evaluation activities to assess the performance of the programs in preserving and recolonizing native salmon and steelhead. The following monitoring and evaluation activities are included in the HGMPs:
    - Operation of weirs at the Elwha Channel and Lower Elwha Fish hatcheries to count hatchery-origin and any stray natural-origin adult returns, and allow for biological sampling of returning fish
    - Operation of juvenile outmigrant traps to collect fish for identification of species, origin, and biological characteristics
    - Foot and boat surveys to census salmon and steelhead spawning abundance and to sample carcasses to identify fish origin
    - Monitoring and reporting of fish harvests by species and by origin
    - Monitoring of broodstock collection, egg take, and smolt release levels for each program
    - Fish health monitoring and reporting
    - Genetic analysis of naturally produced smolts, and unmarked adults to measure the extent of genetic exchange between hatchery-origin and natural-origin fish
    - Other activities needed to determine hatchery program effects and performance

In addition, as part of NMFS requirements set forth in the reinitiated dam deconstruction biological opinion, the following other monitoring and evaluation actions will be implemented (funded by National Park Service) to complement HGMP-related monitoring and evaluation efforts:

- Spawning ground surveys to assess listed adult fish abundance and distribution
- Operation of juvenile fish outmigrant traps to determine the productivity of naturally-spawning fish upstream of dam sites
- Operation of DIDSON to assess adult salmon and steelhead spawning escapement abundance
- Aerial Spawning Ground Surveys to assess adult fish spawning escapement abundance and distribution in the upper watershed
- Fish health surveys and sampling to identify fish disease pathogen status in wild fish
- Upstream transport and release of adult salmon and steelhead to increase spawner escapement abundances in middle and upper river reaches
- Fish tagging and tracking to Monitor and assess salmon and steelhead distribution

- Monitoring and tracking of habitat conditions in the watershed as they recover from dam deconstruction effects

Activities included in the HGMPs to meet conservation objectives for each of the native Elwha River salmon and steelhead populations, including broodstock collection methods and goals, juvenile fish release numbers by life stage, and juvenile fish release locations, were developed by the *United States* v. *Washington* salmon resource managers (WDFW and the Lower Elwha Klallam Tribe), as guided by the Elwha River Fish Restoration Plan (Ward et al. 2008) and federal agency and independent scientific experts. In particular, proposed annual adult broodstock collection and juvenile salmon and steelhead release numbers were developed based on the need to produce enough returning adult fish to preserve the abundance and genetic diversity of the remnant native populations during and for a period after dam removal. The proposed HGMPs were also sized to increase the number of adult fish spawning in the river, which will aid in the recolonizing of available healthy habitat and the restoration of naturally self-sustaining populations.

Table 2. Hatchery facilities associated with the proposed Elwha River watershed native salmon and steelhead population supportive breeding programs.

Activity	**Facility**	**Location**	**Does Facility Exist under Baseline Conditions?**	**Is Facility Operated under Baseline Conditions?**
Broodstock collection[1]	Elwha Channel Facility	River mile 3.5 on the Elwha River	Yes	Yes
	Lower Elwha Fish Hatchery	River mile 1.25 on the Elwha River	Yes	Yes
	Morse Creek Facility [1]	River mile 1.0 on Morse Creek	Yes	Yes
	Opportunistic seining, gaffing, and gill-netting[1]	Downstream of river mile 4.9 on the Elwha River	N/A	Yes
Spawning	Elwha Channel Facility	River mile 3.5 on the Elwha River	Yes	Yes
	Lower Elwha Fish Hatchery	River mile 1.25 on the Elwha River	Yes	Yes
	Morse Creek Facility [1]	River mile 1.0 Morse Creek	Yes	Yes
Incubation	Hurd Creek Hatchery	River mile 0.2 on Hurd Creek (a tributary to the Dungeness at river mile 2.8)	Yes	Yes
	Lower Elwha	River mile 1.25 on the	Yes	Yes

Activity	Facility	Location	Does Facility Exist under Baseline Conditions?	Is Facility Operated under Baseline Conditions?
	Hatchery	Elwha River		
Rearing	Elwha Channel Facility	River mile 3.5 on the Elwha River	Yes	Yes
	Lower Elwha Fish Hatchery	River mile 1.25 on the Elwha River	Yes	Yes
	Morse Creek Facility	River mile 1.0 Morse Creek	Yes	Yes
	Sol Duc Hatchery	River mile 29 on the Sol Duc River	Yes	Yes
	Manchester Research Station	Manchester, Washington	Yes	Yes
Juvenile release	Elwha Channel Facility	River mile 3.5 on the Elwha River	Yes	Yes
	Lower Elwha Fish Hatchery	River mile 1.25 on the Elwha River	Yes	Yes
	Morse Creek Facility	River mile 1.0 Morse Creek	Yes	Yes
Adult release	Elwha River mainstem and tributary areas	Elwha River watershed upstream of river mile 4.9	N/A	Yes
Monitoring and evaluation	Elwha Channel Facility	River mile 3.5 on the Elwha River	Yes	Yes
	Lower Elwha Fish Hatchery	River mile 1.25 on the Elwha River	Yes	Yes
	Watershed areas accessible to natural salmon and steelhead migration, spawning and rearing	Elwha River watershed areas from river mile 0 through river mile 45 plus its tributaries	N/A	N/A

[1] Broodstock collection actions associated with the five hatchery programs were previously evaluated and authorized by NMFS through separate ESA consultations with the National Park Service addressing dam deconstruction effects on listed fish. Broodstock collection actions required to implement the Chinook salmon and steelhead hatchery plans were required as terms and conditions to limit the effects of take resulting from the release of stored sediments behind the dams.
N/A = Not applicable.

A Tribal Harvest Plan has been submitted by the Lower Elwha Klallam Tribe for harvest of hatchery-origin steelhead in the Elwha River Basin. The Tribal Harvest Plan would guide management of steelhead fisheries in the Elwha River. Harvest of Elwha steelhead outside of the Elwha River, e.g., in coastal marine salmon fisheries in British Columbia or Washington, or in the Strait of Juan de Fuca or elsewhere in Puget Sound, is not regulated by the Tribal Harvest Plan. Under the Tribal Harvest Plan, the Tribal early-timed fisheries directed at non-native,

hatchery-origin steelhead (i.e., Chambers Creek fish) would continue in the lower 5 miles of the Elwha River through the 2013-2014 fishing season when the last non-native steelhead adults are expected to return. After the 2013-2014 steelhead fishing season, a moratorium on all Elwha River tribal fisheries would be in effect, and the Lower Elwha Klallam Tribe would stop fishing in the Elwha River Basin until 2018. At that point, the Tribe proposes to initiate a small (less than 50 hatchery-origin steelhead) ceremonial and subsistence fishery on native stock, hatchery-origin fish if the late-timed natural-origin steelhead abundance is projected to exceed 300 fish. Beginning January of 2020 and later, if the natural-origin component of the steelhead population exceeds 500 fish, the Lower Elwha Klallam Tribe would scale up their fishery to target 200 to 300 hatchery-origin steelhead.

1.3. Purpose of and Need for the Action

The purpose of the Proposed Action is to ensure that the hatchery programs operated by the Lower Elwha Klallam Tribe and WDFW for the production of Chinook salmon, steelhead, coho salmon, fall chum salmon, and pink salmon as described in the five HGMPs and the Tribal Harvest Plan comply with the requirements of the ESA, and are reviewed for potential approval under the ESA 4(d) Rule.

NMFS's need for the Proposed Action is two-fold:

- Ensure the proposed hatchery programs and harvest plan comply with the requirements of the ESA
- Meet NMFS's tribal treaty rights stewardship responsibilities

The applicants' need for the Proposed Action is five-fold:

- Preserve and assist in the recolonization of all native salmon and steelhead populations in the Elwha River Basin during and after the removal of two dams
- Ensure substantial progress towards fish restoration in the Elwha River within a 20- to 30-year time frame
- Fulfill treaty-reserved fishing rights on steelhead[2] and Chinook, pink, chum, and coho salmon as the populations recover
- Provide fishing opportunities for citizens of Washington State as the populations recover
- Use existing hatchery facilities to meet the recovery objectives for the Elwha River

[2] The proposed Tribal Harvest Plan (LEKT 2012d) for native stock hatchery-origin steelhead takes into account the status of the total adult return of native Elwha River steelhead in its current depressed condition, and the need for the population to recover. As such, steelhead harvests under the Tribal Harvest Plan would be maintained at very low levels, and below levels that would allow fulfillment of the Lower Elwha Tribe's treaty-reserved fishing rights.

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 Elwha River fish would be spawned, incubated, reared, acclimated, released, or harvested under the proposed hatchery and tribal harvest plans (Figure 1). The following facilities would be used by the Elwha River hatchery programs:

- Elwha Channel Facility (river mile 3.5 on Elwha River)
- Lower Elwha Fish Hatchery (river mile 1.25 on Elwha River)
- Morse Creek Facility (river mile 1.0 on Morse Creek)
- ~~Elwha River mainstem weir (river mile 3.7 on the Elwha River)~~[3]
- Hurd Creek Hatchery (river mile 0.2 on Hurd Creek, a tributary to the Dungeness River at river mile 2.8)
- Sol Duc Hatchery (river mile 29 on the Sol Duc River)
- Manchester Research Station (Manchester, Washington)

In addition, adult hatchery-origin fish would be released in mainstem and tributary areas above river mile 4.9 of the Elwha River. Monitoring and evaluation activities would occur from the mouth of the Elwha River upstream to river mile 45 (its headwaters) plus its tributaries, including in the Olympic National Park and Olympic Wilderness Area. Harvest activities may occur in the Elwha River mainstem as far upstream as the boundary of the Olympic National Park (river mile 9.6) starting with tribal ceremonial and subsistence fisheries in 2018.

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. The analysis area for each resource is described in Chapter 3, Affected Environment.

[3] The Elwha River mainstem weir is no longer in operation (Subsection 1.5.5, Monitoring and Adaptive Management Plans for the Elwha Restoration Project).

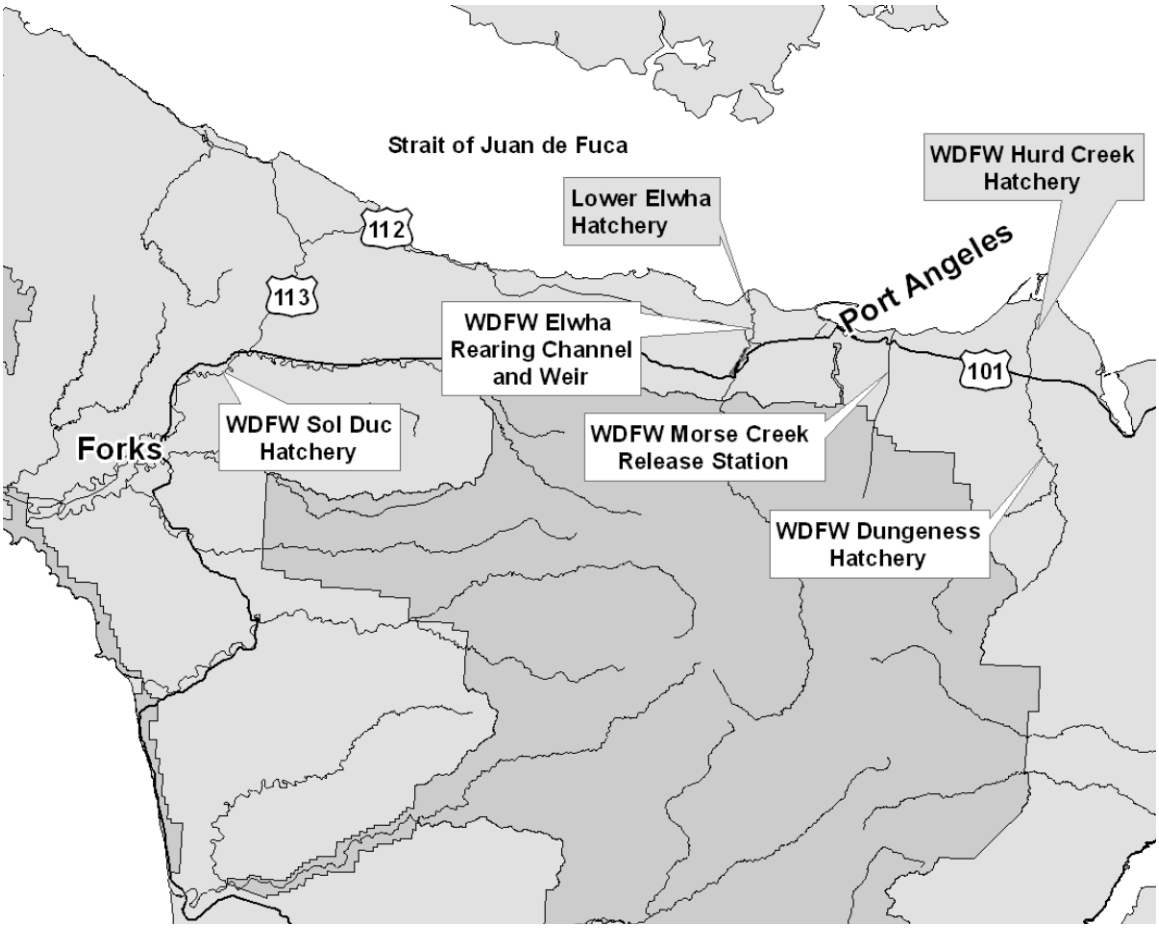

Figure 1. Action area (not shown: Manchester, Washington, hatchery facility). Source: Ward et al. 2008).

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 the Elwha River. They are summarized below to provide additional context for Elwha River hatchery programs.

1.5.1. Elwha Act

The Elwha River Ecosystem and Fisheries Restoration Act, or "The Elwha Act" was signed on October 24, 1992 by the President of the United States of America. The Elwha Act authorized the Secretary of Interior to acquire the two hydroelectric dams on the Elwha River and implement the actions necessary to achieve full restoration of the Elwha River and native anadromous (salmon and steelhead) fisheries therein.

1.5.2. Elwha River Ecosystem Restoration EIS

To implement the Elwha Act's goal of "full restoration of the Elwha River ecosystem and native anadromous fisheries," the Secretary of the Interior directed the National Park Service to conduct NEPA analysis on the preferred method for doing so. A final EIS was completed in 1995 (NPS 1995). This document is herein incorporated by reference.

1.5.3. Elwha River Ecosystem Restoration Implementation EIS

After the National Park Service completed their EIS on Elwha River Ecosystem Restoration (Subsection 1.5.2, Elwha River Ecosystem Restoration EIS), they developed a second EIS, the "implementation EIS," to examine options for removing the Elwha and Glines Canyon Dams. The final EIS on Elwha River Ecosystem Restoration Implementation was complete in 1996 (NPS 1996). A supplemental EIS on Elwha River Ecosystem Restoration Implementation was completed in 2005 (NPS 2005). Both of these documents are herein incorporated by reference.

1.5.4. Elwha River Fish Restoration Plan

In 2008, the Elwha River Fish Restoration Plan was completed (Ward et al. 2008). It was developed collaboratively by biologists from Federal, state, and tribal agencies with expertise in Elwha salmon and steelhead populations and their habitat to identify a general multiagency approach and scientific framework for preserving and restoring fish populations before, during, and after dam removal. The plan is not self-implementing, but relies on various entities' subsequent actions, such as the proposed hatchery plans, to carry it out.

The primary objective of the agencies and tribe, as described in the Elwha River Fish Restoration Plan, is to reestablish self-sustaining fish populations and their habitats. The Elwha River Fish Restoration Plan recommends plans and schedules for salmon and steelhead hatchery programs. It also proposes a process for monitoring and evaluating the effects of hatchery programs during Elwha River restoration. Although the Elwha River Fish Restoration Plan identifies three phases of Elwha River recovery – before, during, and after dam removal – the submitted HGMPs and Tribal Harvest Plan would adopt four phases based on both biological and temporal conditions. The phases described in the HGMPs and referred to in the Tribal Harvest Plan divide the post preservation, "after dam removal" phase from the Elwha River Fish Restoration Plan into three additional phases (recolonization, local adaptation, and self-sustaining). The proposed HGMPs and Tribal Harvest Plan describe hatchery and harvest activities during the first two phases of recovery: (1) preservation and (2) recolonization.

1.5.5. Monitoring and Adaptive Management Plans for the Elwha Restoration Project

Biologists from federal, state, and tribal agencies with expertise in Elwha salmon and steelhead populations and their habitat have developed two draft monitoring and adaptive management plans for the Elwha Restoration Project. The purpose of the monitoring and adaptive management plans is to create recommended strategies that address uncertainty, incorporate the best available scientific methods and management responses, and best ensure the recovery of the native Elwha Chinook salmon, steelhead, and other non-listed stocks of anadromous salmonids, while minimizing the risks to these species from the dam removal and stock preservation efforts.

The adaptive management process includes recommendations for a decision making process and timeframe, defined decision rules, a decision focused monitoring and evaluation plan, and relies on performance indicators and triggers and thresholds tied to the monitoring in order to guide associated management actions. The plans develop objectives, performance indicators and triggers for the four different phases of restoration: preservation, recolonization, local adaptation, and self-sustaining population.

Like the Elwha River Fish Restoration Plan, the monitoring and adaptive management plans are the recommendations of the authors, and are not self-implementing or action-forcing. They rely on various entities' subsequent actions, such as the proposed hatchery plans, to carry them out. Many of the actions and goals recommended in the monitoring and adaptive management plans have been incorporated into the submitted HGMPs and Tribal Harvest Plan. Other actions have an identified funding source, and are, therefore, reasonably certain to occur. However, there are many actions identified in the monitoring and adaptive management plans that may be too costly for implementation in the near future. Therefore, these actions are not relied upon in NMFS' determinations based on this Environmental Assessment because they are not reasonably certain to occur.

Initiated in 2010, the operation of the mainstem weir was viewed by researchers as experimental, and dependent on river flow and post-dam removal bedload conditions that would allow for its successful operation. As described in U.S. Fish and Wildlife Service (2012) in the agency's consultation with NMFS regarding Elwha hatchery effects on U.S. Fish and Wildlife Service listed species, "the feasibility of continuing to effectively operate the mainstem weir is currently under review. High spring and early summer flows carry high debris loads, limiting its operation and capture efficiency which calls to question its continued operation beyond 2013." Recognizing that flow and sediment conditions in the river had a high potential to prevent successful operation of the weir, in its section biological opinion, NMFS noted that the co-managers will "operate the mainstem Elwha River weir if feasible" (NMFS 2012a). As predicted by NMFS and U.S. Fish and Wildlife Service release, large amounts of course sediment stored

behind the dams, combined with high river flows during salmon and steelhead migration periods, caused operation of the mainstem resistance board weir to become unfeasible.

These conditions, including burial of weir components under large quantities of sediment, prevented the weir from meeting its objectives, which included enumerating migrating adult fish populations, and augmenting Chinook salmon broodstock collection actions implemented at the hatcheries and in the mainstem river (Anderson and Ackley 2013). Consistent with the adaptive management intent for adjusting research, monitoring, and evaluation actions (Peters et al. 2014), the mainstem weir program was terminated after 2013, and replaced with a DIDSON (sonar) salmon and steelhead abundance census program. Salmon and steelhead population abundance monitoring and evaluation objectives originally proposed through mainstem weir operation are now being met through successful implementation of the DIDSON program (Denton et al. 2013). Broodstock collection actions implemented in the river (seines, gill nets, hook and line) and at the hatcheries are providing required numbers of adult salmon to sustain the co-manager supportive breeding program without contributions from the mainstem weir (WDFW 2014).

1.5.6. 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.

1.5.7. 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).

1.5.8. 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).

1.5.9. 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.

1.5.10. Treaties of Point Elliot, Medicine Creek, and Point No Point

Beginning in the mid-1850s, the United States entered into a series of treaties with tribes in Puget Sound. The treaties were completed to secure the rights of the tribes to land and the use of natural resources in their historically inhabited areas, in exchange for the ceding of land to the United States for settlement by its citizens. These treaties secured the rights of tribes for taking fish at usual and accustomed grounds and stations in common with all citizens of the United States. Marine and freshwater areas of Puget Sound were affirmed as the usual and accustomed fishing areas for treaty tribes under *U.S. v. Washington* (1974).

The 1855 Treaty of Point No Point, 12 Stat. 933, is the foundation for the Lower Elwha Tribe's rights in the Elwha River fishery. The Tribe is the modern-day successor to several traditional Klallam villages on the Elwha River (including the village of Elwha at the mouth of the River, where the Tribe's Reservation is located today) that signed the Treaty. In that treaty the Tribe reserved its right to harvest fish at all of its usual and accustomed grounds and stations, which have been determined by Judge Boldt to include the entire Elwha River and Strait of Juan de Fuca [*U.S. v Washington*, 626 F. Supp. 1405, 1443 (W.D. Wash. 1985), and 459 F. Supp. 1020, 1049, 1066 (W.D. Wash. 1978)].

1.5.11. U.S. v. Washington

U.S. v. Washington (1974) is the Federal court proceeding that enforces and implements reserved treaty fishing rights with regards to salmon and steelhead returning to Puget Sound. Hatcheries in Puget Sound provide salmon and steelhead for these fisheries. Without many of these hatcheries, there would be few, if any, fish for the tribes to harvest. These fishing rights and attendant access were established by treaties that the Federal government signed with the tribes in the 1850s. In those treaties, the tribes agreed to allow the peaceful settlement of Indian lands in western Washington in exchange for their continued right to fish, gather shellfish, hunt, and exercise other sovereign rights. Under Phase II of *U.S. v. Washington*, the Federal District Court ensured tribes the rights to the protection of fish habitat subject to treaty catch and a right to the fish that are produced by hatcheries. In 1974, Judge George Boldt decided in *U.S. v. Washington* that the tribes' fair and equitable share was 50 percent of all of the harvestable fish destined for the tribes' traditional fishing places.

1.5.12. 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 (Sect. 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)

1.5.13. 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).

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

This EA will consider the effects of hatchery programs and 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.

1.5.15. 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). It supersedes WDFW's Wild Salmonid Policy, which was adopted in 1997. 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.[4]

1.5.16. Recovery Plans for Puget Sound Salmon

Federal recovery plans are in place for the ESA-listed Puget Sound Chinook Salmon (NMFS 2007) and Hood Canal Summer Chum Salmon ESUs (HCCC 2005). Broad partnerships of Federal, state, local, and tribal governments and community organizations collaborated in the

[4] On July 25, 2014, following release of the draft EA, NMFS issued the Puget Sound Hatcheries Draft Environmental Impact Statement. As this is in draft form, the analysis is not incorporated here.

development of the two recovery plans under Washington's Salmon Recovery Act. The comprehensive recovery plans include conservation goals and proposed habitat, hatchery, and harvest actions needed to achieve the conservation goals for each watershed within the geographic boundaries of the two listed ESUs. Although listed in 2007, a recovery plan for the Puget Sound Steelhead DPS has not yet been completed.

1.5.17. Wilderness Act

The 1964 Wilderness Act directs Federal agencies to manage wilderness so as to preserve its wilderness character. Lands classified as wilderness through the Wilderness Act may be under the jurisdiction of the U.S. Forest Service, National Park Service, U.S. Fish and Wildlife Service, or the U.S. Bureau of Land Management. With some exceptions, the Wilderness Act prohibits motorized and mechanized vehicles, timber harvest, new grazing and mining activity, or any kind of development. In 1988, Congress designated 95 percent of the Olympic National Park as wilderness under the Wilderness Act. The Olympic Wilderness Area is under the jurisdiction of the National Park Service.

1.5.18. Man and Biosphere Program

In 1976, Olympic National Park became an International Biosphere Reserve under the Man and Biosphere Program. The Man and Biosphere Program of the United Nations Educational, Scientific, and Cultural Organization (UNESCO) was launched in 1971 establish a scientific basis for the improvement of relationships between people and their environment (UNESCO 2014a). The Man and the Biosphere Program combines the natural and social sciences, economics and education to improve human livelihoods and the equitable sharing of benefits, and to safeguard natural and managed ecosystems, thus promoting innovative approaches to economic development that are socially and culturally appropriate, and environmentally sustainable (UNESCO 2014a).

1.5.19. World Heritage Convention

In 1981, the Olympic National Park was designated as a World Heritage Site under the World Heritage Convention because it meets two of 10 criteria for designation as a World Heritage Site:

- *Criterion*: The property contains superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance (UNESCO 2012).
  Olympic National Park: The Park is the largest protected area in the temperate region of the world that includes in one complex ecosystems from ocean edge through temperate rainforest, alpine meadows and glaciated mountain peaks. It contains one of the world's

largest stands of virgin temperate rainforest, and includes many of the largest coniferous tree species on earth (UNESCO 2014b).

- *Criterion*: The property is an outstanding example representing significant on-going ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals (UNESCO 2012).
  Olympic National Park: The Park's varied topography from seashore to glacier, affected by high rainfall has produced complex and varied vegetation zones, providing habitats of unmatched diversity on the Pacific coast. The coastal Olympic rainforest reaches its maximum development within the property and has a living standing biomass that may be the highest anywhere in the world. The Park's isolation has allowed the development of endemic wildlife, subspecies of trout, varieties of plants and unique fur coloration in mammals, indications of a separate course of evolution (UNESCO 2014).

According to the Operational Guidelines for the Implementation of the World Heritage Convention (UNESCO 2012), protection and management of World Heritage properties ensure the site's qualities that resulted in their inclusion as a World Heritage Site are sustained or enhanced.

2. ALTERNATIVES INCLUDING THE PROPOSED ACTION

Five alternatives are considered in this EA: (1) NMFS would not make a determination under the 4(d) Rule, (2) NMFS would make a determination that the submitted HGMPs and Tribal Harvest Plan meet the requirements of the 4(d) Rule, (3) NMFS would make a determination that revised HGMPs that include a sunset term and the Tribal Harvest Plan meet the requirements of limit 6 of the 4(d) Rule, (4) NMFS would make a determination that the submitted HGMPs and Tribal Harvest Plan do not meet the requirements of the 4(d) Rule, and (5) NMFS would make a determination that revised HGMPs with reduced production levels and the Tribal Harvest Plan meet the requirements of limit 6 of the 4(d) Rule. No other alternatives that would meet the purpose and need were identified that would be appreciably different from the five alternatives described below.

2.1. Alternative 1 (No Action) – Do Not Make a Determination under the 4(d) Rule

Under this alternative, NMFS would not make determinations under the 4(d) Rule. The Lower Elwha Klallam Tribe and WDFW would continue to operate the Elwha River hatchery programs as under baseline conditions without NMFS's ESA determination. Consequently, the hatchery programs would not have ESA coverage. No new environmental protection or enhancement measures would be implemented.

Other potential outcomes might occur under this No-action Alternative – the Tribe and WDFW could pursue other mechanisms for ESA coverage, for example. However, NMFS's No-action Alternative represents NMFS's best estimate of what would happen in the absence of the proposed Federal action – a determination that the submitted plans meet the requirements of the 4(d) Rule[5].

2.2. Alternative 2 (Proposed Action) – Make a Determination that the Submitted HGMPs and Tribal Harvest Plan Meet the Requirements of the 4(d) Rule

Under this alternative, NMFS would make a determination that the submitted HGMPs and Harvest Tribal Plan meet the requirements of the 4(d) Rule, and the Elwha River hatchery programs would be implemented as described in the five HGMPs until the Elwha River and its anadromous salmonid populations reach the local adaptation phase of recovery (Subsection 1.2., Description of the Proposed Action). Parameters marking the local adaptation phase and natural productivity milestones would likely be achieved at different times for the different species, with

[5] NMFS recognizes the possibility that the No-action alternative could result in discontinuation of the hatchery programs. However, this is not NMFS's best estimate of what would occur, and discontinuation is the subject of Alternative 4.

the result that hatchery programs might be terminated at different times.

Under Alternative 2, the annual maximum release levels would be as follows:

- Steelhead: 175,000 yearlings
- Chum salmon: 450,000 age-0 fry
- Pink salmon: 3,000,000 age-0 fry
- Chinook salmon: 2,500,000 subyearlings; 200,000 yearlings released into the Elwha River; 200,000 yearlings released into Morse Creek
- Coho salmon: 425,000 yearlings

NMFS would determine that the submitted Tribal Harvest Plan meets the requirements of the Tribal 4(d) Rule, and fisheries would be implemented as follows:

- A moratorium on all Elwha River tribal fisheries would be in effect, and the Lower Elwha Klallam Tribe would not fish in the Elwha River Basin until 2018.
- At that point, the Tribe would initiate a small (less than 50 hatchery-origin steelhead) ceremonial and subsistence fishery on native stock, hatchery-origin fish if the natural-origin steelhead abundance in 2018 is projected to exceed 300 fish.
- Beginning January of 2020 or later, if the natural-origin component of the steelhead population exceeds 500 fish, the Lower Elwha Klallam Tribe would scale up their fishery to target 200 to 300 hatchery-origin steelhead.

2.3. Alternative 3 (Proposed Hatchery Programs with a Sunset Term) – Make a Determination that Revised HGMPs that Include a Sunset Term and a Revised Tribal Harvest Plan Meet the Requirements of the 4(d) Rule

Under this alternative, the HGMPs would be revised to specify a sunset term for the Elwha River hatchery programs, and NMFS would make a determination that the revised HGMPs and the Tribal Harvest Plan meet the requirements of the 4(d) Rule. N.b., NMFS' 4(d) regulations do not provide NMFS with the authority to order changes of this magnitude as a condition to approval of the HGMPs[6]. NMFS' 4(d) regulations require NMFS to make a determination that the HGMPs as proposed either meet or do not meet the standards prescribed in the rule. Nonetheless, NMFS supports analysis of this alternative to assist with a full understanding of potential effects on the human environment under various management scenarios, including those that do not

[6] The consequences of continuing to operate the hatchery without ESA coverage would require a more careful review to determine next steps, including potential emergency operations to maintain population survival during dam removal. It would not be prudent to speculate on these details at this time; this note is included only to point out that any negative determination in any HGMP review does not necessarily lead to complete cessation of activities.

achieve all of the applicants' specific objectives.

The revised HGMPs would terminate the Elwha River hatchery programs after the dams have been removed, sediment levels have returned to pre-dam removal levels, and salmon and steelhead have exhibited some natural productivity. The programs would be terminated near the end of the preservation phase (Subsection 1.5.2, Elwha River Fish Restoration Plan), and it would be expected that the last hatchery-origin fish would be released around 2019. This approximate termination date is in contrast to the Proposed Action, which is bounded by biological parameters marking the end of the preservation phase and natural productivity milestones, which would likely be achieved at different times for the different species, with the result that hatchery programs might be terminated at different times.

Under this alternative, the Tribal Harvest Plan would be revised because there would be no hatchery-origin steelhead returning to the Elwha River after approximately 2021. A moratorium on all Elwha River tribal fisheries would be in effect until 2018. At that point, the Tribe would initiate a small (less than 50 hatchery-origin steelhead) ceremonial and subsistence fishery on hatchery-origin fish if the natural-origin steelhead abundance is projected to exceed 300 fish. Because hatchery-origin steelhead would stop returning to the Elwha River in approximately 2021, the steelhead fishery would only be ramped up to target 200 to 300 hatchery-origin steelhead for one year, and only if natural-origin steelhead abundance that year is projected to exceed 500 fish.

This alternative would not be expected to meet the applicants' purpose and need for action because substantial progress toward fish restoration in the Elwha River would not be expected to occur in a 20- to 30-year time frame under this alternative. Additionally, this alternative would not fulfill treaty-reserved fishing rights or provide fishing opportunities for citizens of Washington State.

2.4. Alternative 4 (No Hatchery Programs in the Elwha River) --- Make a Determination that the Submitted HGMPs and Tribal Harvest Plan do Not Meet the Requirements of the 4(d) Rule

Under this alternative, NMFS would make a determination that the submitted HGMPs and Tribal Harvest Plan do not meet the requirements of the 4(d) Rule, and the Elwha River hatchery programs would be terminated immediately. All salmon and steelhead currently being raised in hatchery facilities would be released or killed, and no additional broodstock would be collected. N.b., NMFS' 4(d) regulations do not provide NMFS with blanket authority to require this outcome as a consequence of its 4(d) determination. NMFS' 4(d) regulations require NMFS to make a determination that the HGMPs as proposed either meet or do not meet the standards

prescribed in the rule. Nonetheless, NMFS supports analysis of this alternative to assist with a full understanding of potential effects on the human environment under various management scenarios, including those that do not achieve all of the applicants' specific objectives.

This alternative would not be expected to meet the applicants' purpose and need for action because substantial progress toward fish restoration in the Elwha River would not be expected to occur in a 20- to 30-year time frame under this alternative. Additionally, this alternative would not fulfill treaty-reserved fishing rights or provide fishing opportunities for citizens of Washington State.

2.5. Alternative 5 (Hatchery Programs with Decreased Production Levels) - Make a Determination that Revised HGMPs with Decreased Production Levels and the Tribal Harvest Plan Meet the Requirements of the 4(d) Rule

Under this alternative, NMFS would reduce the number of fish released from each of the five hatchery programs. This alternative has been added in response to the court order in Wild Fish Conservancy v. Department of the Interior, NO. C12-5109 BHS (W.D. Wash.), wherein the court held that the Environmental Assessment must either provide detailed analysis of an alternative involving reduced releases of hatchery smolts, or more fully explain why such an alternative would not be a viable means of meeting the purpose and need. The plaintiffs in Wild Fish Conservancy, et al. v. National Park Service, et al., have suggested that the Elwha River native steelhead and coho hatchery programs should be reduced from their proposed annual release levels (175,000 and 425,000 smolts, respectively) to a maximum release level of 50,000 smolts. Although the plaintiffs did not suggest a reduced production level for the other hatchery programs, NMFS has applied a two-thirds reduction to the annual maximum release goals for the chum salmon, pink salmon, and Chinook salmon hatchery programs, which is similar to the roughly two-thirds reduction plaintiffs suggested for steelhead. Under Alternative 5, the annual maximum release levels would be as follows:

- Steelhead: 50,000 yearlings
- Chum salmon: 150,000 age-0 fry
- Pink salmon: 1,000,000 age-0 fry
- Chinook salmon: 833,333 subyearlings; 66,666 yearlings released into the Elwha River; 66,666 yearlings released into Morse Creek
- Coho salmon: 50,000 yearlings

NMFS would determine that the submitted Tribal Harvest Plan (LEKT 2012d) meets the requirements of the Tribal 4(d) Rule, and fisheries would be implemented as follows:

- A moratorium on all Elwha River tribal fisheries would be in effect, and the Lower Elwha Klallam Tribe would not fish in the Elwha River Basin until 2018.
- In 2018, the Tribe would initiate a small (less than 50 hatchery-origin steelhead) ceremonial and subsistence fishery on native stock, hatchery-origin fish if the natural-origin steelhead abundance in 2018 is projected to exceed 300 fish.
- Beginning January of 2020 or later, if the natural-origin component of the steelhead population exceeds 500 fish, the Lower Elwha Klallam Tribe would scale up their fishery to target 200 to 300 hatchery-origin steelhead.

Although the submitted Tribal Harvest Plan (LEKT 2012d) would be implemented identically under Alternative 5 as under the Proposed Action, the timeframe for meeting the plan's triggers for initiating fisheries may be different (i.e., it may take longer to meet the natural-origin abundance targets identified in the plan under Alternative 5).

N.b., NMFS' 4(d) regulations do not provide NMFS with the authority to order changes of this magnitude as a condition to approval of the HGMPs. NMFS' 4(d) regulations require NMFS to make a determination that the HGMPs as proposed either meet or do not meet the standards prescribed in the rule. Nonetheless, NMFS supports analysis of this alternative to assist with a full understanding of potential effects on the human environment under various management scenarios, including those that do not achieve all of the applicants' specific objectives.

2.6. Alternatives Considered but not Analyzed in Detail

2.6.1. Operate Hatchery Programs for Listed Species Only

Under this alternative, NMFS would not make a determination that the proposed hatchery programs for non-listed species (Puget Sound chum, coho, and pink salmon) meet the requirements of limit 6 of the 4(d) rule. For the purpose of this analysis, NMFS would treat this alternative as resulting in hatchery production of only Chinook salmon and steelhead as proposed in the HGMPs for those species. The three HGMPs for the other species – chum, coho, and pink salmon – would not be implemented, and the programs would be terminated. This alternative will not be analyzed in detail because the effects of the alternative would fall within the range of the effects of Alternative 1, Alternative 2, and Alternative 4. That is, the analysis of Alternative 1 and Alternative 2 will disclose the environmental effects of operating the Chinook salmon and steelhead hatchery programs, and the analysis of Alternative 4 will disclose the environmental effects of terminating the chum, coho, and pink salmon hatchery programs.

2.6.2. Approve Proposed Hatchery Programs under Section 10 of the Endangered Species Act

Under this alternative, NMFS would determine that the five proposed hatchery programs, as described in the HGMPs, meet the requirements for either section 10(a)(1)(A) permits (for Chinook salmon and steelhead programs) or section 10(a)(1)(B) permits (for coho, pink, and fall chum salmon programs). Under this alternative, the only change from the Proposed Action would be a difference in which process mechanism would be used to address ESA compliance for these hatchery programs. Consequently, this alternative would not be meaningfully different from the Proposed Action and will not be analyzed in detail.

2.6.3. Hatchery Programs with Additional Best Management Practices

Under this alternative, the applicants would revise their HGMPs to incorporate additional best management practices to further reduce the risk of adverse impacts of the hatchery programs on natural-origin salmon and steelhead populations, and NMFS would then determine that the revised HGMPs meet the criteria of limit 6 of the 4(d) Rule. However, because the proposed HGMPs have already incorporated best management practices identified by independent reviewers and because the HGMPs allow for the incorporation of additional best management practices in the future as a result of monitoring and evaluation activities, this alternative would not be meaningfully different from the Proposed Action and will not be analyzed in detail.

2.6.4. Hatchery Programs with Increased Production Levels

Under this alternative, NMFS would make a determination that revised HGMPs with increased production levels meet the requirements of limit 6 of the 4(d) Rule. This alternative will not be analyzed in detail because substantially higher production levels would exceed fish rearing density limits for the hatchery facilities and result in increasingly adverse fish health and survival effects on the hatchery-origin fish. Constructing additional hatchery facilities to accommodate substantially increased production would not meet the purpose and need for action, which includes using existing hatchery facilities to meet the recovery objectives for the Elwha River (Subsection 1.3, Purpose and Need for the Action).

2.6.5. Hatchery Programs that Release Fish in Streams outside of the Elwha River Basin to Maintain a Genetic Reserve during the Preservation Phase

Under this alternative, the applicants would revise their HGMPs so that Elwha River fish would be propagated in hatcheries and released in rivers that would be more hospitable to salmon and steelhead than the Elwha River during the preservation phase of Elwha River restoration, and NMFS would make a determination that the revised HGMPs meet the criteria of limit 6 of the

4(d) Rule. This alternative is not meaningfully different than the Proposed Action because under the Proposed Action fish would be released into a stream outside the Elwha River Basin (Morse Creek) to maintain a genetic reserve for Chinook salmon during the preservation phase. No other streams would be needed to maintain a genetic reserve, and releasing fish into streams that contain native salmon and steelhead populations would adversely impact native salmon and steelhead populations in those streams.

3. AFFECTED ENVIRONMENT

3.1. Introduction

Chapter 3, Affected Environment, describes baseline conditions for nine resources that may be affected by implementation of the EA alternatives:

- Water quantity (Subsection 3.2)
- Water quality (Subsection 3.3)
- Salmon and steelhead (Subsection 3.4)
- Other fish (Subsection 3.5)
- Wildlife (Subsection 3.6)
- Socioeconomics (Subsection 3.7)
- Environmental justice (Subsection 3.8)
- Cultural resources (Subsection 3.9)
- Human health and safety (Subsection 3.10)

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

Baseline conditions include the operation of the proposed Elwha River hatchery programs at juvenile and adult fish production levels described in the five HGMPs (Table 3). The Elwha River hatchery programs were initiated for fisheries harvest augmentation and stock preservation purposes and to partially mitigate for lost natural salmon and steelhead production from placement of the Elwha and Glines Canyon Dams. The Chinook salmon hatchery program was initiated in 1914 and has been consistently releasing fish since the 1950s. Hatchery-origin coho salmon have been released since the 1950s. A non-native (i.e., Chambers Creek) steelhead program was initiated in 1976, but it was terminated in 2011 to protect the native, ESA-listed steelhead population. In its place, a native steelhead program was initiated in 2005 (Table 3). The chum salmon hatchery program was founded in 1994 to maintain the genetic legacy of the native stock (LEKT 2012c). The pink salmon hatchery program was initiated in 2011 to mitigate for impacts of dam removal activities (Table 3).

Table 3. Annual juvenile and resultant adult hatchery production levels by salmon and steelhead species under baseline conditions.

Species	Hatchery Program Start Date	Target Annual Juvenile Release Levels (2014)	Hatchery-origin Adult Return Levels[3]
Chinook salmon	1914[1]	2.5 million subyearlings 200,000 yearlings (Elwha) 200,000 yearlings (Morse)	2,160 (Elwha)[4] 160 (Morse)
Steelhead (native stock)	2005[2]	175,000	1,300
Fall chum salmon (native stock	1994	450,000	2,250
Pink salmon (native stock)	2011	3,000,000	15,000
Coho salmon (native stock)	1970s	425,000	4,250

[1] Consistent releases of native Elwha River Chinook salmon since the 1950s.
[2] First release of juvenile fish that were progeny of 100% native Elwha River steelhead occurred in 2011.
[3] Total adult production estimates assuming survival rates to adult return (escapement and total contribution to any marine area fisheries) of 0.08% for Chinook (most recent year, combined subyearling and yearling survival rate); 0.75% for steelhead; 0.50% for fall chum; 0.50% for pink; and 1.00% for coho (Source: observed and target rates reported for each species in the five LEKT and WDFW HGMPs).
[4] Elwha Chinook salmon may be harvested incidentally in marine area fisheries in Canada and Alaska targeting other salmon populations. Approximately 25% of the total annual return of Chinook salmon originating in the Elwha River may be intercepted in those fisheries, reducing total annual escapement to the Elwha River to approximately 1,700 fish.

The action area (or project area) is the geographic area where the Proposed Action would take place. It includes the places where Elwha River fish would be spawned, incubated, reared, acclimated, released, or harvested under the proposed hatchery and tribal harvest plans (Subsection 1.4, Action Area). 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 Environmental Assessment's alternatives on that resource would be expected to occur outside the action area (Subsection 1.4, Action Area).

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, 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.

Six hatchery facilities are currently used by the Elwha River hatchery programs (Subsection 1.4, Action Area). One of the hatchery facilities uses groundwater exclusively except in the case of emergencies (Hurd Creek), two of the acclimation facilities use surface water exclusively (Morse Creek Facility and Sol Duc Hatchery), and three facilities use both groundwater and surface water (Elwha Channel Facility, Lower Elwha Fish Hatchery, and Manchester Research Station) (Table 4).

Table 4. Water source and use by hatchery facility.

Hatchery Facility	Surface Water Use (cfs)	Ground-water Use (cfs)	Amount Used for Elwha River Programs (cfs)	Proportion Used for Elwha River Programs (%)	Surface Water Source	Minimum Surface Water Flows (cfs)	Maximum Percentage of Surface Water Diverted for Elwha River Hatchery Programs	Discharge Location
Elwha Channel Facility	36	3[1]	39	100	Elwha River	212	16	Elwha River RM 3.5
Lower Elwha Fish Hatchery	29[4] (max.)	9[1]	38	100	Elwha River	219	13	Elwha River RM 1.3
Morse Creek Facility	5.4	0	5.4	100	Morse Creek	26	21	Morse Creek RM 1.0
Hurd Creek Hatchery	0[2]	4.5	1.5	30	N/A	N/A	N/A	Hurd Creek RM 0.2
Sol Duc Hatchery	76	0	15	20	Sol Duc River	214	7	Sol Duc River RM 29.0
Manchester Research Station	3.3	0.07	0.45	14	Puget Sound[3]	N/A	N/A	Clam Bay, Puget Sound

Source: Elwha-Dungeness Planning Unit 2005; WDOE 2012a; https://fortress.wa.gov/dfw/score/score/hatcheries/hatchery_details.jsp?hatchery=Solduc

[1] Must be treated as surface water because of hydrological connection between the aquifer and the Elwha River

[2] Emergency use only – de mini mis annual withdrawal level.

[3] Pumped seawater.

[4] In 2013, failure of the Elwha Surface Water Treatment Plant from heavy sediment loads that overwhelmed the system led to total reliance by the Lower Elwha Hatchery program on the hatchery's groundwater sources.

Up to 21 percent of the water in Morse Creek is temporarily diverted to the Morse Creek Facility to support Elwha River hatchery programs (Table 4). Up to 7 percent of the water in the Sol Duc

River is diverted to the Sol Duc Hatchery to support Elwha River hatchery programs (Table 4). Between 13 and 16 percent of the water in the Elwha River is temporarily diverted to the Elwha Channel Facility and Lower Elwha Fish Hatchery to support Elwha River hatchery programs (Table 4). The Manchester Research Station uses pumped seawater, and the amount diverted is not measurable relative to the total amount of water in the Puget Sound. All hatchery facilities have current water rights (Ecology 2012a).

A water right permit is required for all groundwater withdrawal within Washington except those supporting single-family homes. All hatchery wells used by hatchery facilities supporting the Elwha River hatchery programs are permitted by the Washington Department of Ecology (Ecology 2012b). The Elwha Channel Facility and Lower Elwha Fish Hatchery withdraw groundwater from an aquifer that underlies the Elwha River valley and supplies municipal water for local residents and businesses (NPS 2005). Because of the extent of the hydrological connection between the Elwha River aquifer and the Elwha River, the aquifer has been designated as under the influence of surface water and must be treated as if it were a surface water source (NPS 2005). Critical Groundwater Areas are not designated in Washington State.

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.

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. Additionally, Native American tribes may adopt their own water quality standards for permits on tribal lands (i.e., tribal wastewater plans). All hatchery facilities used by the Elwha River hatchery programs are compliant with their NPDES permit or do not require a NPDES permit (Table 5). All hatchery effluent is passed through pollution abatement ponds to settle out uneaten food and fish waste before being discharged into receiving waters.

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.

Within the analysis area, the Elwha River, Hurd Creek (a tributary to the Dungeness River), Sol Duc River, and the Puget Sound itself are on the 303(d) lists (Table 5). Activities within the analysis area that contribute to the degradation of water quality include dams, human development, agricultural practices, and forest practices.

Table 5. Water source and use by hatchery facility 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
Elwha Channel Facility	Yes	Yes	Temperature	Thermal heating behind dams
Lower Elwha Fish Hatchery	Yes	Yes	Temperature	Thermal heating behind dams
Morse Creek Facility	Yes	No	None[2]	None
Hurd Creek Hatchery	N/A	Yes	Fecal Coliform	Human development activities
Sol Duc Hatchery	Yes	Yes	Temperature and pH	Forest practices
Manchester Research Station	N/A	Yes	Bacteria	Human development activities

N/A = Not applicable because an NPDES permit is not required because the facility releases less than 20,000 pounds of fish per year or feeds fish less than 5,000 pounds of fish feed per year.
[1]Source: WDOE 2008; http://apps.ecy.wa.gov/wats08/Default.aspx
[2] Morse Creek does not have any Category 5 impaired parameters, which would require a pollution control plan under the Clean Water Act. However, Morse Creek is a "water of concern."

As of May 2014, removal of Glines Canyon Dam was nearly complete and removal of Elwha Dam has already been completed, resulting in adverse effects on water quality in the mainstem Elwha River and estuary downstream of the dam sites. Fine and coarse sediments stored for 100 years behind the dams have been released downstream as the dams have been deconstructed, and will continue to be released after dam removal is complete. Fine sediment mobilized in the water column through dam removal has resulted in extremely high suspended-sediment concentrations in the Elwha River downstream of the Glines Canyon Dam site and fine and coarse sediment have deposited in salmon and steelhead habitat along the mainstem and in the tributaries. In planning for dam removal effects, experts anticipated that turbidity (suspended sediment) levels would exceed 1,000 parts per million (ppm) (lethal for fish at chronic exposures) for extended periods of time and would spike to levels exceeding 10,000 ppm (lethal for fish at acute exposures) for several weeks each year for approximately 3 to 5 years following dam removal (Ward et al. 2008; Duda et al. 2011). Fine sediment levels approaching these forecast levels were released after 2012, and have continued into 2014. Commencing in about mid-October 2012, with Elwha Dam completely gone and only one-third of Glines Canyon Dam remaining, suspended sediment levels dramatically increased. Sediment levels have exceeded 5,000 ppm for extended periods in 2013 and 2014 during critical adult salmon and steelhead migration and spawning periods. (USGS Sediment Monitoring Data, November, 2012; Currans et al. 2014). The highest turbidity levels in downstream areas are predicted to occur after the remainder of Glines Canyon Dam is removed during the summer of 2014 (B. Winter, NPS, pers. comm., March 28, 2014).

The high sediment loads will cause deleterious effects in the egg to outmigrant fry stage for all species of fish present in the lower watershed (Pess et al. 2008). Fish exposed to sediment loads between 50 and 100 ppm for an extended period of time may stop feeding, suffer gill abrasion, and experience loss of fitness due to the associated stress (Cook-Tabor 1995). At turbidity levels above 1,000 ppm, direct mortality of fish may result simply from the elevated sediment loads (Cook-Tabor 1995). With sediment loads expected to exceed 10,000 ppm, it was assumed for salmonid population recovery planning purposes that most or all fish rearing naturally in the Elwha River below the former site of Glines Canyon Dam (the dam farthest upstream) would be killed by stored sediment released during dam removal stages and for years following dam removal (Ward et al. 2008).

During spring, 2013, thousands of yearling Chinook salmon released into the lower Elwha River from WDFW's conservation hatchery program died very shortly after release from effects associated with high turbidity (Figure 2). Histopathological examinations of fish recovered from the river banks confirmed that high turbidity was the cause of these mortalities. Turbidity levels in the river when the event occurred were detected at 1,600 ppm. Turbidity levels during the

juvenile fish seaward migration period this year have often exceeded 2,000 ppm. Last summer and fall, during the adult migration periods for Chinook, coho, and chum salmon, turbidity levels in the lower river exceeded 5,000 ppm for the majority of a several week period (Curran et al. 2014).

In addition to fine sediment loading, coarser sediments stored behind the dams have deposited in and adversely affected the vast majority of salmon and steelhead habitat. This condition is expected to persist for up to 10 years (BOR 1996). Recent observations by NMFS Northwest Fisheries Science Center staff indicate that up to 10 feet of sediment material has overwhelmed portions of the lower Elwha River (Figure 3) (NPS 2014; George Pess, NMFS, pers. comm., November 28, 2012). Aggradation levels at these amounts affect river channel morphology by increasing the width-to-depth ratio of the channel cross section, filling pool habitat used by juvenile and adult fish, and reducing the quality of rearing habitat (Ward et al. 2008). As previously forecasted, stored sediment releases are adversely affecting water quality and negatively impacting the condition of river channel areas needed to support juvenile fish survival. Rather than persisting as refugia for natural origin fish, Elwha River floodplain channel areas downstream of the dam sites have instead become sediment repositories that are inhospitable to fish survival (Figures 4 and 5). Water quality has also been impaired by interstitial filling of the gravel beds with fine sediment from the release of stored sediments. This condition has degraded migration and spawning habitat in these and other lower river areas.

Mobilized sediment transported downstream and into marine waters of the Strait of Juan de Fuca should have both adverse and beneficial effects on fish habitat, as it is dispersed by waves and tidal currents and deposited on sediment-starved beaches and the seafloor of the Elwha River delta (Warrick et al. 2011 in Duda et al. 2011).

Figure 2. Elwha Channel Hatchery yearling Chinook salmon mortalities on the banks of the Elwha River resulting from lethal river turbidity levels, April 2013.

Figure 3. Elwha River mainstem condition on December 11, 2012. Photo courtesy of National Park Service, May 2014.

Figure 4. Middle Elwha River floodplain habitat (Boston Charley Creek) prior to dam removal (on left from 1997) and same location after dam removal commenced (on right from 2013). Photos courtesy of Mike McHenry, Lower Elwha Klallam Tribe.

Figure 5. Middle Elwha River floodplain habitat (Elwha Campground) prior to dam removal (on left in 2003) and same location after dam removal commenced (on right from 2013). Photos courtesy of Mike McHenry, Lower Elwha Klallam Tribe.

3.4. Salmon and Steelhead

Salmon and steelhead populations in the Elwha River Basin are severely diminished in abundance, spatial structure, genetic diversity, and productivity as a result of the Elwha and Glines Canyon Dams. Until recently, the dams blocked upstream passage to 90 percent of the salmon and steelhead spawning and rearing habitat in the Elwha River Basin[7] (Figure 6) (Pess et al. 2008). The dams also interrupted the natural function of the river ecosystem. Over 24 million cubic yards (19 million cubic meters) of sediment has been captured in the two reservoirs behind the dams over the last 100 years (Duda et al. 2011), adversely affecting not only the lower river system, but also the estuarine and nearshore environments that are critical as salmon habitat to the east and west of the river mouth. As a result of the dam-caused truncation of alluvial transport of sediment, from 1939 to 2002, the lower 5 miles of the Elwha River, which remained accessible to salmon and steelhead, lost over 75 percent of available spawning habitat for salmonids (Pess et al. 2008). The recruitment of large woody debris from the upper watershed was virtually eliminated by the dams (Pess et al. 2008), and the two reservoirs behind the dams created "heat sinks" during the summer, significantly increasing downstream water temperature to the detriment of natural fish production. In summary, the two dams left the freshwater and marine habitat that is still available to Elwha River salmon and steelhead severely confined and degraded. The presence of the two dams was identified as the single largest factor limiting recovery of Elwha River salmon and steelhead (SSPS 2005; Ward et al. 2008). Because of the lack of accessible, high-quality habitat, salmon and steelhead populations have been primarily sustained through hatchery operations since the dams were constructed.

In 2011, dam removal efforts were initiated so some effects of dam removal efforts are captured in baseline conditions as described in Chapter 3, Affected Environment. By the end of 2014, both the Elwha and Glines Canyon Dams are expected to be removed, and environmental conditions in the Elwha River Basin will continue to change into the future as a result of dam removal activities (Table 10). Currently, there are no fisheries in the Elwha River due to a 5-year moratorium during and immediately after Elwha and Glines Canyon Dam removals.

[7] The Elwha River Dam was removed in 2011, so salmon and steelhead currently have access to river mile 13.5, which is the location of the Glines Canyon Dam.

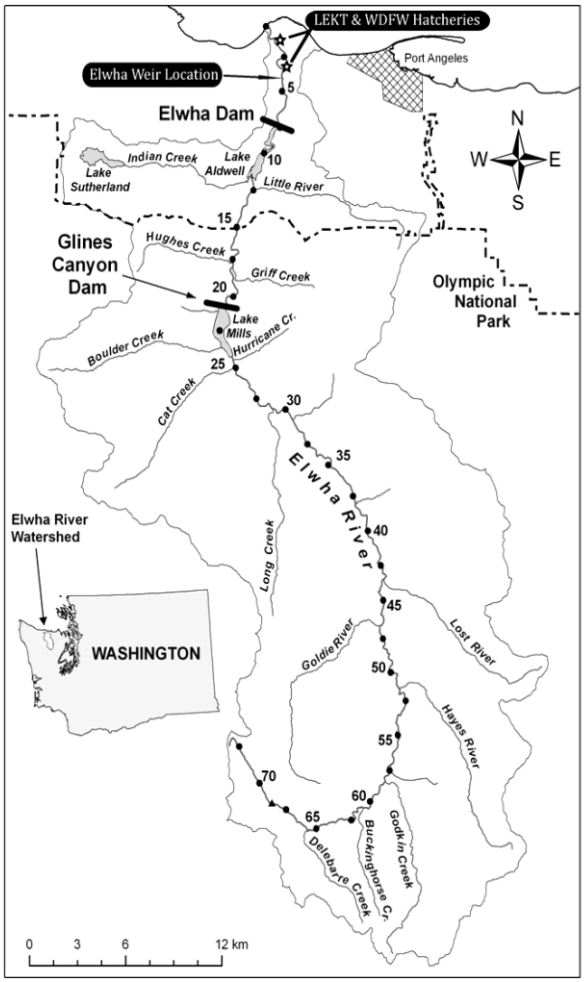

Figure 6. The Elwha River Basin, including the location of Elwha and Glines Canyon Dams, and hatchery structures relevant to the analysis. Numbers on the Elwha River mainstem are river kilometers from the mouth (e.g., river mile 13.5 is equal to river kilometer 20.1).

Generally, 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 6). 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

Table 6. 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 competition for food and space. • Hatchery-origin fish can increase predation on natural-origin salmon and steelhead.
Facility effects	• Hatchery facilities can reduce water quantity or quality in adjacent streams through water withdrawal and discharge. • Weirs 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 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

Effect Category	Description of Effect
	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.

low enough that they are having difficulty finding mates. Table 6 lists the various effects through which the hatchery programs could affect natural-origin salmon and steelhead populations in the Elwha River. 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.

Although current understanding of the genetic effects of hatchery fish spawning with their natural-origin counterparts relies heavily on one study of steelhead in the Hood River, it appears that hatchery rearing can have a substantial genetic effect on fitness.[8] 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 artificial propagation for reducing extinction risk and for rebuilding severely depressed fish populations may outweigh the possibility of short-term fitness loss.

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

[8] See also HSRG (Hatchery Scientific Review Group) 2014. On the Science of Hatcheries: An updated perspective on the role of hatcheries in salmon and steelhead management in the Pacific Northwest. The findings offer an updated prediction on the long-term effects on fitness for segregated and integrated hatchery programs, raising the authors' concerns regarding segregated programs in particular. The study's conclusions do not change NMFS' conclusions regarding the Elwha programs, which rely exclusively on broodstock obtained from the Elwha River, and which include specific pNOB objectives beginning in the local adaptation phase.

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.

Turning to the potential benefits of hatchery programs, in populations with few or no wild fish returning to spawn, hatchery programs can serve as the genetic reserve for the population and prevent the extirpation of the naturally-occurring species. This risk of extirpation is especially high in the Elwha Basin, where the extended release of sediment from dam removal has the potential to kill substantial numbers, if not all, of the remaining natural-origin salmon and steelhead.

A more detailed discussion of the general effects of hatchery programs on salmon, steelhead, and their habitat can be found in the final Environmental Impact Statement to Inform Columbia River Basin Hatchery Operations and the Funding of the Mitchell Act Hatchery Programs (NMFS 2014).

Since 1991, NMFS has identified one salmon ESU (Puget Sound Chinook Salmon) and one steelhead DPS (Puget Sound Steelhead) in the analysis area that require protection under the ESA (70 FR 37160, June 28, 2005; 72 FR 26722, May 11, 2007). There are three additional non-listed salmon species in the analysis area (fall chum salmon, pink salmon, and coho salmon).

Critical habitat was designated for Puget Sound Chinook salmon (70 FR 52630, September 2, 2005). Critical habitat has not been described for chum salmon, pink salmon, or coho salmon. However, NMFS has proposed designation of critical habitat for Puget Sound steelhead (78 FR 2725). The proposed extent of critical habitat for steelhead would encompass the same areas within the Elwha River watershed identified for Puget Sound Chinook salmon. In the Elwha River watershed, Puget Sound Chinook salmon critical habitat is limited to areas below the site of the Elwha Dam, and includes adjacent marine areas. Within these areas, NMFS identifies primary constituent elements, which are sites and habitat components that support one or more life stages and are considered essential for the conservation of the ESU. Critical habitat in the Elwha River includes all of the defined primary constituent elements, such as freshwater spawning and rearing sites, freshwater and estuarine migration corridors, all requiring adequate water quantity and quality, natural cover, freedom from excessive predation, and adequate substrate.

3.4.1. Puget Sound Chinook Salmon (ESA-listed)

The Elwha River Chinook salmon population, which includes Chinook salmon spawning in Morse Creek, is one of the 22 populations of Chinook salmon in the Puget Sound Chinook Salmon ESU. As one of only two populations in the Strait of Juan de Fuca biogeographical region, the Elwha Chinook salmon population has been recognized as a key population needing to be restored to a low extinction risk status for recovery and delisting of the ESU (NMFS 2007).

Abundance of Elwha Chinook salmon is substantially reduced from historical levels, and abundance of the remaining population is further threatened in the short term by excessive sediment and turbidity levels resulting from dam removal (Ward et al. 2008). Total Chinook salmon abundance over the last 35 years has ranged from 929 to 9,083 fish, and averaged 2,541 fish (Figure 6). WDFW estimates that approximately 95 percent of the total Chinook salmon adult returns to the river in 2008, 2009, and 2010 originated from Elwha River Basin hatchery programs, and just 4 percent were of natural-origin (1 percent were out of basin strays) (WDFW 2012a). The estimated recent year average number of natural-origin Chinook salmon is approximately 102 fish.

The hatchery program in the Elwha River that has supported the majority of adult returns currently releases 2.7 million juvenile fish into the Elwha River (2.5 million subyearlings and 200,000 yearlings) (WDFW 2012a) (Table 3). The number of returning adult hatchery-origin fish in the river may also be expected to be reduced relative to the recent year abundances shown in Figure 3, because juvenile release levels for the program in previous decades were higher. The current program was reduced from its previous size following guidance provided in the Elwha Fish Restoration Plan and by the HSRG (2012) to ensure the program meets long term restoration goals, while minimizing hatchery-related risks to unsubstantial levels. This reduced program is expected to result in the total return of about 2,320 adult fish (Table 3), assuming average juvenile to adult return survival levels and before marine area fisheries impacts. Approximately 1,700 adult fish are needed as broodstock to sustain juvenile fish production from the hatchery program at current reduced levels (WDFW 2012a).

Spatial structure of the Elwha Chinook population was adversely affected by dam construction and operation in the watershed, and spatial structure will be further affected as a result of dam removal activities. The construction of the Elwha Dam in 1911 blocked access of Elwha Chinook to 90 percent of their historical range of spawning and rearing habitat (Figure 3) (Pess et al. 2008). Furthermore, access to all areas previously used by the now likely extirpated spring-run Chinook salmon race native to the river was eliminated. Salmon habitat remaining in the lower Elwha River is generally of poor quality, with only a small area of relatively high-

quality habitat remaining in about two dozen mainstem and side-channel areas (e.g., Hunt's Road side-channel). Because the Elwha River Dam was removed in 2011, Elwha River Chinook salmon currently have access to mainstem and tributary areas up to river mile 13.5 of the Elwha River, which is the site of the Glines Canyon Dam.

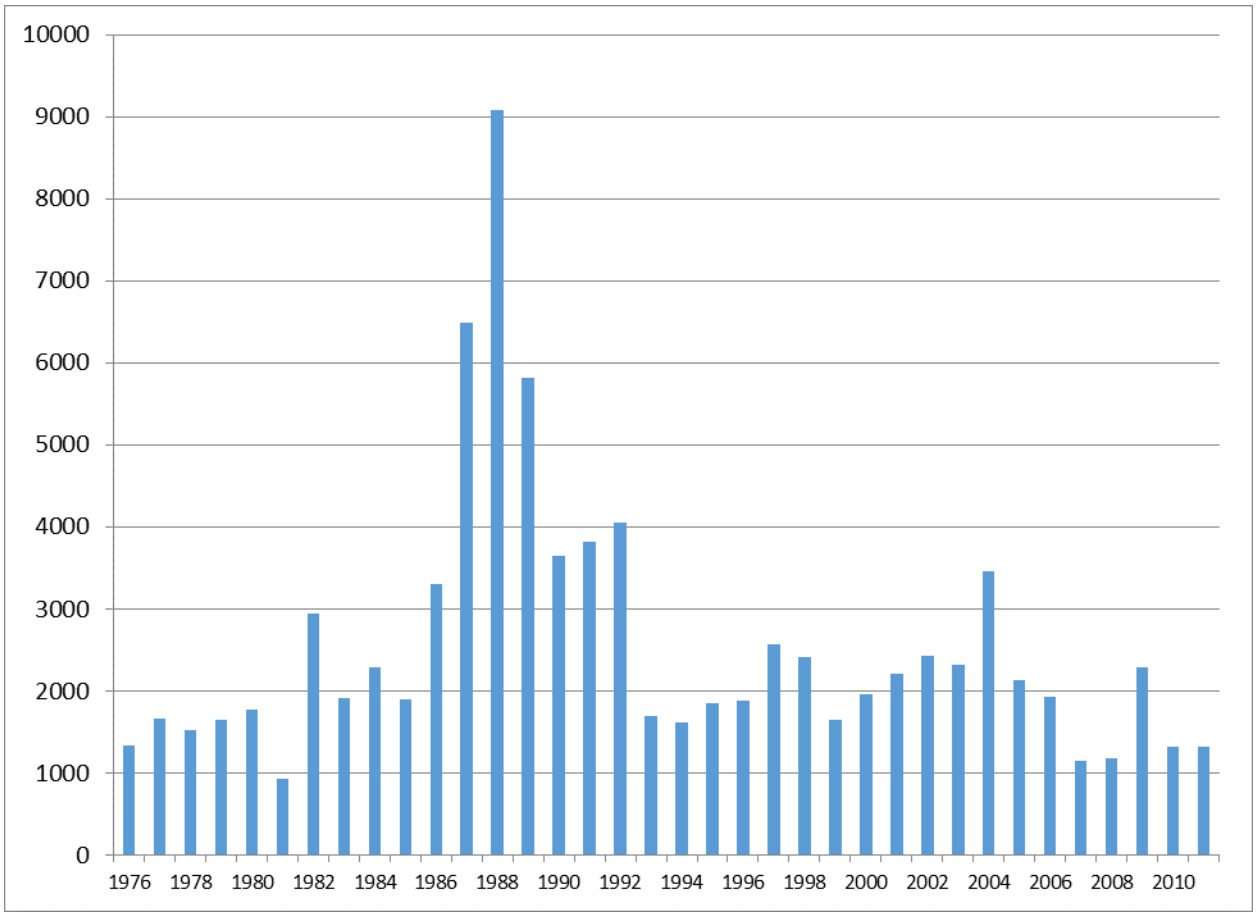

Figure 7. Total run size (natural-origin and hatchery-origin fish included) of Chinook salmon to the Elwha River – 1976 through 2011. Source: WDFW Run Reconstruction - January 23, 2013, and WDFW 2012.

Genetic diversity of the Elwha Chinook salmon was greatly reduced by anthropogenic activities, primarily dam placement and operation, over the last century, and is greatly reduced relative to historical levels. Currently, only a fraction of the original genetic diversity of the species remains (Pess et al. 2008). The spring-run Chinook salmon race, an important genetic component of the Elwha population (as expressed by early river entry, large adult body size, and spawning typically high in the watershed) have been largely extirpated from the Elwha River (Brannon and Hershberger 1984; Wunderlich et al. 1993). Loss of access to upriver habitat was the primary cause of their drastic decline. Genetic diversity of the remaining summer/fall run of Chinook salmon was reduced as a result of confinement to 10 percent of historically available habitat and

to degradation and loss of habitat within the confined area where the population spawns. Considering that nearly all Chinook salmon returning to the river are hatchery-origin fish, remaining diversity of the population has likely been retained predominately through the supportive breeding program for the native stock operated by WDFW for decades. The productivity of the Elwha natural-origin Chinook salmon population has been suppressed by the lack of available and suitable spawning and rearing habitat, with the species recruiting at below-replacement levels (Ford et al. 2011). Although the Elwha River Dam was removed in 2011 and removal of the Glines Canyon Dam is expected to be completed by the end of 2014, the benefits of dam removal on genetic diversity and productivity have not yet been realized. Depending on flow levels allowing passage at the Elwha Dam site, Chinook salmon have been observed spawning in mainstem and tributary reaches downstream of the Glines Canyon dam site. In 2014, 88 percent of the fish that spawned upstream of the Elwha Dam site spawned in mainstem Elwha River areas (S. Brenkman, NPS, unpublished data, November, 2013). Redds created by these spawning fish were exposed to excessive course and fine sediment levels inhospitable to fish survival (Curran et al. 2014).

There are currently no fisheries impacting the abundance of the Elwha Chinook salmon population through direct harvest. Fisheries for Chinook salmon and other salmon species (e.g., coho salmon) have been largely curtailed since the 1980s in the Elwha River and adjacent marine areas as a specific measure to minimize impacts on the Elwha Chinook salmon population. There was a small Tribal commercial fishery in the lower 5 miles of the Elwha River that targeted non-native (i.e., Chambers Creek), hatchery-origin steelhead, but this fishery was terminated after the 2013-2014 fishing season. Elwha River Chinook salmon are harvested incidentally in United States and Canadian mixed-stock marine area fisheries targeting more abundant salmon stocks.

3.4.2. Puget Sound Steelhead (ESA-listed)

The Elwha River late-returning, winter-run steelhead population is included in the Puget Sound Steelhead DPS. Under draft DPS viability criteria under development and consideration by NMFS (Hard et al., pending), it is likely that Elwha River steelhead will be a key population needing to be restored to a low extinction risk status for recovery and delisting of the DPS.

In the most recent status review for the Puget Sound Steelhead DPS, NMFS found that, since 1995, Puget Sound winter-run steelhead abundance has shown a widespread declining trend over much of the DPS (Ford 2011). The native Elwha steelhead population was among the most severely affected, with sharply declining population trends over both the long (1985 through 2009) and short (1995 through 2009) terms. The recent-year (2005-2006 run year through 2009-

2011 run year) average escapement of 141 fish (all natural-origin) is 7.3 percent of the viability trigger level of 1,938 naturally spawning fish developed by scientists for progression into the local adaptation phase of restoration (NMFS 2012a). Naturally spawning fish abundance is further threatened over the short term by dam removal activities. The Puget Sound Steelhead DPS was recently amended to clarify that the Lower Elwha Klallam Tribe's native Elwha River steelhead hatchery population is included in the listing along with the wild population (FR 79 20802, April 14, 2014).

Spatial structure of the Elwha River steelhead population has been adversely affected by dam construction and operation in the watershed. The construction of the Elwha Dam in 1911 blocked access of steelhead to 90 percent of their historical range of spawning and rearing habitat. Because the Elwha River Dam was removed in 2011, Elwha River steelhead currently have access up to river mile 13.5 of the Elwha River, which is the site of the Glines Canyon Dam. However, steelhead habitat in the mainstem river and floodplain below the Glines Canyon Dam is of generally poor quality, with only a small area of relatively high-quality habitat remaining in two tributaries above the Elwha Dam site, and about two dozen mainstem and side-channel areas downstream of the site (e.g., Hunt's Road side-channel).

Because of dam construction and resultant degradation of downstream habitat, genetic diversity of Elwha River steelhead has been substantially reduced from historical levels. Occurrence, distribution, and connectivity of *O. mykiss* life history forms have been severely affected, to the detriment of within- and among-population genetic diversity in the watershed. For example, loss of access to upper watershed areas caused by dam construction has led to decreased life-history diversity (Beechie et al. 2006). Historically, the majority of summer steelhead migrated upstream above Elwha Dam in the late spring and early summer to access river habitats that have more suitable temperatures for holding and spawning (Pess et al. 2008). For 100 years, up-river habitat has not been accessible to anadromous fish because of upstream migration blockage by Elwha Dam. Summer steelhead were confined to the lower Elwha River, where peak summer temperatures when the race entered and held in the river typically reach 18 to 21°C, and this race is now believed by the Puget Sound TRT to be extirpated (PSSTRT 2012). Genetic diversity of remaining winter-run forms of the species in the lower river is further threatened in the short term by excessive sediment and turbidity levels resulting from the stored sediment released by dam removal (Beechie et al. 2006; Ward et al. 2008). The productivity of the Elwha River late-returning steelhead population is suppressed, with the species recruiting at levels well below replacement (Ford et al. 2011). Although the Elwha River Dam was removed in 2011 and removal of the Glines Canyon Dam is expected to be completed by the end of 2014, the benefits of dam removal on genetic diversity and productivity have not yet been realized. A few steelhead have escaped upstream of the Elwha Dam site to spawn naturally in tributaries downstream of Glines Canyon Dam (McMillan et al. 2013). However, the vast majority of

steelhead spawning naturally in the tributaries in 2012-2014 originated from releases from adult steelhead returning to and trapped at the hatcheries, and adjacent lower river areas, and trucked upstream (McMillan et al. 2013a[9]). These trapping and upstream release actions for adult hatchery-origin and natural-origin steelhead surplus to hatchery broodstock needs are consistent with requirements included in the NMFS biological opinions to mitigate for dam deconstruction effects (NMFS 2012c).

There have been no directed fisheries since the late 1970s on the late-returning, winter-run steelhead population. In recognition of the depleted state of the native late-returning steelhead population, tribal and recreational fisheries harvests have targeted only early-returning hatchery-origin steelhead (an out-of-basin stock originating from Chambers Creek stock) that entered the river prior to the majority of late-returning fish in need of protection. However, a small portion of the late-returning run (i.e., the native stock) were taken incidentally each year during fisheries that target early-returning hatchery-origin steelhead produced at Lower Elwha Fish Hatchery. The Lower Elwha Klallam Tribe's steelhead catch monitoring data for 1982 through 1996 indicate an estimated 10 to 18 natural-origin, late-returning steelhead were harvested annually by the Tribal commercial fishery in the Elwha River. Estimated total annual harvests in Tribal fisheries directed at early-returning Chambers Creek lineage steelhead have ranged from 173 to 296 fish for the 2003-2004 through 2007-2008 fishing seasons. The early-returning Chambers Creek lineage steelhead program has been terminated, and the last four year old Chambers Creek adult steelhead returned in 2014. There are no fisheries in the Elwha River on any species at this time due to a 5-year moratorium during and immediately after Elwha and Glines Canyon dam removals.

3.4.3. Puget Sound Fall Chum Salmon

The fall chum salmon population in the Elwha River is part of the Puget Sound/Strait of Georgia Chum Salmon ESU (Johnson et al. 1997). The ESU includes all naturally spawned populations of chum salmon from Puget Sound, the Strait of Georgia, and the Strait of Juan de Fuca up to and including the Elwha River, with the exception of summer-run chum salmon from Hood Canal and the Strait of Juan de Fuca. After reviewing the status of chum salmon populations in the region, NMFS determined that ESA listing of the ESU was not warranted on August 10, 1998 (63 FR 11774).

[9] Steelhead were captured at the WDFW Hatchery trap outflow and in the lower mainstem of the Elwha River. These fish were transported upstream of the Elwha Dam and released into the Little River, a tributary to the Middle Elwha River (Figure 6). Redd surveys of the tributaries between the Elwha and Glines Canyon Dams indicated that most spawning steelhead were transported fish. However, some steelhead spawning (including nine redds in Indian Creek) resulted from natural colonization (McMillan et al. 2013a).

Chum salmon in the Elwha River are considered a native, natural-origin stock (WDFW and WWTIT 1993) with a fall-run timing. Historical spawner estimates placed population abundance at many thousands, likely the second most-abundant species in the river behind pink salmon. Abundance, spatial structure, productivity, and genetic diversity have been greatly reduced by Elwha and Glines Canyon dams. Spawner surveys in 1993 to 1995 indicated the population had declined to 150 to 300 adults (Hiss 1995). The Elwha chum salmon stock is considered critically depressed in status, with annual abundance of adult fish escaping to spawn in the Elwha River in the 100 to 200 fish range. Estimated escapements in 2010, 2011, and 2012 were 4 fish, 80 fish, and 205 fish, respectively (Aaron Default, WDFW, pers. comm., May 14, 2014). Naturally spawning fish abundance, genetic diversity, and productivity are further threatened over the short term by dam removal activities. Spatial structure has improved as a result of the removal of the Elwha River Dam. However, the benefits of dam removal on abundance, genetic diversity, and productivity have not yet been realized.

No harvest is directed at Elwha chum salmon, though very low levels of incidental harvest of the species has occurred historically incidental to commercial and recreational fisheries targeting Elwha River coho salmon. Currently, there are no salmon or steelhead fisheries in the Elwha River due to a 5-year moratorium during and immediately after Elwha and Glines Canyon dam removals. Chum salmon are not encountered during tribal steelhead fisheries.

3.4.4. Puget Sound Pink Salmon

The odd- and even-year pink salmon aggregations in the Elwha River are included as part of the Washington Odd- and Puget Sound Even-Year Pink Salmon ESUs, respectively (Hard et al. 1996). NMFS has determined that ESA listing for the two ESUs and their component populations, including the Elwha populations, was not warranted (60 FR 192, October 4, 1995). However, both Elwha River populations are at a critically low abundance status, and are in danger of extirpation (WDFW 2002; LEKT and WDFW 2012). Although the Elwha River pink salmon populations are in danger of extirpation, the ESUs as a whole, are not in danger of extirpation because they contain several healthy pink salmon populations.

Pink salmon historically were the most numerous salmonids in the Elwha River and their recovery is critical to the overall success of the restoration effort. The historical Elwha River pink salmon populations were considered the “cornerstone” anadromous salmonid species in the Elwha River watershed, and were estimated to have numbered in the hundreds of thousands of adult fish (Pess et al 2008). Abundance, spatial structure, productivity, and genetic diversity have been greatly reduced by Elwha and Glines Canyon Dams. Odd-year pink salmon escapement indices have ranged from approximately 200 fish in 2001 to less than 40 fish in 2009, with even-year pink salmon escapements estimated to be under 20 fish during that period (LEKT and

WDFW 2012). The native Elwha River pink salmon population is considered to be at high risk of extirpation due to its extremely low annual adult abundance levels.

The quantity and quality of available habitat for pink salmon production will be gradually restored when the Glines Canyon Dam is removed, but pink salmon will be threatened with extirpation over the short term by inhospitable water quality and sedimentation conditions during the adult return and egg incubation periods associated with dam removal in currently accessible river areas.

No directed harvest of Elwha River pink salmon has occurred for decades. Adult fish may be harvested incidentally in marine area fisheries directed at other pink salmon populations and other species (sockeye and Chinook salmon) in United States and Canadian waters. Exploitation rates on Elwha River pink salmon are expected to be very low (under 5 percent), given weak stock management requirements for fisheries occurring in adjacent marine waters (NMFS 2011). Pink salmon are not encountered during tribal steelhead fisheries.

3.4.5. Puget Sound Coho Salmon

The coho salmon population in the Elwha River is part of the Puget Sound/Strait of Georgia coho salmon ESU (Weitkamp et al 1995). ESA listing of the ESU was determined by NMFS to be not warranted (75 FR 38776, July 6, 2010).

Total run size abundance of Elwha River coho salmon (including both hatchery and natural-origin fish) has ranged from 2,000 to 10,000 fish in the last decade. Until 2011, natural coho salmon production was confined to the degraded mainstem area and tributaries downstream of Elwha Dam (river mile 4.9) for 100 years, and hatchery-origin coho salmon have comprised the majority of annual returns to the river for at least four decades. Coho salmon currently have access to mainstem and tributary areas up to river mile 13.5 as a result of the removal of the Elwha River Dam, but the Glines Canyon Dam continues to block their access to most of their historical habitat. Furthermore, remaining coho spawning and rearing habitats downstream of the Elwha Dam site are affected in the short-term by high sediment transport, channel instability, and reduced water quality resulting from dam removal and the release of stored sediments. Consequently, naturally-spawning fish abundance, spatial structure, genetic diversity, and productivity are threatened over the short term by dam removal activities. The benefits of dam removal on abundance, spatial structure, genetic diversity, and productivity have not yet been realized.

In 2013, 1,052 coho salmon were collected in the lower Elwha River, transported, and released into three tributaries above the Elwha Dam (i.e., Indian Creek, Madison Creek, and Little River). Spawning ground surveys indicated that nearly all coho spawning above the Elwha Dam resulted from these transported fish (McMillan et al. 2013b).

Elwha River coho salmon are a mixed-origin stock of composite production associated with hatchery facilities in the lower Elwha River. The river was planted with out-of-basin hatchery coho salmon, beginning in the early 1950s and continuing to the 1970s (WDFW and WWTIT 1993). Artificial production of the current hatchery stock began with Dungeness and Elwha River fish in the mid-1970s.

Currently, no fisheries target hatchery-origin or natural-origin coho salmon in the Elwha River Basin due to a 5-year moratorium during and immediately after the Elwha and Glines Canyon dam removals. However, Elwha coho salmon would continue to be harvested incidentally in United States and Canadian mixed stock marine area fisheries targeting more abundant salmon stocks. Coho have been encountered during the now terminated steelhead fishery on the early-timed, Chambers Creek population. Coho would not be encountered during the steelhead fishery on the late-timed, hatchery-origin steelhead population.

3.5. Other Fish Species

Many fish species in the Elwha River Basin and nearshore marine areas have a relationship with salmon and steelhead as prey, predators, or competitors (Table 7). The following species may eat salmon and steelhead eggs and fry: Pacific lamprey, Western brook lamprey, coast range sculpin, prickly sculpin, eastern brook trout, rainbow trout, kokanee, bull trout, cutthroat trout, and rockfish. All fish species in the Elwha River Basin may be prey for salmon and steelhead at some life stage. Additionally, all fish species in the Elwha River Basin compete with salmon and steelhead for food and space.

In addition to Chinook salmon and steelhead, there are two other fish species listed under the ESA in the Elwha River Basin: eulachon and bull trout are both listed as threatened (Table 7). Critical habitat has been designated for the southern DPS of Pacific eulachon (76 FR 65324, October 20, 2011). In general, watershed areas designated as critical habitat extend from the mouth of the river upstream to a fixed location where eulachon were known to be present, including the stream channel and side channels; critical habitat also includes tidally influenced areas. In the Elwha River, Reservation, adjacent, and nearby lands owned by the Lower Elwha Klallam Tribe were excluded from the critical habitat designation. The physical or biological features essential for conservation of the southern DPS of Pacific eulachon include freshwater

spawning and incubation sites, freshwater and estuarine migration corridors, and nearshore and offshore marine foraging habitat.

The Elwha River Basin includes habitat designated as critical for bull trout (75 FR 63898, October 18, 2010). Bull trout critical habitat includes primary constituent elements considered essential for the conservation of bull trout, and may require special management considerations or protection. Such elements include adequate migration, spawning, and rearing habitat, including maintained connectivity, sufficient water quality and quantity, low levels of piscivorous (i.e., fish eating) or competing species, and an abundant food base.

Pacific lamprey and Western brook lamprey are Federal "species of concern" and are Washington State "monitored species" (Table 7). In marine areas, several species of rockfish are

Table 7. Range and status of other fish species that may interact with Elwha River salmon and steelhead.

Species	Range in Elwha River Basin	Federal/State Listing Status	Type of Interaction with Salmon and Steelhead
Freshwater -			
Pacific lamprey and Western brook lamprey	Pacific: accessible reaches below Glines Canyon Dam Western brook: watershed areas upstream and downstream of the Glines Canyon Dam.	Federal species of concern; Washington State monitored species.	• 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 benefit from additional marine-derived nutrients provided by hatchery-origin fish
Coast range and Prickly sculpin	All accessible reaches in the Elwha River Basin	None	• 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 benefit from additional marine-derived nutrients provided by hatchery-origin fish
Eulachon	Accessible reaches below Glines Canyon Dam	Federal threatened species	• May compete with salmon and steelhead for food and space • Potential prey item for salmon and steelhead • May benefit from additional marine-derived nutrients provided by hatchery-origin fish

Species	Range in Elwha River Basin	Federal/State Listing Status	Type of Interaction with Salmon and Steelhead
Three-spine stickleback	Accessible reaches upstream and downstream of the Glines Canyon Dam	None	• May compete with salmon and steelhead for food and space • Potential prey item for salmon and steelhead • May benefit from additional marine-derived nutrients provided by hatchery-origin fish
Red-side shiner	Accessible reaches downstream of RM 7.0. (Highway 101 Bridge)	None	• May compete with salmon and steelhead for food and space. • Potential prey item for salmon and steelhead • May benefit from additional marine-derived nutrients provided by hatchery-origin fish
Eastern brook trout	High lakes and localized below Rica Canyon to the river mouth. Non-native but localized to the watershed.	None	• 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 benefit from additional marine-derived nutrients provided by hatchery-origin fish
Rainbow trout (resident)	Elwha River watershed upstream of the Glines Canyon Dam and in mainstem areas downstream of the dam site.	None	• 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
Kokanee	Lake Sutherland, Elwha River watershed	None	• 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 benefit from additional marine-derived nutrients provided by hatchery-origin fish
Bull Trout	Accessible reaches upstream and downstream of the Glines Canyon Dam	Federal threatened species	• Predator of salmon and steelhead eggs and fry • Potential prey item for adult salmon and steelhead • May compete with salmon and

Species	Range in Elwha River Basin	Federal/State Listing Status	Type of Interaction with Salmon and Steelhead
			steelhead for food and space • May benefit from additional marine-derived nutrients provided by hatchery-origin fish
Cutthroat trout	Accessible reaches upstream and downstream of the Glines Canyon Dam	None	• 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 benefit from additional marine-derived nutrients provided by hatchery-origin fish
Marine Areas			
Rockfish	Rocky reef habitats in certain areas of Puget Sound including South Sound, Hood Canal, waters east of Admiralty Inlet, the eastern Strait of Juan de Fuca and the San Juan Island region	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
Forage fish	Most marine waters within Puget Sound and the Strait of Juan de Fuca	Pacific herring is a Federal species of concern and a State candidate species	• Prey for juvenile and adult salmon and steelhead • May compete with salmon and steelhead for food

Sources: NPS 1996; DOI et al 1994; Brenkman et al. 2008; Gustafson et al. 2010; Ward et al. 2008; http://www.elwhainfo.org/research-and-science/fisheries/fish-elwha-river/fish-species; Sam Brenkman, National Park Service, pers. comm., August 8, 2012.

[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.

listed as threatened under the ESA. Pacific herring (a forage fish for salmon and steelhead) is a Federal species of concern and a State candidate species. All of these species have a range that includes the Elwha River Basin or nearby marine areas. However, none of these species is located exclusively in the Elwha River Basin or nearby marine waters, and in most cases these areas are a very small percentage of their total range.

The last non-native, Chambers Creek steelhead returned to the Elwha River in 2014. Until 2014, a Tribal steelhead fishery in the lower 5 miles of the Elwha River used commercial gillnets (5-inch mesh) to target Chambers Creek hatchery-origin steelhead. Tribal fishermen did not

encounter any freshwater species, including Pacific lamprey, Western brook lamprey, coast range and prickly sculpin, eulachon, three-spined stickleback, red-side shiner, eastern brook trout, kokanee, bull trout, and cutthroat trout (D. Morrill, pers. comm. with Amilee Wilson, NMFS, September 5, 2012). These species are too small to be captured by 5-inch mesh gillnets. Until this year, Tribal members also had a subsistence fishery in the lower Elwha River using commercial gillnets and hook and line gear. Larger fish species such as bull trout were periodically encountered in the subsistence fishery, but no documented information on total incidental mortality is available at this time (D. Morrill, pers. comm. with Amilee Wilson, NMFS, September 5, 2012). There are no other fisheries in the Elwha River at this time due to a 5-year moratorium during and immediately after Elwha and Glines Canyon Dam removals.

3.6. Wildlife

Hatchery operations have the potential to affect wildlife by changing the total abundance of salmon and steelhead in aquatic and marine environments. Changes in the abundance of salmon and steelhead can affect wildlife through predator/prey interactions. Many wildlife species feed on salmon carcasses in the Elwha River and subsequently bring nutrients from the salmon into the terrestrial ecosystem (i.e., nutrient cycling). In addition, hatcheries could affect wildlife through transfer of toxic contaminants from hatchery-origin fish to wildlife, the operation of weirs (which could block or entrap wildlife), or predator control programs (which may harass or kill wildlife preying on juvenile salmon at hatchery facilities).

The Elwha River Basin area supports a variety of birds, large and small mammals, amphibians, and invertebrates that may eat or be eaten by salmon and steelhead (Table 8). Salmon and steelhead eat invertebrates and amphibians, which may include insects and frogs. Salmon predators include several species of birds, cougars, black bear, river otter, mink, weasels, and some amphibians. Some bird species, including bald eagle and cormorants, scavenge on salmon and steelhead carcasses, as do minks, weasels, and several invertebrate species. Other wildlife species compete with salmon and steelhead for food or habitat (e.g., gulls). Fish are not the only component of the diets of these species, though salmonids may represent a somewhat larger proportion of the diet during the relatively short period of the year that adult salmon return to the analysis area.

Within the analysis area, the following wildlife species are listed under the ESA: Northern spotted owl, marbled murrelet, Southern resident killer whale, and Steller sea lion (Table 8). The Pacific fisher and Mazama pocket gopher are Federal candidate species. The brown pelican, Northern goshawk, and peregrine falcon are Federal species of concern.

Although killer whales, seals, sea lions, dolphins, and porpoises are not found in the Elwha River Basin, they may intercept Elwha River salmon and steelhead when feeding in marine waters. No other marine mammals eat Elwha River salmon and steelhead. The Southern resident killer whale diet consists of a high percentage of Chinook salmon, with an overall average of 82

Table 8. Status and habitat associations of wildlife in the analysis area with direct or indirect relationships with hatchery-origin salmon and steelhead.

	Status	**Habitat[1]**			**Relationship with Salmon and Steelhead**			
Species		**Fresh-water**	**Estuary**	**Marine**	**Predator**	**Competitor**	**Prey**	**Scavenger**
Bald eagle	State threatened species	√	√	√	√			√
Northern spotted owl	Federal threatened species	√			√			
Marbled Murrelet	Federal threatened species		√	√	√			
Brown Pelican	State endangered species; Federal Species of Concern			√	√			
Northern goshawk	Federal species of concern	√	√		√			
Pacific Fisher	Federal candidate species	√			√			
Peregrine falcon	Federal species of concern	√	√					
Gulls and cormorants	None	√	√	√	√	√		√
Great blue heron	State Monitored Species	√	√		√	√		
Duck (species)	None	√	√	√	√			
Beaver	None	√				√		
Cougar	None	√			√			
Black bear	None	√	√		√			
River otter	None	√	√		√			

	Status	Habitat[1]			Relationship with Salmon and Steelhead			
Species		**Fresh-water**	**Estuary**	**Marine**	**Predator**	**Competitor**	**Prey**	**Scavenger**
Mink and weasels	None	√	√		√			√
(Olympic) Mazama pocket gopher	State threatened, Federal candidate species	√						
Bats	Varies by species[2]	√				√		
Amphibians (e.g., salamanders and frogs)	Varies by species[3]	√			√	√	√	
Aquatic/terrestrial/ riparian zone invertebrates (e.g., insects and snails)	Varies by species[4]	√	√				√	√
Southern Resident Killer Whale	Federal Endangered Species			√	√			
Harbor seal	Protected under MMPA[5]		√	√	√	√		
California and Steller sea lions	Protected under MMPA; Western DPS of Steller sea lion ESA-listed endangered		√	√	√	√		
Sea otter (Washington Coastal stock)	State-listed endangered; protected under MMPA			√	√	√		
Harbor porpoise (Inland Washington and Oregon-Washington Coastal stocks)	Protected under MMPA; State species of concern			√	√	√		
Dall's porpoise (California /Oregon/Washington stock)	Protected under MMPA.			√	√	√		

	Status	Habitat[1]			Relationship with Salmon and Steelhead			
Species		**Fresh-water**	**Estuary**	**Marine**	**Predator**	**Competitor**	**Prey**	**Scavenger**
Pacific white-sided dolphin (California /Oregon/Washington stock)	Protected under MMPA.			√	√	√		
Marine invertebrates (e.g., zooplankton)	None		√	√			√	

Sources: Listed And Proposed Endangered And Threatened Species And Critical Habitat; Candidate Species; And Species Of Concern In Clallam County. As Prepared By The U.S. Fish And Wildlife Service Washington Fish And Wildlife Office. (Revised August 1, 2011); Washington State Species of Concern Lists: http://wdfw.wa.gov/conservation/endangered/lists/search.php?searchby=simple&search=black+bear&orderby=AnimalType%2CCommonName

[1] Includes those habitats most relevant for evaluating interactions with salmon and steelhead; does not include all habitats used by each species.

[2] Applicable listed species include Longeared myotis (Myotis evotis) (Federal sensitive species); Longlegged myotis (Myotis volans) (Federal sensitive species); and Pacific Townsend's big-eared bat (Corynorhinus townsendii townsendii) (state and Federal candidate species).

[3] Applicable listed species include federally listed sensitive species (Cascades frog (Rana cascadae) (State Monitored); Olympic torrent salamander (Rhyacotriton olympicus); Tailed frog (Ascaphus truei) (State Monitored); Van Dyke's salamander (Plethodon vandykei); and Western toad (Bufo boreas).

[4] Applicable listed species include federally listed snails (Bliss Rapids snail, Taylorconcha serpenticola, (federally threatened), Banbury Springs lanx, Lanx sp., (federally endangered), Snake River physa snail, Physa natricina, (federally endangered), Utah valvata, Valvata utahensis, (federally endangered).

[5] Marine Mammal Protection Act. Enacted by Congress in 1972, the MMPA 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.

percent Chinook salmon (Hanson et al. 2010). However, because Elwha River salmon and steelhead co-occur with many other hatchery-origin and natural-origin salmon and steelhead populations from the Puget Sound, Fraser River, Columbia River, and Washington Coast while in marine waters, Elwha River salmon and steelhead are not expected to be a substantial component of their diet.[10]

[10] The number of adult fish produced by Elwha River hatchery programs represents an unsubstantial proportion of the total abundance of each salmon species present in Puget Sound and Pacific Coastal marine areas. For example, an estimated 2,104 Chinook salmon on average have returned to the Elwha River in recent years (2000-2009) (estimated total annual adult return to the Elwha River from WDFW Run Reconstruction, January 8, 2010). The 2000-2009 average total run size for Chinook salmon in Puget Sound is 247,917 fish, and the estimated total annual abundance of Chinook salmon from all regions in Washington State and British Columbia Pacific Ocean coastal waters averages approximately 1,000,000 fish (L. LaVoy, NMFS, pers. comm., January 6, 2012).

None of the hatchery facilities supporting the Elwha River hatchery programs hazes wildlife to prevent them from eating fish being raised in the hatchery facilities. Instead, the hatchery facilities use nets over their raceways to exclude predators, and this practice is not expected to adversely affect any wildlife species (LEFT 2012a; LEKT 2012b; LEKT 2012c; LEKT and WDFW 2012).

Fisheries have the potential to affect wildlife through habitat disruption that may occur from physical damage or disruption of riparian vegetation from angler access as well as physical disruption of streambed material by wading or motorized boat use. Currently, there are no salmon and steelhead fisheries in the Elwha River due to a 5-year moratorium during and immediately after the Elwha and Glines Canyon dam removals. However, because there has been subsistence and recreational fishing in the Elwha River Basin prior to the fishing moratorium, fishery access points, roads, and boat launches are present throughout the analysis area.

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 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.

Annual operation of the Elwha River hatchery programs contributes over $1.65 million (through the procurement of local goods and services) and 14 full-time jobs to the regional economy (LEFT 2012a; LEKT 2012b; LEKT 2012c; LEKT and WDFW 2012). WDFW operates the Elwha Channel Facility, the Sol Duc Hatchery, and Hurd Creek Hatchery. The WDFW facilities employ 10 full-time employees to support the Elwha River hatchery programs. The Lower Elwha Klallam Tribe operates the Lower Elwha Hatchery, which employs 4 full-time employees to support the Elwha River hatchery programs (LEFT 2012a; LEKT 2012b; LEKT 2012c; LEKT and WDFW 2012).

Fisheries contribute to local economies through the purchase of supplies such as fishing gear, camping equipment, consumables, and fuel at local businesses. All of these expenditures would be expected to support local businesses. Anglers would also be expected to contribute to the economy through outfitter/guide/charter fees.

No Elwha River salmon or steelhead populations are currently targeted in fisheries. The State and Tribe have terminated all other fisheries during the 5-year period following initiation of dam removal activities to assist in the restoration efforts. Although salmon and steelhead originating from the Elwha River may be incidentally intercepted in fisheries in Puget Sound/Strait of Juan de Fuca, Washington Coast, Southeast Alaska, and British Columbia, Elwha River fish are a very small percentage of the total number of fish in the fisheries in these areas, and the Elwha River hatchery programs do not meaningfully contribute to these fisheries. Although data on the amount of money and the number of jobs currently supported through fishing-related expenditures in the Elwha River Basin are not available, fishing-related expenditures in the state of Washington accounted for less than 0.2 percent ($534 million) of the total state revenue in 2006, and salmon and steelhead angling only accounted for a portion of that total (USCB 2012).

3.8. Cultural Resources

Impacts on cultural resources typically occur when an action disrupts or destroys cultural artifacts, disrupts cultural use of natural resources, or would 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.

Salmon represent an important cultural resource to the Lower Elwha Klallam Tribe. Salmon is 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).

The Lower Elwha Klallam Tribe's "usual and accustomed" fishing area includes the entire Elwha River Basin. Historically, the Tribe relied on all species of fish in the watershed for sustenance and as a valuable cultural resource. However, construction of the Elwha River dams prevented salmon from traveling upriver and led to the degradation of habitat for the fish in the remaining 5 miles downstream of the dams. The resultant precipitous decline in natural-origin salmon and steelhead productivity and abundance severely diminished the availability of all species for harvest by the Tribe relative to historical levels. After the dams were constructed, the Lower Elwha people watched, year after year, as the salmon runs declined (Busch 2008). The river's legendary Chinook salmon were reduced to remnants of hatchery offspring and of the naturally spawning population (Busch 2008). Since dam construction, the Tribe has targeted salmon and steelhead produced by the tribal and state hatchery programs in the lower 5 miles of the Elwha River. These fisheries have played a central role in the Lower Elwha Klallam Tribe's

culture, in particular fisheries conducted for ceremony and subsistence purposes (NPS 1995). Currently, no salmon or steelhead returning to the Elwha River are targeted in Tribal fisheries. The Tribe has terminated all other fisheries during the 5-year period following initiation of dam removal activities.

3.9. Human Health and Safety

Hatchery facilities may use a variety of chemicals to maintain a clean environment for the production of disease-free fish. Common chemical classes include disinfectants, therapeutics (e.g., antibiotics), anesthetics, pesticides/herbicides, and feed additives. The production of these chemicals for the protection of public health and the environment is governed by the Environmental Protection Agency (through the Federal Insecticide, Fungicide, and Rodenticide Act) and Food and Drug Administration (through the Federal Food, Drug, and Cosmetic Act). Use of chemical products in the workplace is not considered a threat to human health when label warnings and directions are followed as established by EPA or FDA. Chemicals used in hatcheries are typically disposed of according to label requirements or discharged as effluents to receiving waters according to established water-quality guidelines developed through Federal or state regulations. However, some chemicals (e.g., antibiotics) do not have established water-quality criteria. A more in-depth description of specific chemicals used at hatchery facilities and their potential effects can be found in Subsection 3.3, Water Quality; Subsection 4.3, Water Quality; and in the Draft Environmental Impact Statement to Inform Columbia River Basin Hatchery Operations and the Funding of the Mitchell Act Hatchery Programs (NMFS 2014).

Hatchery facility workers may also be exposed to diseases while handling fish. A number of parasites, viruses, and bacteria are potentially harmful to human health and may be transmitted from fish species (NMFS 2014). Many of these are transmitted primarily through seafood consumption (i.e., improperly or under-cooked fish). However, exposure to these pathogens may also occur through skin contact with fish or accidental needle-stick injuries during vaccination of fish (Section 3.7.6, Relevant Disease Vectors and Transmission).

Seafood consumption by humans is generally promoted due to the nutritional value of fish products. For example, fish contain elevated levels of omega-3 fatty acids, which are considered beneficial to the cardiovascular system (Mayo Clinic 2010). However, concerns have been raised that farm-raised and hatchery-origin fish may contain toxic contaminants that may pose a health risk to consumers (WHO 1999; Hites et al. 2004; Jacobs et al. 2002a; Jacobs et al. 2002b; Easton et al. 2002). Sources of contaminants in the fish may include chemicals or therapeutics, contamination of the nutritional supplements or feeds, and/or contamination of the environment where the fish are reared or released (Jacobs et al. 2002a; Jacobs et al. 2002b; Easton et al. 2002; Hites et al. 2004; Carlson and Hites 2005; Johnson et al. 2007; Johnson et al. 2009; Maule et al.

2007; Kelly et al. 2008). While hatchery-origin fish may contain chemicals of concern, the risk from consuming contaminants in hatchery-origin fish remains uncertain.

3.10. 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[11]
- 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."

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

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 Elwha River Basin and all hatcheries supporting the Elwha River hatchery programs are located in Clallam County. Elwha River salmon and steelhead do not meaningfully contribute to fisheries outside of the Elwha River Basin (Subsection 3.7, Socioeconomics). Therefore, Clallam County is the only county that would be meaningfully affected by Elwha River hatchery programs. Clallam County is an environmental justice community of concern because 14.2 percent of the population is below the poverty level, compared to 12.1 percent for the state as a whole (Table 9).

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

Indicator	Clallam County	Washington State
Black (percent in 2011)	1.0	3.8
American Indian (percent in 2011)	5.3	1.8
Asian (percent in 2011)	1.5	7.5
Pacific Islanders (percent in 2011)	0.2	0.7
Hispanic or Latino origin (percent in 2011)	5.3	11.6
Per capita income (2006-2010)	$24,449	$29,733
Below poverty level (percent in 2006-2010)	14.3	12.1

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).

The Lower Elwha Klallam Tribe resides in the Lower Elwha River Valley and adjacent bluffs on the north coast of the Olympic Peninsula just west of Port Angeles, Washington, in Clallam County. As recognized by the United States in the 1855 Treaty of Point No Point, the Lower Elwha Klallam Tribe has lived in this area since time immemorial. As described in Subsection 3.8, Cultural Resources, the Elwha River hatchery programs provide cultural, nutritional, economic, and social benefits to the Tribe. In addition, the Lower Elwha Klallam Tribe and other tribes participate in marine salmon fisheries in the Strait of Juan de Fuca and shellfish fisheries.

4. ENVIRONMENTAL CONSEQUENCES

4.1. Introduction

The five alternatives being evaluated in this EA are described in Chapter 2, Alternatives Including the Proposed Action. The baseline conditions for the nine resources (water quantity; water quality; salmon, steelhead, and their habitat; other fish and their habitat; wildlife; socioeconomics; environmental justice; cultural resources; and human health and safety) that may be affected by the Proposed Action and alternatives are described in Chapter 3, Affected Environment. This chapter provides an analysis of the direct and indirect environmental effects associated with the alternatives on these nine resources. In 2011, dam removal efforts were initiated so some effects of dam removal efforts are captured in baseline conditions as described in Chapter 3, Affected Environment. By the end of 2014, both the Elwha and Glines Canyon Dams are expected to be removed, and environmental conditions in the Elwha River Basin will continue to change into the future as a result of dam removal activities (Table 10). This chapter analyzes the effects of the Proposed Action and its alternatives in the context of these changing environmental conditions. Cumulative effects are presented in Chapter 5, Cumulative Effects.

The effects of Alternative 1 are described relative to baseline conditions (Chapter 3, Affected Environment). The effects of the other alternatives are described relative to Alternative 1 (No Action). 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.

Table 10. Summary of expected changes in environmental conditions in the Elwha River Basin relative to baseline conditions.

	Environmental Conditions
Baseline Conditions (2014)	• Elwha Dam has been removed since 2011. Since 2011, natural-origin salmon and steelhead have been able to bypass the Elwha Dam and can access habitat up to the Glines Canyon Dam at river mile 13.5. • Removal of Glines Canyon Dam has begun, but at this point, salmon and steelhead do not have volitional access above Glines Canyon Dam (river mile 13.5). • Non-native Chambers-creek early returning steelhead have stopped returning to the Elwha River. • There are no fisheries in the Elwha River basin that target salmon and steelhead • Because dam removal activities have started, course and fine sediment levels have increased in the lower Elwha River to levels inhospitable to fish and other aquatic life • Chinook salmon, native steelhead, coho salmon, pink salmon, and fall chum salmon produced by WDFW and tribal hatchery programs continue to return. • High sediment levels have been relatively continuous, and suspended sediment concentrations are often higher than 1000 mg/l.
Expected Future Conditions	• During dam removal, it is anticipated that turbidity (suspended sediment) levels will exceed 1,000 parts per million (ppm) for extended periods of time and will spike to levels exceeding 10,000 ppm for several weeks each year, with periodically high concentrations for as much as 3 to 5 years following dam removal (Randle et al., 1996; Ward et al. 2008; Duda et al. 2011) • Dam removal is expected to almost immediately correct elevated water temperature conditions throughout the lower river caused in the past by thermal warming in the reservoirs that adversely affected fish migrating in the summer months (Ward et al. 2008) • In late 2014, hatchery- and natural-origin salmon and steelhead are expected to have access to habitat above Glines Canyon Dam • The greatest turbidity levels are expected immediately after the Glines Canyon Dam has been fully removed.

4.1.1 Critical Habitat

Critical habitat for ESA-listed species in the Elwha River Basin includes many of the identified primary constituent elements, but most are affected primarily by the existence of the dams, or by the anticipated near-term effects of dam removal (e.g., sediment impacts on freshwater rearing sites, floodplain connectivity, or migration corridors), which is not part of the Proposed Action. The aspects of critical habitat that may be affected by the Proposed Action include (1) adequate

water quantity and quality, and (2) freedom from excessive predation. Potential impacts on critical habitat are analyzed in this Environmental Assessment in the broader discussion of impacts on habitat (Subsection 4.2, Water Quantity; Subsection 4.3, Water Quality; Subsection 4.4, Salmon and Steelhead; and Subsection 4.5, Other Fish Species).

4.2. Water Quantity

4.2.1. Alternative 1 (No Action) – Do Not Make a Determination under the 4(d) Rule

Under Alternative 1 (No Action), the Elwha River hatchery programs would have the same production levels as under baseline conditions, so the same amount of groundwater and surface water would be used as under baseline conditions for broodstock holding, egg incubation, juvenile rearing, and juvenile acclimation (Table 11). Because the same amount of water would be used, there would be no change in the amount of surface water flowing between the hatchery facilities' water intake and discharge structures. Likewise, there would be no change in the amount of water in any aquifer and no change in compliance with water permits or water rights at any of the hatchery facilities relative to baseline conditions (Subsection 3.2, Water Quantity).

4.2.2. Alternative 2 (Proposed Action) – Make a Determination that the Submitted HGMPs and Tribal Harvest Plan Meet the Requirements of the 4(d) Rule

Under Alternative 2, the Elwha River hatchery programs would have the same production levels as under Alternative 1, so the same amount of groundwater and surface water would be used as under Alternative 1 for broodstock holding, egg incubation, juvenile rearing, and juvenile acclimation (Table 11). Because the same amount of water would be used, there would be no change in the amount of surface water flowing between the hatchery facilities' water intake and discharge structures. Likewise, there would be no change in the amount of water in any aquifer and no change in compliance with water permits or water rights at any of the hatchery facilities relative to Alternative 1.

Table 11. Water use by hatchery facility and alternative.

Hatchery Facility	Water Use By Alternative											
	Baseline Conditions		Alternative 1		Alternative 2		Alternative 3		Alternative 4		Alternative 5	
	Sur-face	Ground	Sur-face	Ground	Sur-face	Ground	Sur-face	Ground	Sur-face	Ground	Sur-face	Ground

Elwha Channel Facility	36	3	36	3	36	3	0	0	0	0	12	1
Lower Elwha Fish Hatchery	29 max	9	29 max	9	29 max	9	0	0	0	0	9.67	3
Morse Creek Facility	5.4	0	5.4	0	5.4	0	0	0	0	0	1.8	0
Hurd Creek Hatchery	0	4.5	0	4.5	0	4.5	0	3.15	0	3.15	0	3.6
Sol Duc Hatchery	76	0	76	0	76	0	60.8	0	60.8	0	65.8	0
Manchester Research Station	3.3	0.07	3.3	0.07	3.3	0.07	2.84	0.06	2.84	0.06	2.99	0.06

[1] Under Alternative 3, the Programs would operate as under the Proposed Action through most of the Preservation Phase of Elwha River restoration. The hatchery programs would be terminated near the end of the Preservation phase. Numbers in the table represent the long-term effects on water quantity. Short-term effects under Alternative 3 would be identical as under Alternative 2.

4.2.3. Alternative 3 (Proposed Hatchery Programs with a Sunset Term) – Make a Determination that Revised HGMPs that Include a Sunset Term and a Revised Tribal Harvest Plan Meet the Requirements of the 4(d) Rule

Under Alternative 3, hatchery programs would be operated at levels similar to those under Alternative 1 until the Glines Canyon Dams have been removed, sediment levels have returned to pre-dam removal levels, and salmon and steelhead have exhibited some natural productivity. The programs would be terminated near the end of the preservation phase, and the last hatchery-origin fish would be released in approximately 2019. Therefore, in the short term, production levels would be the same as under Alternative 1 and effects on water quantity (e.g., ground and surface water) would be the same as under Alternative 1. However, after approximately 2019, the Elwha River hatchery programs would be terminated, so long-term water use would be less under Alternative 3 than under Alternative 1. There would be no change in compliance with water permits or water rights at any of the hatchery facilities under Alternative 3 because the same amount of water or less would be used relative to Alternative 1. An analysis of the site-specific effects of the Elwha River hatchery programs is provided below.

Hurd Creek Hatchery

Hurd Creek uses groundwater exclusively except in the case of emergencies (Subsection 3.2, Water Quality). Under Alternative 3, the Hurd Creek Hatchery would not be used for Elwha River hatchery programs after around 2019, and 1.5 cfs less groundwater would be used than under Alternative 1 (Table 11). A 1.5 cfs reduction in water use would be slight but detectable

and may increase the amount of water available for other users of the aquifer. Therefore, Alternative 3 would have a low and beneficial effect on groundwater relative to Alternative 1.

Morse Creek Facility and Sol Duc Hatchery

Morse Creek Facility and Sol Duc Hatchery use surface water exclusively. All water diverted from these rivers (minus evaporation) is returned after it circulates through the facility, so the only segment of the river that may be impacted by the hatchery facility would be the area between the water intake and discharge structures (Subsection 3.2, Water Quantity).

Under Alternative 3, the Morse Creek Facility would be closed after approximately 2019, and 5.4 cfs less water would be diverted from Morse Creek in the area between the water intake and discharge structures (Table 11). Because 5.4 cfs is up to 21 percent of the water in Morse Creek during low-flow conditions (Subsection 3.2, Water Quantity), the effect on water quantity in Morse Creek would be readily apparent, and Alternative 3 may reduce the long-term potential for impacts on fish or wildlife as a result of stream dewatering. Consequently, the long-term effects of Alternative 3 would be medium and beneficial relative to Alternative 1.

Under Alternative 3, Sol Duc Hatchery would not be used for Elwha River hatchery programs after approximately 2019, and 15 cfs less water would be diverted from the Sol Duc River in the area between the water intake and discharge structures (Table 11). Because 15 cfs is up to 7 percent of the water in Sol Duc River during low-flow conditions (Subsection 3.2, Water Quantity), the effect would be slight but detectable and may reduce the long-term potential for impacts on fish and wildlife as a result of stream dewatering. Consequently, the long-term effects of Alternative 3 on water quantity in the Sol Duc River would be low and beneficial relative to Alternative 1.

Elwha Channel Facility and Lower Elwha Fish Hatchery

The Elwha Channel Facility and Lower Elwha Fish Hatchery use both groundwater and surface water (Subsection 3.2, Water Quality). All surface water diverted from the Elwha River (minus evaporation) is returned after it circulates through the facility. The only segment of the Elwha River that may be impacted by the hatchery facilities would be the area between the water intake and discharge structures (Subsection 3.2, Water Quantity).

Under Alternative 3, the Elwha Channel Facility and Lower Elwha Fish Hatchery would be closed after approximately 2019, and between 29 and 36 cfs less water would be diverted from the Elwha River in the areas between the water intakes and discharge structures (Table 10). Because 29 to 36 cfs is between 13 and 16 percent of the water in the Elwha River during low-flow conditions (Subsection 3.2, Water Quantity), the effect would be readily apparent and may reduce the long-term potential for impacts on fish and wildlife as a result of stream dewatering.

Because of the hydrological connection between the Elwha River aquifer and the Elwha River, the aquifer has been designated as under the influence of surface water and must be treated as if it were a surface water source (Subsection 3.2, Water Quantity). Under Alternative 3, the Elwha Channel Facility and the Lower Elwha Fish Hatchery would use between 3 and 9 cfs less well water than under Alternative 1 (Table 11). A reduction of between 3 and 9 cfs of well water would have a negligible impact on surface water relative to Alternative 1.

Manchester Research Station

Manchester Research Station uses both groundwater and surface water (i.e., marine water from the Puget Sound) (Subsection 3.2, Water Quantity). Under Alternative 3, the Manchester Research Station would not be used for Elwha River hatchery programs after approximately 2019, and 0.46 cfs less water would be diverted from the Puget Sound (Table 11). Because 0.46 cfs is a very small amount of water relative to the total amount of water in Puget Sound, the long-term effects of Alternative 3 of water quantity in Puget Sound would be undetectable relative to Alternative 1. Under Alternative 3, 0.01 cfs less groundwater would be used at the Manchester Research Station relative to Alternative 1. The effect on groundwater would be at the lower levels of detection. Therefore, Alternative 3 would have a negligible, long-term effect on groundwater relative to Alternative 1.

4.2.4. Alternative 4 (No Hatchery Programs in the Elwha River) --- Make a Determination that the Submitted HGMPs and Tribal Harvest Plan Do Not Meet the Requirements of the 4(d) Rule

Under Alternative 4, the Elwha River hatchery programs would be terminated immediately (Subsection 2.4, Alternative 4). Consequently, short- and long-term water use would be less under Alternative 4 relative to Alternative 1. There would be no change in compliance with water permits or water rights at any of the hatchery facilities under Alternative 4 because less water would be used relative to Alternative 1.

The site-specific evaluation of effects described under Alternative 3 (Subsection 4.2.3, Alternative 3) would apply in both the short and long term under Alternative 4. In summary, 36 cfs less water would be diverted between the intake and discharge structures of the Elwha Channel Facility relative to Alternative 1, up to 29 cfs less water would be diverted between the intake and discharge structures of the Lower Elwha Fish Hatchery relative to Alternative 1, and over 5 cfs less water would be diverted from Morse Creek relative to Alternative 1 (Table 11). These changes would reduce the short- and long-term potential for impacts on fish and wildlife as a result of stream dewatering. In addition, less groundwater would be used relative to

Alternative 1, which may increase the amount of water available for other users of aquifers used by the Elwha River hatchery programs.

4.2.5. Alternative 5 (Hatchery Programs with Decreased Production Levels) - Make a Determination that Revised HGMPs with Decreased Production Levels and the Tribal Harvest Plan Meet the Requirements of the 4(d) Rule

Under Alternative 5, hatchery programs would be operated at decreased production levels so short and long-term water use would be less under Alternative 5 than under Alternative 1. There would be no change in compliance with water permits or water rights at any of the hatchery facilities under Alternative 5 because less water would be used relative to Alternative 1. An analysis of the site-specific effects of the Elwha River hatchery programs is provided below.

Hurd Creek Hatchery

Hurd Creek uses groundwater exclusively except in emergencies (Subsection 3.2, Water Quality). Under Alternative 5, 0.9 cfs less groundwater would be used than under Alternative 1 (Table 11). A 0.9 cfs reduction in water use would be slight, but detectable and may increase the amount of water available for other users of the aquifer. Therefore, Alternative 3 would have a low and beneficial effect on groundwater relative to Alternative 1.

Morse Creek Facility and Sol Duc Hatchery

Morse Creek Facility and Sol Duc Hatchery use surface water exclusively. All water diverted from these rivers (minus evaporation) is returned after it circulates through the facility, so the only segment of the river that may be impacted by the hatchery facility would be the area between the water intake and discharge structures (Subsection 3.2, Water Quantity).

Under Alternative 5, the Morse Creek Facility would use 3.6 cfs less water from Morse Creek in the area between the water intake and discharge structures (Table 11). Because 3.6 cfs is up to 14 percent of the water in Morse Creek during low-flow conditions (Subsection 3.2, Water Quantity), the effect on water quantity in Morse Creek would be slight, but detectable, and Alternative 5 may reduce the long-term potential for impacts on fish or wildlife as a result of stream dewatering. Consequently, the long-term effects of Alternative 5 would be low and beneficial relative to Alternative 1.

Under Alternative 5, 10.2 cfs less water would be diverted from the Sol Duc River in the area between the water intake and discharge structures (Table 11). Because 10.2 cfs is up to 4.8 percent of the water in Sol Duc River during low-flow conditions (Subsection 3.2, Water Quantity), the effect would be slight, but detectable and may reduce the long-term potential for impacts on fish and wildlife as a result of stream dewatering. Consequently, the long-term

effects of Alternative 5 on water quantity in the Sol Duc River would be low and beneficial relative to Alternative 1.

Elwha Channel Facility and Lower Elwha Fish Hatchery

The Elwha Channel Facility and Lower Elwha Fish Hatchery use both groundwater and surface water (Subsection 3.2, Water Quality). All surface water diverted from the Elwha River for these two facilities (minus evaporation) is returned to the river after it circulates through the facility. The only segment of the Elwha River that may be impacted by the hatchery facilities would be the area between the water intake and discharge structures (Subsection 3.2, Water Quantity).

Under Alternative 5, between 19 and 24 cfs less water would be diverted from the Elwha River in the areas between the water intakes and discharge structures (Table 10). Because 19 to 24 cfs is between 8 and 11 percent of the water in the Elwha River during low-flow conditions (Subsection 3.2, Water Quantity), the effect would be slight, but detectable, and may reduce at a low level the long-term potential for impacts on fish and wildlife as a result of stream dewatering.

Because of the hydrological connection between the Elwha River aquifer and the Elwha River, the aquifer has been designated as under the influence of surface water and must be treated as if it were a surface water source (Subsection 3.2, Water Quantity). Under Alternative 5, the Elwha Channel Facility and the Lower Elwha Fish Hatchery would use between 2 and 6 cfs less well water than under Alternative 1 (Table 11). A reduction of between 2 and 6 cfs of well water would have a negligible impact on surface water relative to Alternative 1.

Manchester Research Station

Manchester Research Station uses both groundwater and surface water (i.e., marine water from the Puget Sound) (Subsection 3.2, Water Quantity). Under Alternative 5, approximately 0.31 cfs less water would be diverted from the Puget Sound (Table 11). Because 0.31 cfs is a very small amount of water relative to the total amount of water in Puget Sound, the long-term effects of Alternative 5 of water quantity in Puget Sound would be undetectable relative to Alternative 1. Under Alternative 5, 0.01 cfs less groundwater would be used at the Manchester Research Station relative to Alternative 1. The effect on groundwater would be at the lower level of detection. Therefore, Alternative 5 would have a negligible, long-term effect on groundwater relative to Alternative 1.

4.3. Water Quality

4.3.1. Alternative 1 (No Action) – Do Not Make a Determination under the 4(d) Rule

Under Alternative 1 (No Action), the Elwha River hatchery programs would have the same production levels as under baseline conditions, so there would be no expected change in the discharge of ammonia, nutrients (e.g., nitrogen), biological oxygen demand, pH, suspended solids levels, antibiotics, fungicides, disinfectants, steroid hormones, pathogens, anesthetics, pesticides, and herbicides into the Elwha River, Hurd Creek, Sol Duc River, or the Puget Sound from Elwha River hatchery programs(Subsection 3.3, Water Quality). Consequently, there would be no change in compliance with NPDES permits or tribal wastewater plans.

No changes would be expected to 303(d) listings for Hurd Creek, Sol Duc River, or the Puget Sound because hatchery production levels and ongoing contributions of substances from other sources (e.g., from activities such as human development, agricultural practices, and forest practices) would be the same as under baseline conditions, and there are no known mitigation actions being implemented within the analysis area that would remove these impaired water bodies from the 303(d) list in the foreseeable future.

However, water quality conditions in the Elwha River would be expected to change in the short and long term from dam removal (Table 10). In the short term, sediment levels would increase immediately after removal of the Glines Canyon Dam, but water temperature conditions throughout the lower river would be expected to improve immediately (Ward et al. 2008). In the long-term, sediment levels will dissipate and temperatures in the lower Elwha River would be reduced (NPS 2005). Consequently, the Elwha River may be removed from the 303(d) list because temperatures would be reduced in lower part of the river after dam removal, and temperature is its only 303(d) listing parameter (Subsection 3.3, Water Quality).

4.3.2. Alternative 2 (Proposed Action) – Make a Determination that the Submitted HGMPs and Tribal Harvest Plan Meet the Requirements of the 4(d) Rule

Under Alternative 2, the Elwha River hatchery programs would have the same production levels, so there would be no expected change in water quality relative to Alternative 1 as a result of changes in the discharge of ammonia, nutrients (e.g., nitrogen), biological oxygen demand, pH, suspended solids levels, antibiotics, fungicides, disinfectants, steroid hormones, pathogens, anesthetics, pesticides, and herbicides into the Elwha River, Hurd Creek, Sol Duc River, or the Puget Sound from Elwha River hatchery programs (Subsection 3.3, Water Quality). Consequently, there would be no change in compliance with NPDES permits or tribal wastewater plans, and there would be no change in the contribution of hatcheries to water quality in any 303(d) listed segments of the analysis area relative to Alternative 1.

4.3.3. Alternative 3 (Proposed Hatchery Programs with a Sunset Term) – Make a Determination that Revised HGMPs that Include a Sunset Term and a Revised Tribal Harvest Plan Meet the Requirements of the 4(d) Rule

Under Alternative 3, hatchery programs would be operated at levels similar to those under Alternative 1 until the dams have been removed, sediment levels have returned to pre-dam removal levels, and salmon and steelhead have exhibited some natural productivity. The programs would be terminated near the end of the preservation phase, and it would be expected that the last hatchery-origin fish would be released in approximately 2019. Therefore, in the short term, production levels would be the same as under Alternative 1, so there would be no expected change in water quality as a result of changes in the discharge of ammonia, nutrients (e.g., nitrogen), biological oxygen demand, pH, suspended solids levels, antibiotics, fungicides, disinfectants, steroid hormones, pathogens, anesthetics, pesticides, and herbicides into the Elwha River, Hurd Creek, Sol Duc River, or the Puget Sound from Elwha River hatchery programs (Subsection 3.3, Water Quality). However, after around 2019, the Elwha River hatchery programs would be terminated, and, therefore, long-term effects on water quality may differ relative to Alternative 1.

Over the long-term, there would be a reduction in the discharge of ammonia, nutrients (e.g., nitrogen), biological oxygen demand, pH, suspended solids levels, antibiotics, fungicides, disinfectants, steroid hormones, pathogens, anesthetics, pesticides, and herbicides into the Elwha River, Hurd Creek, Sol Duc River, or the Puget Sound from Elwha River hatchery programs (Subsection 3.3, Water Quality). The effects of a reduction in the discharge of these substances would be slight because hatchery effluent is passed through a pollution abatement pond to settle out uneaten food and waste before being discharged into receiving waters (Subsection 3.3, Water Quality), but because changes may be detectable in the immediate vicinity of the hatchery discharge structures, Alternative 3 may provide a low and beneficial, long term and localized benefit to water quality relative to Alternative 1.

Alternative 3 would not be expected to change any of the 303(d) lists relative to Alternative 1 because the contribution of substances from these programs is very small relative to the contribution of substances described under baseline conditions (e.g., from activities such as human development, agricultural practices, and forest practices) (Subsection 3.3, Water Quality). Because long-term water quality would be expected to improve under Alternative 3 relative to Alternative 1, there would be no change in compliance with applicable NPDES permits or tribal wastewater plans relative to Alternative 1.

4.3.4. Alternative 4 (No Hatchery Programs in the Elwha River) -- Make a Determination that the Submitted HGMPs and Tribal Harvest Plan Do not Meet the Requirements of the 4(d) Rule.

Under Alternative 4, the Elwha River hatchery programs would be terminated immediately. Consequently, there would be a reduction in the discharge of ammonia, nutrients (e.g., nitrogen), biological oxygen demand, pH, suspended solids levels, antibiotics, fungicides, disinfectants, steroid hormones, pathogens, anesthetics, pesticides, and herbicides into the Elwha River, Hurd Creek, Sol Duc River, or the Puget Sound over the short and long term relative to Alternative 1. The effects of a reduction in the discharge of these substances would be slight because hatchery effluent is passed through a pollution abatement pond to settle out uneaten food and waste before being discharged into receiving waters (Subsection 3.3, Water Quality), but because changes would be detectable in the immediate vicinity of the hatchery discharge structures, Alternative 4 would provide low and beneficial, long-term, and localized benefits to water quality relative to Alternative 1.

Alternative 4 would not be expected to change any of the 303(d) lists because the contribution of substances from these programs is very small relative to the contribution of these substances from activities such as human development, agricultural practices, and forest practices (Subsection 3.3, Water Quality). Because water quality would be expected to improve in both the short and long term, there would be no change in compliance with applicable NPDES permits or tribal wastewater plans at the Hurd Creek Hatchery, Sol Duc Hatchery, or Manchester Research Station relative to Alternative 1. These facilities use between 14 and 30 percent of their capacity to raise Elwha River fish and would continue to operate under Alternative 4 (Subsection 3.3, Water Quality). Because the Elwha Channel Facility and the Lower Elwha Fish Hatchery raise Elwha River fish exclusively (Subsection 3.3, Water Quality), they would close under Alternative 4, and NPDES or tribal wastewater plans would no longer be necessary or applicable.

4.3.5. Alternative 5 (Hatchery Programs with Decreased Production Levels) –Make a Determination that Revised HGMPs with Decreased Production Levels and the Tribal Harvest Plan Meet the Requirements of the 4(d) Rule

Under Alternative 5, there would be a long-term reduction in the discharge of ammonia, nutrients (e.g., nitrogen), biological oxygen demand, pH, suspended solids levels, antibiotics, fungicides, disinfectants, steroid hormones, pathogens, anesthetics, pesticides, and herbicides into the Elwha River, Hurd Creek, Sol Duc River, or the Puget Sound from Elwha River hatchery programs (Subsection 3.3, Water Quality). The effects of a reduction in the discharge of these substances

would be slight because hatchery effluent is passed through a pollution abatement pond to settle out uneaten food and waste before being discharged into receiving waters (Subsection 3.3, Water Quality), but because changes may be detectable in the immediate vicinity of the hatchery discharge structures, Alternative 5 may provide a low and beneficial, long term and localized benefit to water quality relative to Alternative 1.

Alternative 5 would not be expected to change any of the 303(d) lists relative to Alternative 1 because the contribution of substances from these programs is very small relative to the contribution of substances described under baseline conditions (e.g., from activities such as human development, agricultural practices, and forest practices) (Subsection 3.3, Water Quality). Because long-term water quality would be expected to improve under Alternative 5 relative to Alternative 1, there would be no change in compliance with applicable NPDES permits or tribal wastewater plans relative to Alternative 1.

4.4. Salmon and Steelhead

As removal of the two dams on the Elwha River continues, habitat conditions for salmon and steelhead downstream of the dams will continue to degrade in the short-term, as sediment that was trapped behind the dams is released, increasing turbidity levels, and making water quality conditions inhospitable for fish in mainstem and side-channel reaches of the lower Elwha River. Turbidity levels are expected to exceed 1,000 parts per million (ppm) for extended periods of time and will spike to levels exceeding 10,000 ppm for several weeks each year, with periodically high concentrations for as much as 3 to 5 years following dam removal (Randle et al. 1996; Ward et al. 2008; Duda et al. 2011).

The high sediment loads will cause deleterious effects in the egg to fry life stages for all species of fish present in the lower watershed (Pess et al. 2008). Fish exposed to sediment loads between 50 and 100 ppm for an extended period of time may stop feeding, suffer gill abrasion, and experience loss of fitness due to the associated stress (Cook-Tabor 1995). At turbidity levels above 1,000 ppm, direct mortality of fish may result simply from the elevated sediment loads (Cook-Tabor 1995). With sediment loads expected to exceed 10,000 ppm, all salmon and steelhead rearing naturally and/or migrating in the Elwha River below Glines Canyon Dam may be killed by stored sediment released during dam removal (Ward et al. 2008).

As described in Subsection 3.3 Water Quality, water quality in the river has become degraded by high fine and course sediment loads stored behind the Elwha River dams for 100 years, and released downstream as the dams are removed. Sediment levels at concentrations lethal to fish have been realized commensurate with removal of the dams. Based on course sediment accumulations documented in side channel and mainstem areas (G. Pess, NOAA Northwest

Fisheries Science Center, unpublished data, March 26, 2014), and turbidity levels recorded in the lower Elwha River mainstem (Currans et al. 2014), water quality conditions in mainstem, side channel, and estuarine areas downstream of the dam sites have become inhospitable to Elwha River salmon and steelhead.

In the long term, dam removal is expected to fully restore riverine sediment delivery to a natural condition, and partially restore sediment-starved areas in the nearshore marine environment. Several years will likely be required to reach equilibrium between sediment supply and transport capacity (Ward et al. 2008). It is expected that dam removal will almost immediately correct elevated water temperature conditions throughout the lower river caused in the past by thermal warming in the reservoirs. These temperatures adversely affected fish migrating in the summer months (Ward et al. 2008). By the end of 2014, natural-origin salmon and steelhead are expected to have access to habitat above Glines Canyon Dam (river mile 13.5) because of the scheduled dam removal.

Table 6 lists the various effects through which the hatchery programs could affect natural-origin salmon and steelhead populations in the Elwha River. However, NMFS also recognizes the substantial program elements designed to minimize these impacts, as well as the dynamics of hatchery operations during the native salmon and steelhead preservation and recolonization phases of Elwha River restoration. Potential impacts such as disease, competition and predation are minimized by the location of the hatchery release sites near the mouth of the river, which limits the potential for interactions between hatchery and natural-origin fish. The risk of disease transfer is further minimized by the hatchery operators' strict adherence to Washington State disease control protocols. Genetic risks are minimized by propagating only the native fish stocks, using large effective breeding population sizes, collecting broodstock across the entire run-timing of the species, and applying proper broodstock selection and mating protocols.

4.4.1. Puget Sound Chinook Salmon (ESA-listed)

4.4.1.1.Alternative 1 (No Action) – Do Not Make a Determination under the 4(d) Rule

Under Alternative 1, the hatchery programs would be operated the same as under baseline conditions (Subsection 2.1, Alternative 1), but habitat conditions would continue to change as Glines Canyon Dam is removed. Therefore, the risks associated with competition and predation, facility effects, natural population status masking, incidental fishing effects, or disease transfer would persist at similar levels relative to baseline conditions (Table 6) (Subsection 3.4, Salmon and Steelhead). Nutrient cycling and population viability benefits would continue to change relative to baseline conditions as the processes associated with dam removal proceed.

In the short term, while the effects of dam removal activities continue, the hatchery programs would continue to preserve genetic diversity under Alternative 1 at a level consistent with baseline conditions, but the hatchery programs would provide the following additional benefits going forward:

- The hatchery program would add marine-derived nutrients to the aquatic and terrestrial systems above Glines Canyon Dam, which are inaccessible to salmon and steelhead under baseline conditions.
- The Chinook salmon hatchery program would increase total and natural-origin abundance and spatial structure of the Chinook salmon population as additional habitat becomes available and as first-generation hatchery-origin fish, and the offspring of naturally spawning hatchery-origin fish, return to spawn naturally.
- The Chinook salmon hatchery program would preserve the Elwha River Chinook salmon population when turbidity levels are high and detrimental to natural-origin fish survival due to dam removal activities.

In the long term, spatial structure and abundance of the Elwha River Chinook salmon population would be expected to continue to improve relative to baseline conditions because Chinook salmon would continue to re-seed habitat that has been inaccessible since dam construction.

Table 12. Naturally spawning fish contributions by alternative relative to the recolonization phase abundance target for Elwha River Chinook salmon.

Alt	Elwha River Juvenile Chinook Release Numbers	Estimated Hatchery-Origin Adult Return[1]	Estimated Natural-origin Adult Return[2]	Estimated Total Adult Return	Annual Broodstock Collection to Maintain 500 Fish per Generation Effective Size[3]	Required Number of Broodstock to Meet Annual Smolt Release Target	Estimated Number of Naturally Spawning Fish in 2018[4]	Target for Natural Chinook Abundance [6]	Estimated Naturally Spawning Fish Percent of Abundance Target
1	2,700,000	2,160	102	2,262	500	1,700	562	4,340	**13**
2	2,700,000	2,160	102	2,262	500	1,700	562	4,340	**13**
3	2,700,000[5]	2,160	102	2,262	500	1,700	562	4,340	**13**
4	0	0	102	102	N/A	N/A	102	4,340	**2**
5	900,000 [7]	720	102	722	500	510	212 - 222	4,340	**5**

[1] Estimated hatchery-origin adult return is based on recent average smolt-to-adult survival rates. Actual survival rates will be lower while sediment levels are high.

[2] Estimated natural-origin adult return is based on recent average abundance in the Elwha River based on otolith mark recovery data (NMFS 2012a), prior to commencement of dam removal and resultant inhospitable to lethal sediment loads in critical habitat for fish. Actual return levels will be lower while sediment levels are high.

[3] To determine the total number of fish needed to achieve a 500 fish per generation effective size, divide 500 by the generation time of the fish species. For Chinook, the generation time is 4 years, so you would need 125 effective spawners per year. Because of the high mortality from the time a fish is a fry to the time it is an adult, an average of one in four of the Chinook spawned in the hatchery contribute to the subsequent generation of fish (Pers. Comm. between M. Ford and C. Busack; June 3, 2014). Therefore, multiply 125 times four to calculate the number of annual broodstock needed to achieve a 500 fish per generation effective size. For the Chinook salmon hatchery program, you would need to collect 500 broodstock annually to maintain a 500 fish per generation effective size. These calculations assume equal numbers of males and females.

[4] The estimate of natural spawners under each alternative is the average natural-origin adult return (102 fish) plus the number of hatchery-origin Chinook surplus to broodstock needs. When the number of broodstock needed to meet target annual smolt release levels was greater than the number needed to maintain a 500 fish per generation effective size, NMFS assumed hatchery operators would collect the number of broodstock needed to meet target annual smolt release levels. When the opposite was true, NMFS analyzed the range in broodstock numbers. NMFS assumed a hatchery-origin juvenile-to-adult return survival rate of 0.08%. Actual survival rates in the short-term will likely be worse while sediment levels are high.

[5] Alternative 3 includes a sunset, so although the Chinook program would release up to 2,700,000 juveniles into the Elwha River in year 1, the program would sunset after the Chinook population reached the preservation phase of restoration (NMFS 2012a; EMG 2014).

[6] Natural Chinook spawner population viability target identified by the Elwha Monitoring Group (EMG 2014) for the end of the recolonization phase, and the beginning of the local adaptation phase of restoration, when the population would begin to become self-sustaining and the supportive breeding program for the species would no longer be needed.

[7] Juvenile fish releases directly into the Elwha River reduced to 1/3 of proposed levels – 833,333 subyearlings and 66,666 yearlings = ~900,000 fish.

Under Alternative 1, an estimated 2,262 adult Chinook salmon would return to the Elwha River in the short term (Table 12). After broodstock collection, 562 Chinook salmon would be available to spawn naturally, or 13 percent of the spawner abundance level needed to end the recolonization phase and begin the local adaptation phase of restoration, under which the hatchery program for steelhead would no longer be needed (Table 12).

As a result of the removal of Gline Canyons Dam, newly accessible habitat will be of higher quality than existing habitat in the long-term, so in the long term productivity would be expected to improve relative to baseline conditions. However, in the short term, the productivity of spawners above the dams will likely be lower than spawners below the dam until the spawning gravel above the dams is conditioned by salmon and steelhead spawners (i.e., the first generation of spawners would loosen and clean the spawning gravel, which would make it better for subsequent generations of salmon and steelhead). As fish colonize new areas, they would be subject to a broader array of selective pressures, which would be expected to increase genetic diversity relative to baseline conditions.

Under Alternative 1, no fisheries would directly harvest hatchery-origin or natural-origin Elwha River Chinook salmon. However, Elwha River Chinook salmon would continue to be harvested incidentally in United States and Canadian mixed-stock marine area fisheries targeting more abundant salmon stocks. Under Alternative 1, there would be no change in the long-term potential for tribal and recreational fisheries on Chinook salmon in the Elwha River relative to baseline conditions.

4.4.1.2. Alternative 2 (Proposed Action) – Make a Determination that the Submitted HGMPs and Tribal Harvest Plan Meet the Requirements of the 4(d) Rule

Under Alternative 2, habitat conditions as a result of dam removal would be the same as under Alternative 1 (i.e., habitat conditions would continue to change as Glines Canyon Dam is removed). Additionally, the operation of the Elwha River hatchery programs would be the same as under Alternative 1 (Subsection 2.2, Alternative 2), so the hatchery programs would have identical impacts on natural-origin Chinook salmon and their habitat as under Alternative 1. There would not be any change in risks associated with genetic effects, competition and predation, facility effects, natural population status masking, incidental fishing effects, or disease transfer relative to Alternative 1 (Table 6) (Subsection 3.4, Salmon and Steelhead). Similarly, there would be no change in population viability benefits or benefits from nutrient cycling relative to Alternative 1. There would be no change in total population abundance relative to Alternative 1 (Table 12).

Under Alternative 2, there would be no change in fisheries affecting Elwha River Chinook salmon relative to Alternative 1. No fisheries would directly harvest hatchery-origin or natural-origin Elwha River Chinook salmon, but Elwha River Chinook salmon would continue to be harvested incidentally in United States and Canadian mixed-stock marine area fisheries targeting more abundant salmon stocks. Fisheries on native, hatchery-origin steelhead (ceremonial/subsistence and later commercial) would be initiated under Alternative 2 once the Elwha River natural-origin steelhead reach abundance thresholds, but these fisheries would not be expected to affect Chinook salmon because adult Chinook salmon would not be in the fishing area during the steelhead fisheries. Under Alternative 2, there would be no change in the long-term potential for tribal and recreational fisheries on Chinook salmon in the Elwha River relative to Alternative 1.

4.4.1.3. Alternative 3 (Proposed Hatchery Programs with a Sunset Term) – Make a Determination that Revised HGMPs that Include a Sunset Term and a Revised Tribal Harvest Plan Meet the Requirements of the 4(d) Rule

In the short term, the operation of the Elwha River hatchery programs and habitat conditions as a result of dam removal would be the same under Alternative 3 as under Alternative 1 (i.e., habitat conditions would continue to change as Glines Canyon Dam is removed) (Subsection 2.3, Alternative 3). Therefore, in the short term, there would be no change in risks associated with genetic effects, competition and predation, facility effects, natural population status masking, incidental fishing effects, or disease transfer relative to Alternative 1 (Table 6) (Subsection 3.4, Salmon and Steelhead). Similarly, there would be no change in the short term in total species abundance and population viability benefits or benefits from nutrient cycling relative to Alternative 1.

In the long term, Alternative 3 would eliminate risks associated with genetic effects, competition and predation, facility effects, natural population status masking, incidental fishing effects, or disease transfer from hatchery programs, because the hatchery programs would be terminated in approximately 2019. Similarly, population viability and nutrient cycling benefits would be eliminated after hatchery-origin fish stop returning to the Basin to spawn (Subsection 3.4, Salmon and Steelhead). Salmon and steelhead would have similar access to high quality habitat throughout the Elwha River Basin under Alternative 3 as under Alternative 1, so there would be no change in the spatial structure or productivity of the Elwha River Chinook salmon population relative to Alternative 1, but the pace in achieving benefits to these parameters will likely be delayed by decades relative to Alternative 1 because of decreases in total population abundance. Because some hatchery programs may reduce the genetic diversity and fitness of a salmon population, eliminating the hatchery programs in approximately 2019 would reduce any genetic diversity and fitness loss risks associated with hatchery production relative to Alternative 1.

Under Alternative 3, there would be no short-term change in fisheries affecting Elwha River Chinook salmon relative to Alternative 1. No fisheries would directly harvest hatchery-origin or natural-origin Elwha River Chinook salmon. However, Elwha River Chinook salmon would continue to be harvested incidentally in United States and Canadian mixed-stock marine area fisheries targeting more abundant salmon stocks. Tribal steelhead fisheries would be initiated under Alternative 3 if Elwha River natural-origin steelhead reach abundance thresholds, but these fisheries would not be expected to affect Chinook salmon because adult Chinook salmon would not be in the fishing area during the steelhead fisheries. Because Alternative 3 would delay attainment of a viable abundance level relative to Alternative 1, Alternative 3 would reduce the long-term potential for tribal and recreational fisheries on Chinook salmon in the Elwha River relative to Alternative 1.

4.4.1.4. Alternative 4 (No Hatchery Programs in the Elwha River) – Make a Determination that the Submitted HGMPs and Tribal Harvest Plan Do Not Meet the Requirements of the 4(d) Rule

Under Alternative 4, habitat conditions as a result of dam removal would be the same as under Alternative 1 (i.e., habitat conditions would continue to change as Glines Canyon Dam is removed). However, under Alternative 4, the Elwha River hatchery programs would be terminated immediately (Subsection 2.4, Alternative 4). Consequently, Alternative 4 would eliminate short- and long-term risks associated with genetic effect caused by hatchery programs, competition and predation, facility effects, natural population status masking, incidental fishing effects, and disease transfer from the hatchery programs. These risks would, therefore, be lower than under Alternative 1. Similarly, benefits from the hatchery programs on population viability and nutrient cycling would be eliminated after hatchery-origin fish stop returning to the Basin to spawn (Table 6) (Subsection 3.4, Salmon and Steelhead).

Dam removal activities are leading to water quality conditions that are reducing the survival rate of all fish migrating, spawning, and rearing in the Elwha River below Glines Canyon Dam. Consequently, fish that spend less time in the Elwha River during adverse water quality conditions (i.e., fish held for spawning, rearing and release in the hatcheries) are going to have a higher survival rate when compared to fish migrating, spawning, and rearing in the Elwha River. The Elwha River Chinook salmon population is an ESA-listed threatened population that is considered at high risk of extinction and has low abundance relative to population viability parameter target levels (Subsection 3.4.1, Puget Sound Chinook Salmon). Nearly all (about 95 percent) of adult fish escaping to spawn in recent years are hatchery-origin fish, and the natural-origin Chinook salmon population averages only about 102 fish (Subsection 3.4.1, Puget Sound Chinook salmon). The already very low number of natural-origin fish is expected to decline

further as a result of dam removal activities, and Alternative 4 would further reduce short-term abundance relative to Alternative 1, directly increasing extinction risk. Any Chinook salmon that survive dam removal activities would have access to high-quality habitat throughout the Elwha River Basin, but because abundance levels would be expected to be critically low, the spatial structure, productivity, and genetic diversity status of the species would be markedly reduced relative to Alternative 1, which would also increase extinction risk. Therefore, Alternative 4 would increase the extinction risk of the Elwha River Chinook population relative to Alternative 1 both directly and indirectly.

Under Alternative 4, no fisheries would directly harvest Elwha River Chinook salmon. However, Elwha River Chinook salmon may continue to be harvested incidentally in United States and Canadian mixed-stock marine area fisheries targeting more abundant salmon stocks (if they are not extirpated), and the adverse effects of any fisheries would be increased over Alternative 1, as the consequences to the population of intercepting the few remaining natural-origin Chinook salmon would increase as the proportion of hatchery-origin fish, and hence the total population, decreases. Because Alternative 4 would increase the risk of extirpation and delay attainment of a viable abundance level relative to Alternative 1, Alternative 4 would reduce the long-term potential for tribal and recreational fisheries on Chinook salmon in the Elwha River.

4.4.1.5. Alternative 5 (Hatchery Programs with Decreased Production Levels) –Make a Determination that Revised HGMPs with Decreased Production Levels and the Tribal Harvest Plan Meet the Requirements of the 4(d) Rule

Decreased juvenile Chinook salmon production levels under Alternative 5 relative to Alternative 1 (Table 3) would reduce short-term risks associated with domestication, competition and predation, facility effects, natural population status masking, and disease transfer from the hatchery programs (Table 6) (Subsection 3.4, Salmon and Steelhead). Competition and predation risks are low under Alternative 1, but they would be even lower under Alternative 5 because fewer hatchery fish would be released.

While these short-term risks would be lower, the risk of extirpation would be higher. Dam removal activities are leading to water quality conditions that are reducing the survival rate of all fish migrating, spawning, and rearing in the Elwha River below Glines Canyon Dam. Consequently, fish that spend less time in the Elwha River during adverse water quality conditions (i.e., fish in the hatcheries) are going to have a higher survival rate when compared to fish that are rearing and spawning in the Elwha River. The Elwha River Chinook salmon population is an ESA-listed threatened population that is considered at high risk of extinction (Subsection 3.4.1, Puget Sound Chinook Salmon). The natural-origin steelhead population

averages only 102 fish (Subsection 3.4.1, Puget Sound Chinook Salmon), and these numbers are expected to decline as a result of the adverse sediment impact period during and immediately following dam removal . Under Alternative 5, the hatchery program would be reduced by two-thirds, so hatchery-origin fish returning the Elwha River would be reduced from 2,160 Chinook salmon to 720 Chinook salmon under average survival rates (actual survival rates in the short term will be lower because of the adverse sediment impact period) (Table 13). After broodstock collection, the short-term total abundance of Chinook salmon would be between 212 and 222 fish, or 5 percent of the Chinook spawner abundance level needed to end the recolonization phase and begin the local adaptation phase of restoration, under which the hatchery program for Chinook salmon would no longer be needed. (Table 12).

Because of the critically low abundance levels under Alternative 5 and the deleterious river turbidity levels caused by dam removal, the hatchery would be primarily responsible for the conservation of genetic diversity of the native species in the Elwha River. A genetic effective population size (a measure of the rate at which a population of a certain size will lose diversity) of 500 per generation is needed for conservation of genetic diversity (Lande and Barrowclough 1987), and the production levels under Alternative 5 may be adequate to achieve a 500 fish per generation effective size within the hatchery if survival rates remain similar to those observed in recent years (Table 12). However, if the majority of returning adults cannot be collected, and if survival of juveniles to adulthood is substantially less than in recent years (recent year survivals have been 0.08 percent of the juveniles released), adequate numbers of broodstock would not be available, and the 500 fish per generation size would not be achieved[12]. Therefore, Alternative 5 would be less effective at conserving genetic diversity of the Elwha River Chinook salmon population relative to Alternative 1 if survival rate are substantially less than in recent years.

Any Chinook salmon that survive the adverse sediment impact period during and immediately following dam removal would have access to high-quality habitat throughout the Elwha River Basin. However, in the short term, the productivity of spawners above the dams will likely be lower than spawners below the dam until the spawning gravel above the dams is conditioned by salmon and steelhead spawners (i.e., the first generation of spawners would loosen and clean the spawning gravel, which would make it better for subsequent generations of salmon and steelhead). The process of conditioning gravel would take longer under Alternative 5 relative to

[12] The "effective population size" is usually less than the census population size. To determine the total number of fish needed to achieve a 500 fish per generation effective size, divide 500 by the generation time of the fish species. For Chinook, the generation time is 4 years, so you would need 125 effective spawners per year. Because of the high mortality from the time a fish is a fry to the time it is an adult, an average of one in four of the Chinook spawned in the hatchery contribute to the subsequent generation of fish (Pers. Comm. between M. Ford and C. Busack; June 3, 2014). Therefore, multiply 125 times four to calculate the number of annual broodstock needed to achieve a 500 fish per generation effective size. For the Chinook salmon hatchery program, you would need to collect 500 broodstock annually to maintain a 500 fish per generation effective size. These calculations assume equal numbers of males and females.

Alternative 1. There would also be fewer salmon and steelhead spawning under Alternative 5 relative to Alternative 1, so fewer marine-derived nutrients would be added to an aquatic system that has been cut off from this important source of nutrients for decades.

Because of the reduced number of spawners, extinction risk would be higher under Alternative 5 relative to Alternative 1. Loss of the unique Elwha Chinook salmon population would be highly detrimental to recovery of the listed Puget Sound Chinook salmon ESU, as it is one of only two extant populations within the Strait of Juan de Fuca biogeographical region. As such, the population is considered an important component of overall diversity of the species and essential for the ESU's recovery to a viable status (Subsection 3.4, Salmon and Steelhead).

Under Alternative 5, there would be no short-term change in fisheries affecting Elwha River Chinook salmon relative to Alternative 1. No fisheries would directly harvest listed hatchery-origin or natural-origin Elwha River Chinook salmon. However, Elwha River Chinook salmon would continue to be harvested incidentally in United States and Canadian mixed-stock marine area fisheries targeting annually determined, static annual harvest quotas for more abundant salmon stocks. The adverse effects of any fisheries would be increased over Alternative 1, as the incidence of intercepting a natural-origin Chinook salmon would increase as the proportion of listed hatchery-origin fish decreases. Because Alternative 5 would delay attainment of a viable abundance level relative to Alternative 1, Alternative 5 would delay the long-term potential for fisheries on Chinook salmon in the Elwha River relative to Alternative 1.

Tribal steelhead fisheries would be initiated under Alternative 5 if Elwha River natural-origin steelhead reach abundance thresholds, but these fisheries would not be expected to affect Chinook salmon because adult Chinook salmon would not be in the fishing area during the steelhead fisheries.

4.4.2. Puget Sound Steelhead (ESA-listed)

4.4.2.1. Alternative 1 (No Action) – Do Not Make a Determination under the 4(d) Rule

Under Alternative 1, the hatchery programs would be operated the same as under baseline conditions (Subsection 2.1, Alternative 1), but habitat conditions would continue to change as Glines Canyon Dam is removed. Therefore, there would be no change in risks associated with competition and predation, facility effects, natural population status masking, incidental fishing effects, or disease transfer relative to baseline conditions (Subsection 3.4, Salmon and Steelhead). Nutrient cycling and population viability benefits would continue to change relative to baseline conditions.

In the short term, while the effects of dam removal activities continue, the hatchery programs would continue to preserve genetic diversity under Alternative 1 at a level consistent with baseline conditions, but the hatchery programs would provide the following additional benefits going forward:

- The hatchery programs would add marine-derived nutrients to the aquatic and terrestrial systems above Glines Canyon Dam, which are inaccessible to salmon and steelhead under baseline conditions.
- By 2018, the hatchery program would be expected increase total abundance of the naturally spawning Chinook salmon aggregation to a level that is 94 to 97 percent of the total natural spawner population abundance level needed to end the recolonization phase and begin the local adaptation phase of restoration, under which the hatchery program for steelhead would no longer be needed (Table 13).
- The hatchery program would increase natural-origin abundance and spatial structure of the steelhead population as additional habitat becomes available and as first-generation hatchery-origin fish, and the offspring of naturally spawning hatchery-origin fish, return to spawn naturally.
- The steelhead hatchery program would preserve the late-returning, native Elwha River steelhead population when turbidity levels are high and detrimental to natural-origin fish survival due to dam removal activities.

Table 13. Naturally spawning fish contributions by alternative relative to the recolonization phase abundance target for Elwha River steelhead.

Alternative	Elwha River Native Steelhead Smolt Release Numbers	Estimated Hatchery-Origin Adult Return[1]	Estimated Natural-origin Adult Return[2]	Estimated Total Adult Return	Annual Broodstock Collection to Maintain 500 Fish per Generation Effective Size[3]	Required Number of Broodstock to Meet Annual Smolt Release Target	Estimated Number of Naturally Spawning Fish in 2018[4]	Target for Natural Steelhead Abundance [6]	Estimated Naturally Spawning Fish Percent of Abundance Target
1	175,000	1,300	141	1,441	526	500	915 - 941	969	**94 - 97**
2	175,000	1,300	141	1,441	526	500	915 - 941	969	**94 - 97**
3	175,000[5]	1,300	141	1,441	526	500	915 - 941	969	**94 - 97**
4	0	0	141	141	N/A	N/A	141	969	**15**
5	50,000	375	141	516	526	143 [7]	0 - 373	969	**0 - 39**

[1] Estimated hatchery-origin adult return is based on a smolt-to-adult survival rate of 0.75%. Actual annual survival rates will be lower while sediment levels are high.

[2] Estimated natural-origin adult return is based on recent average abundance in the Elwha River (LEKT 2012a; NMFS 2012a) prior to commencement of dam removal and resultant inhospitable to lethal sediment loads in critical habitat for fish. Actual return levels will be lower while sediment levels are high.

[3] To determine the total number of fish needed to achieve a 500 fish per generation effective size, divide 500 by the generation time of the fish species. For steelhead, the generation time is 3.8 years, so you would need 132 effective spawners per year. Because of the high mortality from the time a fish is a fry to the time it is an adult, an average of one in four of the steelhead spawned in the hatchery contribute to the subsequent generation of fish (Pers. Comm. between M. Ford and C. Busack; June 3, 2014). Therefore, multiply 132 times four to calculate the number of annual broodstock needed to achieve a 500 fish per generation effective size. For steelhead hatchery program, you would need to collect 526 broodstock annually to maintain a 500 fish per generation effective size. These calculations assume equal numbers of males and females.

[4] The estimate of the contribution of natural spawners under each alternative is the pre-dam removal average natural-origin adult return (141 fish) plus contributions of hatchery-origin steelhead surplus to effective size and smolt release target broodstock needs and available for natural spawning. When the number of broodstock needed to meet target annual smolt release levels was greater than the number needed to maintain a 500 fish per generation effective size, NMFS assumed hatchery operators would collect the number of broodstock needed to meet target annual smolt release levels. When the opposite was true, NMFS analyzed the range in broodstock numbers. Assumed in estimated hatchery-origin steelhead contributions is a smolt to adult return survival rate of 0.75%. Actual survival rates in the short-term will be worse while sediment levels are high.

[5] Alternative 3 includes a sunset, so although the steelhead program would release 175,000 juveniles in year 1, the program would sunset after the steelhead population reached the preservation phase of restoration (NMFS 2012a; EMG 2014).

[6] Natural steelhead spawner population viability target identified by the Elwha Monitoring Group (EMG 2014) for the end of the recolonization phase, and the beginning of the local adaptation phase of restoration, when the population would begin to become self-sustaining and the supportive breeding program for the species would no longer be needed.

[7] Required number of broodstock needed to meet a 50,000 smolt release levels assumed to be 28.6% (50,000/175,000) of the number of adult fish identified as needed by LEKT (500 fish) to produce 175,000 two-year-old smolts through the program at the Lower Elwha Fish Hatchery facility.

4.4.2.2. Alternative 2 (Proposed Action) – Make a Determination that the Submitted HGMPs and Tribal Harvest Plan Meet the Requirements of the 4(d) Rule

Under Alternative 2, habitat conditions as a result of dam removal would be the same as under Alternative 1 (i.e., habitat conditions would continue to change as Glines Canyon Dam is removed). Additionally, the operation of the Elwha River hatchery programs would be the same as under Alternative 1 (Subsection 2.2, Alternative 2), so the hatchery programs would have identical impacts on natural-origin steelhead and their habitat as under Alternative 1. There would not be any change in risks associated with genetic effects, competition and predation, facility effects, natural population status masking, incidental fishing effects, or disease transfer relative to Alternative 1 (Subsection 3.4, Salmon and Steelhead). Similarly, there would be no change in population viability benefits or benefits from nutrient cycling relative to Alternative 1. There would be no change in total population abundance relative to Alternative 1 (Table 13).

Under Alternative 2, there would be moratorium on salmon and steelhead fishing in the Elwha River until 2018. At that point, the Tribe would initiate a small (less than 50 hatchery-origin steelhead) ceremonial and subsistence fishery on hatchery-origin fish if the natural-origin steelhead abundance is projected to exceed 300 fish. Beginning January of 2020 or later, if the natural-origin component of the steelhead population exceeds 500 fish, the Lower Elwha Klallam Tribe would scale up their fishery to target 200 to 300 hatchery-origin steelhead. The Tribal fisheries would only incidentally harvest natural-origin steelhead. The rate of incidental mortality in the ceremonial and subsistence fishery would be less than 2 percent of the natural-origin steelhead that reach the mouth of the Elwha River, and the rate of incidental mortality in the commercial fishery would be less than 7 percent of the natural-origin steelhead that reach the mouth of the Elwha River (LEKT 2012d). Based on population growth and harvest modeling done by the Lower Elwha Klallam Tribe, a 2 to 7 percent harvest rate on natural-origin steelhead would have a very small effect on the growth trajectory of the natural-origin population in the 10- to 15-year period after initiation of the fishery.

4.4.2.3. Alternative 3 (Proposed Hatchery Programs with a Sunset Term) – Make a Determination that Revised HGMPs that Include a Sunset Term and a Revised Tribal Plan Meet the Requirements of the 4(d) Rule

In the short term, the operation of the Elwha River hatchery programs and habitat conditions as a result of dam removal would be the same under Alternative 3 as under Alternative 1 (i.e., habitat conditions would continue to change as Glines Canyon Dam is removed (Subsection 2.3, Alternative 3). Therefore, in the short term, there would be no change in risks associated with genetic effects, competition and predation, facility effects, natural population status masking,

incidental fishing effects, or disease transfer relative to Alternative 1 (Subsection 3.4, Salmon, Steelhead, and Their Habitat). Similarly, there would be no change in the short term in total population abundance and population viability benefits or benefits from nutrient cycling relative to Alternative 1.

In the long term, Alternative 3 would eliminate risks associated with genetic effects, competition and predation, facility effects, natural population status masking, incidental fishing effects, or disease transfer from hatchery programs, because the hatchery programs would be terminated in approximately 2019. Similarly, population viability and nutrient cycling benefits would be eliminated after hatchery-origin fish stop returning to the Basin to spawn (Subsection 3.4, Salmon and Steelhead). However, it would take longer for the species to recolonize the Elwha River Basin to a viable population level without hatchery programs (Ward et al. 2008). Salmon and steelhead would have similar access to high-quality habitat throughout the Elwha River Basin under Alternative 3 as under Alternative 1, so there would be no change in the spatial structure or productivity of the Elwha River steelhead population relative to Alternative 1, but the pace in achieving benefits to these parameters might be reduced by decades relative to Alternative 1 because of decreases in total population abundance. Because certain hatchery programs can reduce the genetic diversity and fitness of a salmon population, eliminating the hatchery programs in approximately 2019 would reduce genetic diversity and fitness loss risks associated with hatchery production relative to Alternative 1.

Under Alternative 3, there would be a moratorium on salmon and steelhead fishing in the Elwha River until 2018. At that point, the Tribe would initiate a small (less than 50 hatchery-origin steelhead) ceremonial and subsistence fishery on hatchery-origin fish if the natural-origin steelhead abundance is projected to exceed 300 fish. Because hatchery-origin steelhead would stop returning to the Elwha River in approximately 2021, the steelhead fishery would only be ramped up to target 200 to 300 hatchery-origin steelhead for one year, and only if natural-origin steelhead abundance that year is projected to exceed 500 fish.

The rate of incidental mortality in the ceremonial and subsistence fishery is expected to be less than 2 percent of the natural-origin steelhead that reach the mouth of the Elwha River, and the rate of incidental mortality in the commercial fishery would be less than 7 percent of the natural-origin steelhead that reach the mouth of the Elwha River (LEKT 2012d). Based on population growth and harvest modeling done by the Lower Elwha Klallam Tribe, a 2 to 7 percent harvest rate on natural-origin steelhead would have a very small effect on the growth trajectory of the natural-origin population in the 10- to 15-year period after initiation of the fishery.

4.4.2.4. Alternative 4 (No Hatchery Programs in the Elwha River) --- Make a Determination that the Submitted HGMPs and Tribal Harvest Plan Do Not Meet the 4(d) Rule

Under Alternative 4, habitat conditions as a result of dam removal would be the same as under Alternative 1 (i.e., habitat conditions would continue to change as Glines Canyon Dam is removed). However, under Alternative 4, the Elwha River hatchery programs would be terminated immediately (Subsection 2.4, Alternative 4). Consequently, Alternative 4 would eliminate short- and long-term risks associated with genetic effects, competition and predation, facility effects, natural population status masking, incidental fishing effects, and disease transfer from the hatchery programs. These risks would be lower than under Alternative 1. Similarly, benefits from the hatchery programs on population viability and nutrient cycling would be eliminated after hatchery-origin fish stop returning to the Basin to spawn (Subsection 3.4, Salmon and Steelhead).

Dam removal activities are leading to water quality conditions that are reducing the survival rate of all fish migrating, spawning, and rearing in the Elwha River below Glines Canyon Dam. Consequently, fish that spend less time in the Elwha River during adverse water quality conditions (i.e., fish in the hatcheries) are going to have a higher survival rate when compared to fish that are rearing and spawning in the Elwha River. The Elwha River steelhead population is an ESA-listed threatened population that is considered at high risk of extinction and has low abundance relative to population viability parameter target levels (Subsection 3.4.2, Puget Sound Steelhead). The natural-origin steelhead population averages only 141 fish (Subsection 3.4.2, Puget Sound Steelhead), and these numbers are expected to decline as a result of the adverse sediment impact period during and immediately following dam removal. Therefore, Alternative 4 would reduce short-term steelhead abundance relative to Alternative 1 (Table 13), directly increasing extinction risk. Any steelhead that survive dam removal activities would have access to high-quality habitat throughout the Elwha River Basin but, because abundance levels would be expected to be critically low (with possible extirpation of the population), the spatial structure, productivity, and genetic diversity status of the species would be markedly reduced relative to Alternative 1, which would also increase extinction risk.

Under Alternative 4, like under Alternative 1, there would be no fisheries targeting Elwha River steelhead.

4.4.2.5. Alternative 5 (Hatchery Programs with Decreased Production Levels) – Make a Determination that Revised HGMPs with Decreased Production Levels and the Tribal Harvest Plan Meet the Requirements of the 4(d) Rule

Decreased juvenile steelhead production levels under Alternative 5 relative to Alternative 1 (Table 3) would reduce risks associated with domestication, competition and predation, facility effects, natural population status masking, and disease transfer from the hatchery programs (Table 6) (Subsection 3.4, Salmon and Steelhead). Competition and predation risks are low under Alternative 1, but they would be even lower under Alternative 5 because fewer fish would be released.

While these short-term risks would improve under this alternative, the risk of extirpation would increase. Dam removal activities are leading to water quality conditions that are reducing the survival rate of all fish migrating, spawning, and rearing in the Elwha River below Glines Canyon Dam. Consequently, fish that spend less time in the Elwha River during adverse water quality conditions (i.e., fish in the hatcheries) are going to have a higher survival rate when compared to fish that are rearing and spawning in the Elwha River. The Elwha River steelhead population is an ESA-listed threatened population that is considered at high risk of extinction and has low abundance relative to population viability parameter target levels (Subsection 3.4.2, Steelhead). The natural-origin steelhead population averages only 141 fish (Subsection 3.4.2, Puget Sound Steelhead), and these numbers are expected to decline as a result of the adverse sediment impact period during and immediately following dam removal. Under Alternative 5, the hatchery program would be reduced to 50,000 smolts, so adult hatchery-origin fish returning the Elwha River would be reduced from 1,300 steelhead to 375 steelhead under average survival rates (actual survival rates in the short term will be lower because of the adverse sediment impact period) (Table 13). After broodstock collection, the short-term total abundance of native stock hatchery-origin steelhead provided to natural spawning areas under Alternative 5 would be between 0 and 373 steelhead, or 0 to 39 percent of the natural steelhead spawner abundance level needed to end the recolonization phase and begin the local adaptation phase of restoration, under which the hatchery program for steelhead would no longer be needed (Table 13).

The alternative would also pose risks to the conservation of genetic diversity. Because of the critically low abundance levels under Alternative 5 and the deleterious river turbidity levels caused by dam removal, the hatchery would be primarily responsible for the conservation of genetic diversity of the native species in the Elwha River. A genetic effective population size (a measure of the rate at which a population of a certain size will lose diversity) of 500 per generation is needed for conservation of genetic diversity (Lande and Barrowclough 1987). Given that 375 adult fish would return under Alternative 5, and considering that it would be unlikely that all returning hatchery-origin steelhead could be captured from the river, a reduction

in the size of the program to 50,000 smolts under Alternative 5 would prevent hatchery managers from being able to collect enough broodstock to conserve genetic diversity in the hatchery (Table 13)[13]. Therefore, Alternative 5 would be less effective at conserving genetic diversity of the Elwha River steelhead population relative to Alternative 1.

Any steelhead that survive the adverse sediment impact period during and immediately following dam removal would have access to high-quality habitat throughout the Elwha River Basin. However, in the short term, the productivity of spawners above the dams will likely be lower than spawners below the dam until the spawning gravel above the dams is conditioned by salmon and steelhead spawners (i.e., the first generation of spawners would loosen and clean the spawning gravel, which would make it better for subsequent generations of salmon and steelhead). The process of conditioning gravel would take longer under Alternative 5 relative to Alternative 1. There would also be fewer salmon and steelhead spawning under Alternative 5 relative to Alternative 1, so fewer marine-derived nutrients would be added to an aquatic system that has been cut off from this important source of nutrients for decades.

Because of the reduced number of spawners, extinction risk would be higher under Alternative 5 relative to Alternative 1. Loss of the unique Elwha steelhead population would be highly detrimental to recovery of the listed Puget Sound steelhead DPS, as it is one of only a few extant populations within the Strait of Juan de Fuca biogeographical region. As such, the population is considered an important component of overall diversity of the species and essential for the DPS's recovery to a viable status (Subsection 3.4, Salmon and Steelhead).

Under Alternative 5, there would be a moratorium on salmon and steelhead fishing until 2018. At that point, the Tribe would initiate a small (less than 50 hatchery-origin steelhead) ceremonial and subsistence fishery on hatchery-origin fish if the natural-origin steelhead abundance is projected to exceed 300 fish. However, under Alternative 5, the hatchery program would not be used to rebuild populations after the Glines Canyon Dam has been removed. Therefore, it will take more years for natural-origin abundance to reach the 300-fish abundance target, and for the Lower Elwha Klallam Tribe to initiate a ceremonial and subsistence fishery.

[13] The "effective population size" is usually less than the census population size. To determine the total number of fish needed to achieve a 500 fish per generation effective size, divide 500 by the generation time of the fish species. For steelhead, the generation time is 3.8 years, so you would need 132 effective spawners per year. Because of the high mortality from the time a fish is a fry to the time it is an adult, an average of one in four of the steelhead spawned in the hatchery contribute to the subsequent generation of fish (Pers. Comm. between M. Ford and C. Busack; June 3, 2014). Therefore, multiply 132 times four to calculate the number of annual broodstock needed to achieve a 500 fish per generation effective size. For steelhead hatchery program, you would need to collect 526 broodstock annually to maintain a 500 fish per generation effective size. These calculations assume equal numbers of males and females.

The rate of incidental mortality in the ceremonial and subsistence fishery is expected to be less than 2 percent of the natural-origin steelhead that reach the mouth of the Elwha River, and the rate of incidental mortality in the commercial fishery would be less than 7 percent of the natural-origin steelhead that reach the mouth of the Elwha River (LEKT 2012d). Based on population growth and harvest modeling done by the Lower Elwha Klallam Tribe, a 2 to 7 percent harvest rate on natural-origin steelhead would have a very small effect on the growth trajectory of the natural-origin population.

4.4.3. Puget Sound Fall Chum Salmon

4.4.3.1. Alternative 1 (No Action) – Do Not Make a Determination under the 4(d) Rule

Under Alternative 1, the hatchery programs would be operated the same as under baseline conditions (Subsection 2.1, Alternative 1), but habitat conditions would continue to change as Glines Canyon Dam is removed. Therefore, there would be no change in risks associated competition and predation, facility effects, natural population status masking, incidental fishing effects, or disease transfer relative to baseline conditions (Subsection 3.4, Salmon and Steelhead). Nutrient cycling and population viability benefits would continue to change relative to baseline conditions.

In the short term, while the effects of dam removal activities continue, the hatchery programs would continue to preserve genetic diversity under Alternative 1 at a level consistent with baseline conditions, but the hatchery programs would provide the following additional benefits going forward:

- The hatchery programs would add marine-derived nutrients to the aquatic and terrestrial systems above Glines Canyon Dam, which are inaccessible to salmon and steelhead under baseline conditions.
- The fall chum salmon hatchery program would increase total and natural-origin abundance and spatial structure of the chum salmon population as additional habitat becomes available and as first-generation hatchery-origin fish, and the offspring of naturally spawning hatchery-origin fish, return to spawn naturally.
- The fall chum salmon hatchery program would preserve the Elwha River chum salmon population when turbidity levels are high and detrimental to natural-origin fish survival due to dam removal activities.

In the long term, spatial structure and abundance of the Elwha River chum salmon population would be expected to continue to improve relative to baseline conditions because chum salmon would continue to re-seed habitat that has been inaccessible since dam construction.

Additionally, in the long term, the newly accessible habitat would be of higher quality than existing habitat, so productivity would be expected to improve relative to baseline conditions. However, in the short term, the productivity of spawners above the dams will likely be lower than spawners below the dam until the spawning gravel above the dams is conditioned by salmon and steelhead spawners (i.e., the first generation of spawners would loosen and clean the spawning gravel, which would make it better for subsequent generations of salmon and steelhead). As fish colonize new areas, they would be subject to a broader array of selective pressures, which would be expected to increase genetic diversity relative to baseline conditions.

Under Alternative 1, there would be no fishing for salmon and steelhead in the Elwha River. However, Elwha River chum salmon would continue to be harvested incidentally in United States and Canadian mixed-stock marine area fisheries targeting more abundant salmon stocks.

Under Alternative 1, there would be a no change in long-term potential for tribal and recreational fisheries on chum salmon in the Elwha River relative to baseline conditions.

Table 14. Naturally spawning fish contributions by alternative relative to the recolonization phase abundance target for Elwha River fall chum salmon.

Alternative	Elwha River Chum Fry Release Numbers	Estimated Hatchery-Origin Adult Return[1]	Estimated Natural-origin Adult Return[2]	Estimated Total Adult Return	Annual Broodstock Collection to Maintain 500 Fish per Generation Effective Size[3]	Required Number of Broodstock to Meet Annual Smolt Release Target	Estimated Number of Naturally Spawning Fish in 2018[4]	Target for Natural Chinook Abundance [6]	Estimated Naturally Spawning Fish Percent of Abundance Target
1	450,000	2,250	<100	2,350	572	460	1,778 – 1,890	18,000	**10 - 11**
2	450,000	2,250	<100	2,350	572	460	1,778 – 1,890	18,000	**10 - 11**
3	450,000 [5]	2,250	<100	2,350	572	460	1,778 – 1,890	18,000	**10 - 11**
4	0	0	<100	<100	N/A	N/A	<100	18,000	**< 1**
5	150,000 [7]	750	<100	850	572	138	278 - 712	18,000	**2 - 4**

[1] Estimated hatchery-origin adult return is based on fry-to-adult survival rate goal for fall chum salmon of 0.5%. Actual survival rates will be lower while sediment levels are high.

[2] Estimated natural-origin adult return is based on recent year estimated escapements to the Elwha River prior to commencement of dam removal and resultant inhospitable to lethal sediment loads in critical habitat for fall chum salmon. Actual return levels will be lower while sediment levels are high.

[3] To determine the total number of fish needed to achieve a 500 fish per generation effective size, divide 500 by the generation time of the fish species. For chum salmon, the generation time is 3.5 years, so you would need 143 effective spawners per year. Because of the high mortality from the time a fish is a fry to the time it is an adult, an average of one in four of the chum salmon spawned in the hatchery contribute to the subsequent generation of fish (Pers. Comm. between M. Ford and C. Busack; June 3, 2014). Therefore, multiply 143 times four to calculate the number of annual broodstock needed to achieve a 500 fish per generation effective size. For the fall chum salmon hatchery program, you would need to collect 572 broodstock annually to maintain a 500 fish per generation effective size. These calculations assume equal numbers of males and females.

[4] The estimate of the contribution of natural spawners under each alternative is the pre-dam removal average natural-origin adult return (100 fish) plus contributions of hatchery-origin fall chum surplus to effective size and fry release target broodstock needs and available for natural spawning. When the number of broodstock needed to meet target annual smolt release levels was greater than the number needed to maintain a 500 fish per generation effective size, NMFS assumed hatchery operators would collect the number of broodstock needed to meet target annual smolt release levels. When the opposite was true, NMFS analyzed the range in broodstock numbers. Assumed in estimated hatchery-origin chum salmon contributions is a fry to adult return survival rate of 0.5%. Actual survival rates in the short-term will be worse while sediment levels are high.

[5] Alternative 3 includes a sunset, so although the fall chum program would release up to 450,000 juveniles into the Elwha River in year 1, the program would sunset after the fall chum population reached the preservation phase of restoration (NMFS 2012a; EMG 2014).

[6] Interim restoration target for abundance after 25 years from the Elwha Fish Restoration Plan (Ward et al. 2008).

[7] Fall chum salmon fry releases reduced to 1/3 of proposed levels.

4.4.3.2. Alternative 2 (Proposed Action) – Make a Determination that the Submitted HGMPs and Tribal Harvest Plan Meet the Requirements of the 4(d) Rule

Under Alternative 2, habitat conditions as a result of dam removal would be the same as under Alternative 1 (i.e., habitat conditions would continue to change as Glines Canyon Dam is removed). Additionally, the operation of the Elwha River hatchery programs would be the same as under Alternative 1 (Subsection 2.2, Alternative 2), so the hatchery programs would have identical impacts on natural-origin chum salmon and their habitat as under Alternative 1. There would not be any change in risks associated with genetic effects, competition and predation, facility effects, natural population status masking, incidental fishing effects, or disease transfer relative to Alternative 1 (Subsection 3.4, Salmon and Steelhead). Similarly, there would be no change in population viability benefits or benefits from nutrient cycling relative to Alternative 1 (Table 14).

Under Alternative 2, there would be no change in fisheries affecting Elwha River chum salmon relative to Alternative 1. No fisheries would directly harvest hatchery-origin or natural-origin Elwha River chum salmon, but Elwha River chum salmon would continue to be harvested incidentally in United States and Canadian mixed-stock marine area fisheries targeting more abundant salmon stocks. Fisheries on native, hatchery-origin steelhead (ceremonial/subsistence and later commercial) would be initiated under Alternative 2 once the Elwha River natural-origin steelhead reach abundance thresholds, but these fisheries would not be expected to affect chum salmon because adult chum salmon would not be in the fishing area during the steelhead fisheries. Under Alternative 2, there would be a no change in long-term potential for tribal and recreational fisheries on chum salmon in the Elwha River relative to Alternative 1.

4.4.3.3. Alternative 3 (Proposed Hatchery Programs with a Sunset Term) – Make a Determination that Revised HGMPs that Include a Sunset Term and a Revised Tribal Plan Meet the Requirements of the 4(d) Rule

In the short term, the operation of the Elwha River hatchery programs and habitat conditions as a result of dam removal would be the same under Alternative 3 as under Alternative 1 (i.e., habitat conditions would continue to change as Glines Canyon Dam is removed) (Subsection 2.3, Alternative 3). Therefore, in the short term, there would be no change in risks associated with genetic effects, competition and predation, facility effects, natural population status masking, incidental fishing effects, or disease transfer relative to Alternative 1 (Subsection 3.4, Salmon and Steelhead). Similarly, there would be no change in the short term in total species abundance and population viability benefits or benefits from nutrient cycling relative to Alternative 1.

In the long term, Alternative 3 would eliminate risks associated with genetic effects, competition and predation, facility effects, natural population status masking, incidental fishing effects, or disease transfer from hatchery programs, because the hatchery programs would be terminated in approximately 2019. Similarly, population viability and nutrient cycling benefits would be eliminated after hatchery-origin fish stop returning to the Basin to spawn (Subsection 3.4, Salmon and Steelhead). However, it would take longer for the species to recolonize the Elwha River Basin to a viable population level without hatchery programs (Ward et al. 2008). Salmon and steelhead would have similar access to high quality habitat throughout the Elwha River Basin under Alternative 3 as under Alternative 1, so there would be no change in the spatial structure or productivity of the Elwha River chum salmon population relative to Alternative 1, but the pace in achieving benefits to these parameters would be reduced relative to Alternative 1. Because certain hatchery programs can reduce the genetic diversity and fitness of a salmon population, eliminating the hatchery programs in approximately 2019 would reduce genetic diversity and fitness loss risks associated with hatchery production relative to Alternative 1.

Under Alternative 3, there would be no change in fisheries affecting Elwha River chum salmon relative to Alternative 1. No fisheries would directly harvest hatchery-origin or natural-origin Elwha River chum salmon. However, Elwha River chum salmon would continue to be harvested incidentally in United States and Canadian mixed-stock marine area fisheries targeting more abundant salmon stocks. Tribal steelhead fisheries would be initiated under Alternative 3 once Elwha River natural-origin steelhead reach abundance thresholds, but these fisheries would not be expected to affect chum salmon because adult chum salmon migrate much earlier in the season and would not be in the fishing area during the steelhead fisheries. Because Alternative 3 would delay attainment of a viable abundance level relative to Alternative 1, Alternative 3 would reduce the long-term potential for tribal and recreational fisheries on chum salmon in the Elwha River relative to Alternative 1.

4.4.3.4. Alternative 4 (No Hatchery Programs in the Elwha River) --- Make a Determination that the Submitted HGMPs and Tribal Harvest Plan Do Not Meet the Requirements of the 4(d) Rule

Under Alternative 4, habitat conditions as a result of dam removal would be the same as under Alternative 1 (i.e., habitat conditions would continue to change as Glines Canyon Dam is removed). However, under Alternative 4, the Elwha River hatchery programs would be terminated immediately (Subsection 2.4, Alternative 4). Consequently, Alternative 4 would eliminate short- and long-term risks associated with genetic effects, competition and predation, facility effects, natural population status masking, incidental fishing effects, or disease transfer from the hatchery programs. Similarly, benefits from the hatchery programs on population

viability and nutrient cycling would be eliminated after hatchery-origin fish stop returning to the Basin to spawn (Subsection 3.4, Salmon and Steelhead).

Dam removal activities are leading to water quality conditions that are reducing the survival rate of all fish migrating, spawning, and rearing in the Elwha River below Glines Canyon Dam. Consequently, fish that spend less time in the Elwha River during adverse water quality conditions (i.e., fish held for spawning, rearing and release in the hatcheries) are going to have a higher survival rate when compared to fish migrating, spawning, and rearing in the Elwha River. Although not an ESA-listed species, the Elwha River fall chum salmon population is considered at high risk of extinction due to very low average abundance levels observed prior to the commencement of dam removal, and the natural-origin fall chum salmon population averages under 100 fish (Subsection 3.4.3, Fall Chum Salmon). The already very low number of natural-origin fish is expected to decline further as a result of dam removal activities. Alternative 4 would reduce short-term abundance relative to Alternative 1 (Table 14), directly increasing extinction risk. Any chum salmon that survive dam removal activities would have access to high quality habitat throughout the Elwha River Basin, but because abundance levels would be expected to be critically low (with possible extirpation of the population), the spatial structure, productivity, and diversity status of the species would be markedly reduced relative to Alternative 1, which would also increase extinction risk.

Under Alternative 4, no fisheries would directly harvest hatchery-origin or natural-origin Elwha River chum salmon. However, Elwha River chum salmon may continue to be harvested incidentally in United States and Canadian mixed-stock marine area fisheries targeting more abundant salmon stocks (if they are not extirpated). But under this alternative, the adverse effects of any fisheries would be increased over Alternative 1, as the incidence of intercepting a natural-origin chum salmon would increase as the proportion of hatchery-origin fish decreases. Because Alternative 4 would increase the risk of extirpation and delay attainment of a viable abundance level relative to Alternative 1, Alternative 4 would reduce the long-term potential for tribal and recreational fisheries on chum salmon in the Elwha River.

4.4.3.5. Alternative 5 (Hatchery Programs with Decreased Production Levels) –Make a Determination that Revised HGMPs with Decreased Production Levels and the Tribal Harvest Plan Meet the Requirements of the 4(d) Rule

Decreased juvenile fall chum salmon production levels under Alternative 5 relative to Alternative 1 (Table 3) would reduce short-term risks associated with domestication, competition and predation, facility effects, natural population status masking, and disease transfer from the hatchery programs (Table 6) (Subsection 3.4, Salmon and Steelhead). Competition and

predation risks are low under Alternative 1, but they would be even lower under Alternative 5 because fewer fish would be released.

Dam removal activities are leading to water quality conditions that are reducing the survival rate of all fish migrating, spawning, and rearing in the Elwha River below Glines Canyon Dam. Consequently, fish that spend less time in the Elwha River during adverse water quality conditions (i.e., fish in the hatcheries) are going to have a higher survival rate when compared to fish that are rearing and spawning in the Elwha River. The total hatchery and natural-origin population is already at low abundance (Subsection 3.4.3, Puget Sound Fall Chum Salmon), and these numbers are expected to decline as a result of the adverse sediment impact period during and immediately following dam removal. Under Alternative 5, the hatchery program would be reduced by two-thirds, so hatchery-origin fish returning the Elwha River would be reduced from 2,250 fall chum salmon to 750 fall chum salmon under average survival rates (actual survival rates in the short term will be much lower) (Table 14). After broodstock collection, the short-term total abundance of fall chum salmon would be between 278 and 712 adult fish, or 2 to 4 percent of the fall chum salmon abundance level needed to end the recolonization phase of restoration, under which the hatchery program for fall chum salmon would no longer be needed. Because of the reduced number of spawners, extinction risk would be higher under Alternative 5 relative to Alternative 1.

Because of low abundance levels under Alternative 5 and the deleterious river turbidity levels caused by dam removal, the hatchery would be primarily responsible for the conservation of genetic diversity of the native species in the Elwha River. A genetic effective population size (a measure of the rate at which a population of a certain size will lose diversity) of 500 per generation is needed for conservation of genetic diversity in the hatchery (Lande and Barrowclough 1987), and the production levels under Alternative 5 may be adequate to achieve a 500 fish per generation effective size within the hatchery if a majority of returning adult fish are collected and survival rates remain similar as in recent years (Table 14)[14]. However, if survival of juveniles to adulthood is substantially less than in recent years, adequate numbers of broodstock would likely not be available, and the effective size of 500 would likely not be achieved.

[14] The "effective population size" is usually less than the census population size. To determine the total number of fish needed to achieve a 500 fish per generation effective size, divide 500 by the generation time of the fish species. For chum salmon, the generation time is 3.5 years, so you would need 143 effective spawners per year. Because of the high mortality from the time a fish is a fry to the time it is an adult, an average of one in four of the chum salmon spawned in the hatchery contribute to the subsequent generation of fish (Pers. Comm. between M. Ford and C. Busack; June 3, 2014). Therefore, multiply 143 times four to calculate the number of annual broodstock needed to achieve a 500 fish per generation effective size. For the fall chum salmon hatchery program, you would need to collect 572 broodstock annually to maintain a 500 fish per generation effective size. These calculations assume equal numbers of males and females.

Any fall chum salmon that survive the adverse sediment impact period during and immediately following dam removal would have access to high-quality habitat throughout the Elwha River Basin. However, in the short term, the productivity of spawners above the dams will likely be lower than spawners below the dam until the spawning gravel above the dams is conditioned by salmon and steelhead spawners (i.e., the first generation of spawners would loosen and clean the spawning gravel, which would make it better for subsequent generations of salmon and steelhead). The process of conditioning gravel would take longer under Alternative 5 relative to Alternative 1. There would also be fewer salmon and steelhead spawning under Alternative 5 relative to Alternative 1, so fewer marine-derived nutrients would be added to an aquatic system that has been cut off from this important source of nutrients for decades.

Under Alternative 5, there would be no change in fisheries affecting Elwha River fall chum salmon relative to Alternative 1. No fisheries would directly harvest hatchery-origin or natural-origin Elwha River fall chum salmon. However, Elwha River fall chum salmon would continue to be harvested incidentally in United States and Canadian mixed-stock marine area fisheries targeting more abundant salmon stocks. Tribal steelhead fisheries would be initiated under Alternative 5 once Elwha River natural-origin steelhead reach abundance thresholds, but these fisheries would not be expected to affect chum salmon because adult chum salmon migrate much earlier in the season and would not be in the fishing area during the steelhead fisheries. Because Alternative 5 would delay attainment of a viable abundance level relative to Alternative 1, Alternative 5 would delay the long-term potential for fisheries on chum salmon in the Elwha River relative to Alternative 1.

4.4.4. Puget Sound Pink Salmon

4.4.4.1. Alternative 1 (No Action) – Do Not Make a Determination under the 4(d) Rule

Under Alternative 1, the hatchery programs would be operated identically as under baseline conditions (Subsection 2.1, Alternative 1), but habitat conditions would continue to change as Glines Canyon Dam is removed. Therefore, there would be no change in risks associated with genetic effects, competition and predation, facility effects, natural population status masking, incidental fishing effects, or disease transfer relative to baseline conditions (Subsection 3.4, Salmon and Steelhead). Nutrient cycling and population viability benefits would continue to change relative to baseline conditions.

In the short term, while the effects of dam removal activities continue, the hatchery programs would continue to preserve genetic diversity under Alternative 1 at a level consistent with baseline conditions, but the hatchery programs would provide the following additional benefits going forward:

- The hatchery programs would add marine-derived nutrients to the aquatic and terrestrial systems above Glines Canyon Dam, which are inaccessible to salmon and steelhead under baseline conditions.
- The hatchery program would increase total abundance of the naturally spawning pink salmon aggregation to a level that is 12 to 15 percent of the interim restoration target abundance level for pink salmon identified in the Elwha Fish Restoration Plan (Ward et al. 2008)(Table 15).
- The pink salmon hatchery program would increase total and natural-origin abundance and spatial structure of the pink salmon population as additional habitat becomes available and as first-generation hatchery-origin fish, and the offspring of naturally spawning hatchery-origin fish, return to spawn naturally.
- The pink salmon hatchery program would preserve the Elwha River pink salmon population when turbidity levels are high and detrimental to natural-origin fish survival due to dam removal activities.

Table 15. Naturally spawning fish contributions by alternative relative to the recolonization phase abundance target for Elwha River pink salmon.

Alt	Elwha River Native Pink Fry Release Numbers	Estimated Hatchery-Origin Adult Return[1]	Estimated Natural-origin Adult Return[2]	Estimated Total Adult Return	Annual Broodstock Collection to Maintain 500 Fish per Generation Effective Size[3]	Required Number of Broodstock to Meet Annual Smolt Release Target	Estimated Number of Naturally Spawning Fish in 2018[4]	Target for Natural Chinook Abundance [7]	Estimated Naturally Spawning Fish Percent of Abundance Target
1	3,000,000	15,000	<100	15,100	1,000	3,700	11,400	96,000	**12**
2	3,000,000	15,000	<100	15,100	1,000	3,700	11,400	96,000	**12**
3	3,000,000[6]	15,000	<100	15,100	1,000	3,700	11,400	96,000	**12**
4	0	0	<100	<100	N/A	N/A	<100	96,000	**0.1**
5	1,000,000 [8]	5,000	<100	5,100	1,000	1,110	3,990 – 4,100	96,000	**4 – 4.3**

[1] Estimated hatchery-origin adult return is based on fry-to-adult survival rate goal for fall chum salmon of 0.5%. Actual survival rates will be lower while sediment levels are high.

[2] Estimated natural-origin adult return is based on recent odd year pink salmon escapement estimates (LEKT 2012c) prior to commencement of dam removal and resultant inhospitable to lethal sediment loads in critical habitat for pink salmon. Actual return levels will be lower while sediment levels are high.

[3] To determine the total number of fish needed to achieve a 500 fish per generation effective size, divide 500 by the generation time of the fish species. For pink salmon, the generation time is 2 years, so you would need 250 effective spawners per year. Because of the high mortality from the time a fish is a fry to the time it is an adult, an average of one in four of the pink salmon spawned in the hatchery contribute to the subsequent generation of fish (Pers. Comm. between M. Ford and C. Busack; June 3, 2014). Therefore, multiply 250 times four to calculate the number of annual broodstock needed to achieve a 500 fish per generation effective size. For the pink salmon hatchery program, you would need to collect 1,000 broodstock annually to maintain a 500 fish per generation effective size. These calculations assume equal numbers of males and females.

[4] Estimated minimum number of adult pink salmon needed as broodstock to produce production levels derived, assuming 90% green egg to fry survival rate applied to the total fry release, divided by 1,800 eggs per female, then multiplied by 2, assuming a 1.0 : 1.0 sex ratio for broodstock collected.

[5] The estimate of the contribution of natural spawners under each alternative is the pre-dam removal average natural-origin adult return (<100 fish) plus contributions of hatchery-origin pink salmon surplus to effective size and fry release target broodstock needs and available for natural spawning. When the number of broodstock needed to meet target annual smolt release levels was greater than the number needed to maintain a 500 fish per generation effective size, NMFS assumed hatchery operators would collect the number of broodstock needed to meet target annual smolt release levels. When the opposite was true, NMFS analyzed the range in broodstock numbers. Assumed in estimated hatchery-origin pink salmon contributions is a fry to adult return survival rate of 0.5%. Actual survival rates in the short-term will be worse while sediment levels are high.

[6] Alternative 3 includes a sunset, so although the pink salmon program would release up to 3,000,000 fry into the Elwha River in year 1, the program would sunset after the pink salmon population reached the preservation phase of restoration (NMFS 2012a; EMG 2014).

[7] Interim restoration target for abundance after 25 years from the Elwha Fish Restoration Plan (Ward et al. 2008).

[8] Pink salmon fry releases reduced to 1/3 of proposed levels.

In the long term, spatial structure and abundance of the Elwha River pink salmon population would be expected to continue to improve relative to baseline conditions because pink salmon would continue to re-seed habitat that has been inaccessible since dam construction. Additionally, in the long term, the newly accessible habitat would be of higher quality than existing habitat, so productivity would be expected to improve relative to baseline conditions. However, in the short term, the productivity of spawners above the dams will likely be lower than spawners below the dam until the spawning gravel above the dams is conditioned by salmon and steelhead spawners (i.e., the first generation of spawners would loosen and clean the spawning gravel, which would make it better for subsequent generations of salmon and steelhead). As fish colonize new areas, they would be subject to a broader array of selective pressures, which would be expected to increase genetic diversity relative to baseline conditions.

Under Alternative 1, there would be no fishing for salmon and steelhead in the Elwha River. However, Elwha River pink salmon would continue to be harvested incidentally in United States and Canadian mixed stock marine area fisheries targeting more abundant salmon stocks. Under Alternative 1, there would be no change in long-term potential for tribal and recreational fisheries on pink salmon in the Elwha River relative to baseline conditions.

4.4.4.2. Alternative 2 (Proposed Action) – Make a Determination that the Submitted HGMPs and Tribal Harvest Plan Meet the Requirements of the 4(d) Rule

Under Alternative 2, habitat conditions as a result of dam removal would be the same as under Alternative 1 (i.e., habitat conditions would continue to change as Glines Canyon Dam is removed). Additionally, the operation of the Elwha River hatchery programs would be the same as under Alternative 1 (Subsection 2.2, Alternative 2), so the hatchery programs would have identical impacts on natural-origin pink salmon and their habitat as under Alternative 1. There would not be any change in risks associated with genetic effects, competition and predation, facility effects, natural population status masking, incidental fishing effects, or disease transfer relative to Alternative 1 (Subsection 3.4, Salmon and Steelhead). Similarly, there would be no change in population viability benefits or benefits from nutrient cycling relative to Alternative 1 (Table 15).

Under Alternative 2, there would be no change in fisheries affecting Elwha River pink salmon relative to Alternative 1. No fisheries would directly harvest hatchery-origin or natural-origin Elwha River pink salmon, but Elwha River pink salmon would continue to be harvested incidentally in United States and Canadian mixed-stock marine area fisheries targeting more abundant salmon stocks. Fisheries on native, hatchery-origin steelhead (ceremonial/subsistence and later commercial) would be initiated under Alternative 2 once the Elwha River natural-origin steelhead reach abundance thresholds, but these fisheries would not be expected to affect pink

salmon because adult pink salmon would not be in the fishing area during the steelhead fisheries. Under Alternative 2, there would be no change in long-term potential for tribal and recreational fisheries on pink salmon in the Elwha River relative to Alternative 1.

4.4.4.3. Alternative 3 (Proposed Hatchery Programs with a Sunset Term) – Make a Determination that Revised HGMPs that Include a Sunset Term and a Revised Tribal Harvest Plan Meet the Requirements of the 4(d) Rule

In the short term, the operation of the Elwha River hatchery programs and habitat conditions as a result of dam removal would be the same under Alternative 3 as under Alternative 1 (i.e., habitat conditions would continue to change as Glines Canyon Dam is removed) (Subsection 2.3, Alternative 3). Therefore, in the short term, there would be no change in risks associated with genetic effects, competition and predation, facility effects, natural population status masking, incidental fishing effects, or disease transfer relative to Alternative 1 (Subsection 3.4, Salmon, and Steelhead). Similarly, there would be no change in the short term in total species abundance and population viability benefits or benefits from nutrient cycling relative to Alternative 1.

In the long term, Alternative 3 would eliminate risks associated with genetic effects, competition and predation, facility effects, natural population status masking, incidental fishing effects, or disease transfer from hatchery programs because the hatchery programs would be terminated in approximately 2019. Similarly, population viability and nutrient cycling benefits would be eliminated after hatchery-origin fish stop returning to the Basin to spawn (Subsection 3.4, Salmon and Steelhead). However, it would take longer for the species to recolonize the Elwha River Basin to a viable population level without hatchery programs (Ward et al. 2008). Salmon and steelhead would have similar access to high quality habitat throughout the Elwha River Basin under Alternative 3 as under Alternative 1, so there would be no change in the spatial structure or productivity of the Elwha River pink salmon population relative to Alternative 1, but the pace in achieving benefits to these parameters may be reduced relative to Alternative 1. Because certain hatchery programs can reduce the genetic diversity and fitness of a salmon population, eliminating the hatchery programs in approximately 2019 may reduce genetic diversity risks relative to Alternative 1.

Under Alternative 3, there would be no change in fisheries affecting Elwha River pink salmon relative to Alternative 1. No fisheries would directly harvest hatchery-origin or natural-origin Elwha River pink salmon. However, Elwha River pink salmon would continue to be harvested incidentally in United States and Canadian mixed-stock marine area fisheries targeting more abundant salmon stocks. Tribal steelhead fisheries would be initiated under Alternative 3 once Elwha River natural-origin steelhead reach abundance thresholds, but these fisheries would not be expected to affect pink salmon because adult pink salmon migrate much earlier in the season

and would not be in the fishing area during the steelhead fisheries. Because Alternative 3 would delay attainment of a viable abundance level relative to Alternative 1, Alternative 3 would reduce the long-term potential for tribal and recreational fisheries on pink salmon in the Elwha River relative to Alternative 1.

4.4.4.4. Alternative 4 (No Hatchery Programs in the Elwha River) --- Make a Determination that the Submitted HGMPs and Tribal Harvest Plan Do Not Meet the Requirements of the 4(d) Rule

Under Alternative 4, habitat conditions as a result of dam removal would be the same as under Alternative 1 (i.e., habitat conditions would continue to change as Glines Canyon Dam is removed). However, under Alternative 4, the Elwha River hatchery programs would be terminated immediately (Subsection 2.4, Alternative 4). Consequently, Alternative 4 would eliminate short- and long-term risks associated with genetic effects, competition and predation, facility effects, natural population status masking, incidental fishing effects, or disease transfer from the hatchery programs. Similarly, benefits from the hatchery programs on population viability and nutrient cycling would be eliminated after hatchery-origin fish stop returning to the Basin to spawn (Subsection 3.4, Salmon and Steelhead).

Dam removal activities are leading to water quality conditions that are reducing the survival rate of all fish migrating, spawning, and rearing in the Elwha River below Glines Canyon Dam. Consequently, fish that spend less time in the Elwha River during adverse water quality conditions (i.e., fish held for spawning, rearing and release in the hatcheries) are going to have a higher survival rate when compared to fish migrating, spawning, and rearing in the Elwha River. Although not an ESA-listed species, the Elwha River pink salmon population is considered at high risk of extinction due to very low average abundance levels observed prior to the commencement of dam removal (Subsection 3.4.4, Pink Salmon). The natural-origin pink salmon population averages under 100 fish. The already very low number of natural-origin fish is expected to decline further as a result of dam removal activities. Alternative 4 would reduce short-term abundance relative to Alternative 1 (Table 15), directly increasing extinction risk. Any pink salmon that survive dam removal activities would have access to high-quality habitat throughout the Elwha River Basin but, because abundance levels would be expected to be critically low (with possible extirpation of the population), the spatial structure, productivity, and diversity status of the species would be markedly reduced relative to Alternative 1, which would also increase extinction risk.

Under Alternative 4, no fisheries would directly harvest hatchery-origin or natural-origin Elwha River pink salmon. However, Elwha River pink salmon may continue to be harvested incidentally in United States and Canadian mixed-stock marine area fisheries targeting more

abundant salmon stocks (if they are not extirpated). Under this alternative, the adverse effects of any fisheries would be increased over Alternative 1, as the incidence of intercepting a natural-origin pink salmon would increase as the proportion of hatchery-origin fish decreases. Because Alternative 4 would increase the risk of extirpation and delay attainment of a viable abundance level relative to Alternative 1, Alternative 4 would reduce the long-term potential for tribal and recreational fisheries on pink salmon in the Elwha River.

4.4.4.5. Alternative 5 (Hatchery Programs with Decreased Production Levels) –Make a Determination that Revised HGMPs with Decreased Production Levels and the Tribal Harvest Plan Meet the Requirements of the 4(d) Rule

Decreased juvenile fall pink salmon production levels under Alternative 5 relative to Alternative 1 (Table 3) would reduce short-term risks associated with domestication, competition and predation, facility effects, natural population status masking, and disease transfer from the hatchery programs (Table 6) (Subsection 3.4, Salmon and Steelhead). Competition and predation risks are low under Alternative 1, but they would be even lower under Alternative 5 because fewer fish would be released.

Dam removal activities are leading to water quality conditions that are reducing the survival rate of all fish migrating, spawning, and rearing in the Elwha River below Glines Canyon Dam. Consequently, fish that spend less time in the Elwha River during adverse water quality conditions (i.e., fish in the hatcheries) are going to have a higher survival rate when compared to fish that are rearing and spawning in the Elwha River. Both Elwha River populations are at a critically low abundance status (Subsection 3.4.3, Puget Sound Pink Salmon), and abundance is expected to decline as a result of dam removal activities. Under Alternative 5, the hatchery program would be reduced by two-thirds, so hatchery-origin fish returning the Elwha River would be reduced from 15,000 pink salmon to 5,000 pink salmon under average survival rates (actual survival rates in the short term will be much lower) (Table 15). After broodstock collection, the short-term total abundance of Chinook salmon would be between 3,990 and 41,000 adult fish, or 4 to 4.3 percent of the pink spawner abundance level needed to end the recolonization phase. Because of the reduced number of spawners, extinction risk would be higher under Alternative 5 relative to Alternative 1.

Because of critically low abundance levels under Alternative 5 and the deleterious river turbidity levels caused by dam removal, the hatchery would be primarily responsible for the conservation of genetic diversity of the native species in the Elwha River. A genetic effective population size (a measure of the rate at which a population of a certain size will lose diversity) of 500 per generation is needed for conservation of genetic diversity in the hatchery (Lande and

Barrowclough 1987), and the production levels under Alternative 5 should be adequate to achieve a 500 fish per generation effective size within the hatchery (Table 15)[15].

Any pink salmon that survive the adverse sediment impact period during and immediately following dam removal would have access to high-quality habitat throughout the Elwha River Basin. However, in the short term, the productivity of spawners above the dams will likely be lower than spawners below the dam until the spawning gravel above the dams is conditioned by salmon and steelhead spawners (i.e., the first generation of spawners would loosen and clean the spawning gravel, which would make it better for subsequent generations of salmon and steelhead). The process of conditioning gravel would take longer under Alternative 5 relative to Alternative 1. There would also be fewer salmon and steelhead spawning under Alternative 5 relative to Alternative 1, so fewer marine-derived nutrients would be added to an aquatic system that has been cut off from this important source of nutrients for decades.

Under Alternative 5, there would be no change in fisheries affecting Elwha River pink salmon relative to Alternative 1. No fisheries would directly harvest hatchery-origin or natural-origin Elwha River pink salmon. However, Elwha River pink salmon would continue to be harvested incidentally in United States and Canadian mixed-stock marine area fisheries targeting more abundant salmon stocks. Tribal steelhead fisheries would be initiated under Alternative 5 once Elwha River natural-origin steelhead reach abundance thresholds, but these fisheries would not be expected to affect pink salmon because adult pink salmon migrate much earlier in the season and would not be in the fishing area during the steelhead fisheries. Because Alternative 5 would delay attainment of a viable abundance level relative to Alternative 1, Alternative 5 would delay the long-term potential for fisheries on pink salmon in the Elwha River relative to Alternative 1.

4.4.5. Puget Sound Coho Salmon

4.4.5.1. Alternative 1 (No Action) – Do Not Make a Determination under the 4(d) Rule

Under Alternative 1, the hatchery programs would be operated identically as under baseline conditions (Subsection 2.1, Alternative 1), but habitat conditions would continue to change as Glines Canyon Dam is removed. Therefore, there would be no change in risks associated with

[15] The "effective population size" is usually less than the census population size. To determine the total number of fish needed to achieve a 500 fish per generation effective size, divide 500 by the generation time of the fish species. For pink salmon, the generation time is 2 years, so you would need 250 effective spawners per year. Because of the high mortality from the time a fish is a fry to the time it is an adult, an average of one in four of the pink salmon spawned in the hatchery contribute to the subsequent generation of fish (Pers. Comm. between M. Ford and C. Busack; June 3, 2014). Therefore, multiply 250 times four to calculate the number of annual broodstock needed to achieve a 500 fish per generation effective size. For the pink salmon hatchery program, you would need to collect 1,000 broodstock annually to maintain a 500 fish per generation effective size. These calculations assume equal numbers of males and females.

genetic effects, competition and predation, facility effects, natural population status masking, incidental fishing effects, or disease transfer relative to baseline conditions (Subsection 3.4, Salmon and Steelhead). Nutrient cycling and population viability benefits would continue to change relative to baseline conditions.

In the short term, while the effects of dam removal activities continue, the hatchery programs would continue to preserve genetic diversity under Alternative 1 at a level consistent with baseline conditions, but the hatchery programs would provide the following additional benefits going forward:

- The hatchery programs would add marine-derived nutrients to the aquatic and terrestrial systems above Glines Canyon Dam, which are inaccessible to salmon and steelhead under baseline conditions.
- The coho salmon hatchery program would increase total and natural-origin abundance and spatial structure of the coho salmon population as additional habitat becomes available and as first-generation hatchery-origin fish, and the offspring of naturally spawning hatchery-origin fish, return to spawn naturally.
- The coho salmon hatchery program would preserve the Elwha River coho salmon population when turbidity levels are high and detrimental to natural-origin fish survival due to dam removal activities.

In the long term, spatial structure and abundance of the Elwha River coho salmon population would be expected to continue to improve relative to baseline conditions because coho salmon would continue to re-seed habitat that has been inaccessible since dam construction. Additionally, in the long term, the newly accessible habitat would be of higher quality than existing habitat, so productivity would be expected to improve relative to baseline conditions. However, in the short term, the productivity of spawners above the dams may be lower than

Table 16. Naturally spawning fish contributions by alternative relative to the recolonization phase abundance target for Elwha River coho salmon.

Alternative	Elwha River Coho Smolt Release Numbers	Estimated Hatchery-Origin Adult Return[1]	Estimated Natural-origin Adult Return[2]	Estimated Total Adult Return	Annual Broodstock Collection to Maintain 500 Fish per Generation Effective Size[3]	Required Number of Broodstock to Meet Annual Smolt Release Target	Estimated Number of Naturally Spawning Fish in 2018[4]	Target for Natural Chinook Abundance[6]	Estimated Naturally Spawning Fish Percent of Abundance Target
1	425,000	4,250	168	4,418	667	600	3,751 – 3,818	12,100	**31 - 32**
2	425,000	4,250	168	4,418	667	600	3,751 – 3,818	12,100	**31 - 32**
3	425,000[5]	4,250	168	4,418	667	600	3,751 – 3,818	12,100	**31 - 32**
4	0	0	168	168	N/A	N/A	168	12,100	**1**
5	50,000	500	168	668	667	72[7]	1 – 596	12,100	**0.01 - 5**

[1] Estimated hatchery-origin adult return is based on recent average smolt-to-adult survival rates. Actual survival rates will be lower while sediment levels are high.

[2] Estimated natural-origin adult return is based on recent observed proportion (based on tagged fish recoveries) of the 2006-2011 estimated average total return (1,683 from WDFW runs reconstruction, Haymes, 2011) that are hatchery-origin fish (>90% or 168 wild coho), prior to commencement of dam removal and resultant inhospitable to lethal sediment loads in critical habitat for coho salmon. Actual return levels will be lower while sediment levels are high.

[3] To determine the total number of fish needed to achieve a 500 fish per generation effective size, divide 500 by the generation time of the fish species. For Coho, the generation time is 3 years, so you would need 167 effective spawners per year. Because of the high mortality from the time a fish is a fry to the time it is an adult, an average of one in four of the coho spawned in the hatchery contribute to the subsequent generation of fish (Pers. Comm. between M. Ford and C. Busack; June 3, 2014). Therefore, multiply 167 times four to calculate the number of annual broodstock needed to achieve a 500 fish per generation effective size. For the coho salmon hatchery program, you would need to collect 667 broodstock annually to maintain a 500 fish per generation effective size. These calculations assume equal numbers of males and females.

[4] The estimate of the contribution of natural spawners under each alternative is the pre-dam removal average natural-origin adult return (168 fish) plus contributions of hatchery-origin coho surplus to effective size and smolt release target broodstock needs and available for natural spawning. When the number of broodstock needed to meet target annual smolt release levels was greater than the number needed to maintain a 500 fish per generation effective size, NMFS assumed hatchery operators would collect the number of broodstock needed to meet target annual smolt release levels. When the opposite was true, NMFS analyzed the range in broodstock numbers. Assumed in estimated hatchery-origin coho contributions is a juvenile to adult return survival rate of 1.0%. Actual survival rates in the short-term will be worse while sediment levels are high.

[5] Alternative 3 includes a sunset, so although the coho program would release up to 425,000 juveniles into the Elwha River in year 1, the program would sunset after the coho population reached the preservation phase of restoration (NMFS 2012a; EMG 2014).

[6] Interim restoration target for abundance after 25 years from the Elwha Fish Restoration Plan (Ward et al. 2008). Required number of broodstock needed to meet a 50,000 smolt release levels assumed to be 11.8% (50,000/425,000) of the number of adult fish identified as needed by LEKT (600 fish) to produce 425,000 coho salmon smolts through the program at the Lower Elwha Fish Hatchery facility.

spawners below the dam until the spawning gravel above the dams is conditioned by salmon and steelhead spawners (i.e., the first generation of spawners would loosen and clean the spawning gravel, which would make it better for subsequent generations of salmon and steelhead). As fish colonize new areas, they would be subject to a broader array of selective pressures, which would be expected to increase genetic diversity relative to baseline conditions.

Under Alternative 1, there would be no salmon and steelhead fisheries in the Elwha River. However, Elwha River coho salmon would continue to be harvested incidentally in United States and Canadian mixed stock marine area fisheries targeting more abundant salmon stocks. Under Alternative 1, there would be no change in long-term potential for tribal and recreational fisheries on coho salmon in the Elwha River relative to baseline conditions.

4.4.5.2. Alternative 2 (Proposed Action) – Make a Determination that the Submitted HGMPs and Tribal Harvest Plan Meet the Requirements of the 4(d) Rule

Under Alternative 2, habitat conditions as a result of dam removal would be the same as under Alternative 1 (i.e., habitat conditions would continue to change as Glines Canyon Dam is removed). Additionally, the operation of the Elwha River hatchery programs would be the same as under Alternative 1 (Subsection 2.2, Alternative 2), so the hatchery programs would have identical impacts on natural-origin pink salmon and their habitat as under Alternative 1. There would not be any change in risks associated with genetic effects, competition and predation, facility effects, natural population status masking, incidental fishing effects, or disease transfer relative to Alternative 1 (Subsection 3.4, Salmon and Steelhead). Similarly, there would be no change in population viability benefits or benefits from nutrient cycling relative to Alternative 1 (Table 16).

Under Alternative 2, there would be no change in fisheries affecting Elwha River coho salmon relative to Alternative 1. No fisheries would directly harvest hatchery-origin or natural-origin Elwha River coho salmon, but Elwha River coho salmon would continue to be harvested incidentally in United States and Canadian mixed-stock marine area fisheries targeting more abundant salmon stocks. Fisheries on native, hatchery-origin steelhead (ceremonial/subsistence and later commercial) would be initiated under Alternative 2 once the Elwha River natural-origin steelhead reach abundance thresholds, but these fisheries would not be expected to affect coho salmon because adult coho salmon would not be in the fishing area during fisheries targeting late-returning steelhead (i.e., native stock). Under Alternative 2, there would be no change in long-term potential for tribal and recreational fisheries on coho salmon in the Elwha River relative to Alternative 1.

4.4.5.3. Alternative 3 (Proposed Hatchery Programs with a Sunset Term) – Make a Determination that Revised HGMPs that Include a Sunset Term and a Revised Tribal Harvest Plan Meet the Requirements of the 4(d) Rule

In the short term, the operation of the Elwha River hatchery programs and habitat conditions as a result of dam removal would be the same under Alternative 3 as under Alternative 1 (i.e., habitat conditions would continue to change as Glines Canyon Dam is removed) (Subsection 2.3, Alternative 3). Therefore, in the short term, there would be no change in risks associated with genetic effects, competition and predation, facility effects, natural population status masking, incidental fishing effects, or disease transfer relative to Alternative 1 (Subsection 3.4, Salmon, and Steelhead). Similarly, there would be no change in the short term in total species abundance and population viability benefits or benefits from nutrient cycling relative to Alternative 1.

In the long term, Alternative 3 would eliminate risks associated with genetic effects, competition and predation, facility effects, natural population status masking, incidental fishing effects, or disease transfer from hatchery programs because the hatchery programs would be terminated in approximately 2019. Similarly, population viability and nutrient cycling benefits would be eliminated after hatchery-origin fish stop returning to the Basin to spawn (Subsection 3.4, Salmon, Steelhead, and Their Habitat). However, it would take longer for the species to recolonize the Elwha River Basin to a viable population level without hatchery programs (Ward et al. 2008). Salmon and steelhead would have similar access to high quality habitat throughout the Elwha River Basin under Alternative 3 as under Alternative 1, so there would be no change in the spatial structure or productivity of the Elwha River coho salmon population relative to Alternative 1, but the pace in achieving benefits to these parameters may be reduced relative to Alternative 1. Because certain hatchery programs can reduce the genetic diversity and fitness of a salmon population, eliminating the hatchery programs in approximately 2019 may reduce genetic diversity risks relative to Alternative 1.

Under Alternative 3, there would be no change in fisheries affecting Elwha River coho salmon relative to Alternative 1. No fisheries would directly harvest hatchery-origin or natural-origin Elwha River coho salmon. However, Elwha River coho salmon would continue to be harvested incidentally in United States and Canadian mixed-stock marine area fisheries targeting more abundant salmon stocks. Tribal steelhead fisheries would be initiated under Alternative 3 once Elwha River natural-origin steelhead reach abundance thresholds, but these fisheries would not be expected to affect coho salmon because adult coho salmon migrate much earlier in the season and would not be in the fishing area during the late-returning steelhead fisheries. Because Alternative 3 would delay attainment of a viable abundance level relative to Alternative 1, Alternative 3 may reduce the long-term potential for tribal and recreational fisheries on coho salmon in the Elwha River relative to Alternative 1.

4.4.5.4. Alternative 4 (No Hatchery Programs in the Elwha River) --- Make a Determination that the Submitted HGMPs and Tribal Harvest Plan do Not Meet the Requirements of the 4(d) Rule

Under Alternative 4, habitat conditions as a result of dam removal would be the same as under Alternative 1 (i.e., habitat conditions would continue to change as Glines Canyon Dam is removed). However, under Alternative 4, the Elwha River hatchery programs would be terminated immediately (Subsection 2.4, Alternative 4). Consequently, Alternative 4 would eliminate short- and long-term risks associated with genetic effects, competition and predation, facility effects, natural population status masking, incidental fishing effects, or disease transfer from the hatchery programs. Similarly, benefits from the hatchery programs on population viability and nutrient cycling would be eliminated after hatchery-origin fish stop returning to the basin to spawn (Subsection 3.4, Salmon and Steelhead).

Dam removal activities are leading to water quality conditions that are reducing the survival rate of all fish migrating, spawning, and rearing in the Elwha River below Glines Canyon Dam. Consequently, fish that spend less time in the Elwha River during adverse water quality conditions (i.e., fish held for spawning, rearing and release in the hatcheries) are going to have a higher survival rate when compared to fish migrating, spawning, and rearing in the Elwha River. Although not an ESA-listed species, the Elwha River coho salmon population is considered at high risk of extinction due to low average abundance levels observed prior to the commencement of dam removal (Subsection 3.4.5, Coho Salmon). The natural-origin coho salmon population averages under 200 fish. The already very low number of natural-origin fish is expected to decline further as a result of dam removal activities. Alternative 4 would reduce short-term abundance relative to Alternative 1 (Table 15), directly increasing extinction risk. Any coho salmon that survive dam removal activities would have access to high-quality habitat throughout the Elwha River Basin but, because abundance levels would be expected to be critically low (with possible extirpation of the population), the spatial structure, productivity, and genetic diversity status of the species would be markedly reduced relative to Alternative 1, which would also increase extinction risk.

Under Alternative 4, no fisheries would directly harvest hatchery-origin or natural-origin Elwha River coho salmon. However, Elwha River coho salmon may continue to be harvested incidentally in United States and Canadian mixed-stock marine area fisheries targeting more abundant salmon stocks (if they are not extirpated). But under this alternative, the adverse effects of any fisheries would be increased over Alternative 1, as the incidence of intercepting a natural-origin coho salmon would increase as the proportion of hatchery-origin fish decreases. Because Alternative 4 would increase the risk of extirpation and delay attainment of a viable

abundance level relative to Alternative 1, Alternative 4 would reduce the long-term potential for tribal and recreational fisheries on coho salmon in the Elwha River.

4.4.5.5. Alternative 5 (Hatchery Programs with Decreased Production Levels) –Make a Determination that Revised HGMPs with Decreased Production Levels and the Tribal Harvest Plan Meet the Requirements of the 4(d) Rule

Decreased juvenile coho salmon production levels under Alternative 5 relative to Alternative 1 (Table 3) would reduce short-term risks associated with domestication, competition and predation, facility effects, natural population status masking, and disease transfer from the hatchery programs (Table 6) (Subsection 3.4, Salmon and Steelhead). Competition and predation risks are low under Alternative 1, but they would be even lower under Alternative 5 because fewer fish would be released.

Dam removal activities are leading to water quality conditions that are reducing the survival rate of all fish migrating, spawning, and rearing in the Elwha River below Glines Canyon Dam. Consequently, fish that spend less time in the Elwha River during adverse water quality conditions (i.e., fish in the hatcheries) are going to have a higher survival rate when compared to fish that are rearing and spawning in the Elwha River. The total hatchery and natural-origin population is already at low abundance (Subsection 3.4.3, Puget Sound Coho Salmon), and these numbers are expected to decline as a result of the adverse sediment impact period during and immediately following dam removal. Under Alternative 5, the hatchery program would be reduced to 50,000 smolts, so the number of hatchery-origin fish returning to the Elwha River would be reduced from 4,250 coho salmon to 500 coho salmon under average survival rates (actual survival rates in the short term will be much lower) (Table 16). After broodstock collection, the short-term abundance of coho salmon would be between 1 and 596 fish, or 0.01 and 5 percent of the coho salmon abundance needed to end the recolonization phase and begin the local adaptation phase of restoration, under which the hatchery programs for coho salmon would no longer be needed (Table 16). Because of the reduced number of spawners, extinction risk would be higher under Alternative 5 relative to Alternative 1.

Because of low abundance levels under Alternative 5 and the deleterious river turbidity levels caused by dam removal, the hatchery would be primarily responsible for the conservation of genetic diversity of the native species in the Elwha River. A genetic effective population size (a measure of the rate at which a population of a certain size will lose diversity) of 500 per generation is needed for conservation of genetic diversity in the hatchery (Lande and

Barrowclough 1987), and the production levels under Alternative 5 would not be adequate to achieve a 500 fish per generation effective size within the hatchery (Table 16)[16].

Any coho salmon that survive the adverse sediment impact period during and immediately following dam removal would have access to high-quality habitat throughout the Elwha River Basin. However, in the short term, the productivity of spawners above the dams will likely be lower than spawners below the dam until the spawning gravel above the dams is conditioned by salmon and steelhead spawners (i.e., the first generation of spawners would loosen and clean the spawning gravel, which would make it better for subsequent generations of salmon and steelhead). The process of conditioning gravel would take longer under Alternative 5 relative to Alternative 1. There would also be fewer salmon and steelhead spawning under Alternative 5 relative to Alternative 1, so fewer marine-derived nutrients would be added to an aquatic system that has been cut off from this important source of nutrients for decades.

Under Alternative 5, there would be no change in fisheries affecting Elwha River coho salmon relative to Alternative 1. No fisheries would directly harvest hatchery-origin or natural-origin Elwha River coho salmon. However, Elwha River coho salmon would continue to be harvested incidentally in United States and Canadian mixed-stock marine area fisheries targeting more abundant salmon stocks. Tribal steelhead fisheries would be initiated under Alternative 5 once Elwha River natural-origin steelhead reach abundance thresholds, but these fisheries would not be expected to affect coho salmon because adult coho salmon migrate much earlier in the season and would not be in the fishing area during the steelhead fisheries. Because Alternative 5 would delay attainment of a viable abundance level relative to Alternative 1, Alternative 5 would delay the long-term potential for fisheries on coho salmon in the Elwha River relative to Alternative 1.

4.5. Other Fish Species

4.5.1. Alternative 1 (No Action) – Do Not Make a Determination under the 4(d) Rule

Under Alternative 1, the hatchery programs and would be operated identically as under baseline conditions, so there would be no change in weir or incidental fishery effects relative to baseline conditions (Subsection 3.5.1, Other Fish and Their Habitat). However, habitat conditions will

[16] The "effective population size" is usually less than the census population size. To determine the total number of fish needed to achieve a 500 fish per generation effective size, divide 500 by the generation time of the fish species. For coho salmon, the generation time is 3 years, so you would need 167 effective spawners each year. Because of the high mortality from the time a fish is a fry to the time it is an adult, an average of one in four of the coho spawned in the hatchery contribute to the subsequent generation of fish (Pers. Comm. between M. Ford and C. Busack; June 3, 2014). Therefore, multiply 167 times four to calculate the annual number of broodstock needed to achieve a 500 fish per generation effective size. For a coho salmon hatchery program, you would need to collect 667 broodstock annually to maintain a 500 fish per generation effective size. These calculations assume equal numbers of males and females.

continue to change as Glines Canyon Dam is removed, and these changes will affect the frequency of predator/prey/competitor interactions.

The U.S. Department of Interior estimates that more than 380,000 adult salmon and steelhead will be produced in the Elwha River once the Glines Canyon Dam is removed and restoration is complete (NPS 1995). These fish and their progeny will provide a source of food for a variety of fish species, including Pacific lamprey, Western brook lamprey, coast range sculpin, prickly sculpin, eastern brook trout, rainbow trout, kokanee, cutthroat trout, bull trout, and rockfish (Subsection 3.5, Other Fish and Their Habitat), perhaps increasing populations of some bird and mammal populations in the Elwha River Basin relative to baseline conditions (NPS 1995). These salmon and steelhead will add an estimated 817,800 pounds of carcasses to the system relative to the baseline conditions, which will bring nutrients from the marine ecosystem to the freshwater ecosystem (i.e., nutrient cycling), benefiting all freshwater fish species (NPS 1995).

Increasing the number of salmon and steelhead in the Elwha River Basin would increase competition for food with all fish species in the analysis area and increase competition for space among freshwater species (Subsection 3.5, Other Fish Species and Their Habitat). Similarly, increasing the number of salmon and steelhead in the Elwha River Basin would increase the number of predators on all fish species in the analysis area (Subsection 3.5, Other Fish Species and Their Habitat) relative to baseline conditions, indirectly increasing predation risks to co-occurring fish species.

In summary, bull trout may be affected by predation, competition, supply of marine-derived nutrients, and fishing, but these effects are not expected to be substantial under Alternative 1 for the following reasons: (1) bull trout would largely benefit from having hatchery-origin salmon and steelhead released into the Elwha River Basin because they eat juvenile salmon and steelhead, and (2) bull trout are not found exclusively in the Elwha River Basin or nearby marine waters (the Elwha River Basin is a very small percentage of their total range, so any mortalities as a resulting from implementation of Alternative 1 would not be expected to impact the overall size, health, survival, or status of the species).

Despite the occasional presence of eulachon in the Elwha River, the relatively small numbers of straying fish are not likely to be successfully contributing to the annual recruitment of juveniles that would substantially support recovery of the DPS (Gustafson et al. 2010). Therefore, any adverse or beneficial effects on eulachon as a result of competition, predation, or supply of marine derived-nutrients is not expected to impact the overall size, health, survival, or status of the species.

Because Pacific lamprey, Western brook lamprey, all rockfish species, and Pacific herring are not located exclusively in the Elwha River Basin or nearby marine waters, and in most cases these areas are a very small percentage of their total range, any adverse or beneficial effects on these species as a result of competition, predation, or supply of marine derived-nutrients is not expected to impact the overall size, health, survival, or status of the species.

4.5.2. Alternative 2 (Proposed Action) – Make a Determination that the Submitted HGMPs and Tribal Harvest Plan Meet the Requirements of the 4(d) Rule

Under Alternative 2, habitat conditions as a result of dam removal would be the same as under Alternative 1 (i.e., habitat conditions would continue to change as Glines Canyon Dam is removed). Additionally, the operation of the Elwha River hatchery programs would be the same as under Alternative 1 (Subsection 2.2, Alternative 2), so the hatchery programs would have identical impacts on other fish species as under Alternative 1.

Under Alternative 2, there would be moratorium on salmon and steelhead fishing in the Elwha River until 2018. At that point, the Tribe would initiate a small (less than 50 hatchery-origin steelhead) ceremonial and subsistence fishery on hatchery-origin fish if the natural-origin steelhead abundance is projected to exceed 300 fish. Beginning January of 2020 or later, if the natural-origin component of the steelhead population exceeds 500 fish, the Lower Elwha Klallam Tribe would scale up their fishery (i.e., commercial fishery) to target 200 to 300 hatchery-origin steelhead. Subsistence fishermen would use hook and line, and commercial fishermen would use both gillnets and hook and line. In the past, larger fish species such as bull trout were periodically encountered in the subsistence fishery, but no documented information on total incidental mortality is available at this time (Subsection 3.5, Other Fish and Their Habitat). Tribal fishermen using commercial gillnets would not be expected to encounter any other freshwater species, including Pacific lamprey, Western brook lamprey, coast range and prickly sculpin, eulachon, three-spined stickleback, red-side shiner, eastern brook trout, kokanee, bull trout, and cutthroat trout (Subsection 3.5, Other Fish and Their Habitats). These freshwater species would not be captured by 5-inch mesh gillnets. Some of these species may be susceptible to hook and line capture, however.

In summary, bull trout may be affected by predation, competition, supply of marine-derived nutrients, and fishing, but, as under Alternative 1, these effects are not expected to be substantial under Alternative 2 for the following reasons: (1) bull trout would largely benefit from having hatchery-origin salmon and steelhead released into the Elwha River Basin because they eat juvenile salmon and steelhead; (2) although bull trout would be expected to be periodically encountered in the Tribal subsistence fishery, incidental mortalities would be expected to be low; and (3) bull trout are not found exclusively in the Elwha River Basin or nearby marine waters.

The Elwha River Basin is a very small percentage of their total range, so any mortalities as a result of the Proposed Action would not be expected to impact the overall size, health, survival, or status of the species.

Impacts to eulachon under Alternative 2 would be the same as under Alternative 1. Despite the occasional presence of eulachon in the Elwha River, the relatively small numbers of straying fish are not likely to be successfully contributing to the annual recruitment of juveniles that would substantially support recovery of the DPS (Gustafson et al. 2010). Therefore, any adverse or beneficial effects on eulachon as a result of competition, predation, or supply of marine derived-nutrients is not expected to impact the overall size, health, survival, or status of the species.

Because Pacific lamprey, Western brook lamprey, all rockfish species, and Pacific herring are not located exclusively in the Elwha River Basin or nearby marine waters, and in most cases these areas are a very small percentage of their total range, as under Alternative 1, any adverse or beneficial effects on these species as a result of competition, predation, or supply of marine derived-nutrients is not expected to impact the overall size, health, survival, or status of the species.

4.5.3. Alternative 3 (Proposed Hatchery Programs with a Sunset Term) – Make a Determination that Revised HGMPs that Include a Sunset Term and a Revised Tribal Harvest Plan Meet the Requirements of the 4(d) Rule

In the short term, the operation of the Elwha River hatchery programs and habitat conditions as a result of dam removal would be the same under Alternative 3 as under Alternative 1 (i.e., habitat conditions would continue to change as Glines Canyon Dam is removed) (Subsection 2.3, Alternative 3). Therefore, in the short term, the hatchery programs would have identical impacts on other fish species as under Alternative 1. However, after the hatchery programs are terminated (in approximately 2019) and hatchery-origin fish stop returning to the Basin, the total number of salmon and steelhead (hatchery-origin and natural-origin) would decrease, which would reduce the frequency of predator/prey/competitor interactions relative to Alternative 1.

Under Alternative 3, there would be moratorium on salmon and steelhead fishing in the Elwha River until 2018. At that point, the Tribe would initiate a small (less than 50 hatchery-origin steelhead) ceremonial and subsistence fishery on hatchery-origin fish if the natural-origin steelhead abundance is projected to exceed 300 fish. Because hatchery-origin steelhead would stop returning to the Elwha River in approximately 2021, the steelhead fishery would only be ramped up to target 200 to 300 hatchery-origin steelhead for one year, and only if natural-origin steelhead abundance that year is projected to exceed 500 fish. Larger fish species such as bull trout have been periodically encountered in the subsistence fishery in the past, but no

documented information on total incidental mortality is available at this time (Subsection 3.5, Other Fish and Their Habitat). Tribal fisherman have not encountered any freshwater species when using commercial gillnets, because these species are too small to be captured in gillnets used to target steelhead (Subsection 3.5, Other Fish and Their Habitat), but may encounter certain species when hook and line gear is used.

In summary, bull trout may be affected by predation, competition, supply of marine-derived nutrients, and fishing, but, as under Alternative 1, these effects are not expected to be substantial under Alternative 3 for the following reasons: (1) bull trout would largely benefit from having hatchery-origin salmon and steelhead released into the Elwha River Basin because they eat juvenile salmon and steelhead; (2) although bull trout would be expected to be periodically encountered in the Tribal subsistence fishery, incidental mortalities would be expected to be low; and (3) bull trout are not found exclusively in the Elwha River Basin or nearby marine waters. The Elwha River Basin is a very small percentage of their total range, so any mortalities resulting from implementation of Alternative 3 would not be expected to impact the overall size, health, survival, or status of the species).

As under Alternative 1, despite the occasional presence of eulachon in the Elwha River, the relatively small numbers of straying fish are not likely to be successfully contributing to the annual recruitment of juveniles that would substantially support recovery of the DPS (Gustafson et al. 2010). Therefore, any adverse or beneficial effects on eulachon as a result of competition, predation, or supply of marine derived-nutrients is not expected to impact the overall size, health, survival, or status of the species.

Because Pacific lamprey, Western brook lamprey, all rockfish species, and Pacific herring are not located exclusively in the Elwha River Basin or nearby marine waters, and in most cases these areas are a very small percentage of their total range, As under Alternative 1, any adverse or beneficial effects on these species as a result of competition, predation, or supply of marine derived-nutrients is not expected to impact the overall size, health, survival, or status of the species.

4.5.4. Alternative 4 (No Hatchery Programs in the Elwha River) --- Make a Determination that the Submitted HGMPs and Tribal Harvest Plan do Not Meet the Requirements of the 4(d) Rule

Under Alternative 4, habitat conditions as a result of dam removal would be the same as under Alternative 1 (i.e., habitat conditions would continue to change as Glines Canyon Dam is removed). However, under Alternative 4, the Elwha River hatchery programs would be terminated immediately (Subsection 2.4, Alternative 4). Consequently, in the short and long

term, the total number of salmon and steelhead (hatchery-origin and natural-origin) would decrease relative to Alternative 1, which would reduce the frequency of predator/prey/competitor interactions.

Under Alternative 4, there would be no salmon or steelhead fisheries in the Elwha River Basin, so there would be no potential to intercept species such as bull trout, which have been periodically encountered in the subsistence fishery in the past.

In summary, bull trout may be affected by predation, competition, supply of marine-derived nutrients, and fishing, but, as under Alternative 1, these effects are not expected to be substantial under Alternative 4 for the following reasons: (1) bull trout would largely benefit from having hatchery-origin salmon and steelhead released into the Elwha River Basin because they eat juvenile salmon and steelhead; and (2) bull trout are not found exclusively in the Elwha River Basin or nearby marine waters. The Elwha River Basin is a very small percentage of their total range, so any mortalities resulting from implementation of Alternative 5 would not be expected to impact the overall size, health, survival, or status of the species.

As under Alternative 1, despite the occasional presence of eulachon in the Elwha River, the relatively small numbers of straying fish are not likely to be successfully contributing to the annual recruitment of juveniles that would substantially support recovery of the DPS (Gustafson et al. 2010). Therefore, any adverse or beneficial effects on Eulachon as a result of competition, predation, or supply of marine derived-nutrients is not expected to impact the overall size, health, survival, or status of the species.

Because Pacific lamprey, Western brook lamprey, all rockfish species, and Pacific herring are not located exclusively in the Elwha River Basin or nearby marine waters, and in most cases these areas are a very small percentage of their total range, as under Alternative 1, any adverse or beneficial effects on these species as a result of competition, predation, or supply of marine derived-nutrients is not expected to impact the overall size, health, survival, or status of the species.

4.5.5. Alternative 5 (Hatchery Programs with Decreased Production Levels) –Make a Determination that Revised HGMPs with Decreased Production Levels and the Tribal Harvest Plan Meet the Requirements of the 4(d) Rule

Decreased juvenile hatchery salmon and steelhead production levels under Alternative 5 relative to Alternative 1 (Table 3) would reduce risks to other fish species associated with competition and predation, facility effects, incidental fishing effects, and disease transfer from the hatchery

programs (Table 6) (Subsection 3.4, Salmon and Steelhead). Although decreased relative to Alternative 1, competition and predation risks would remain low under Alternative 5 due to the continued lower river release of smolts only and at times that minimize risks to any co-occurring natural-origin fish populations.

Benefits to the population viability of other fish species (through increased prey availability), and benefits afforded to the fish species through nutrient cycling (Table 6) (Subsection 3.4, Salmon and Steelhead) would be reduced relative to Alternative 1 as a result of a roughly two-thirds reduction in the number of juvenile fish produced, and the expected commensurate reduction in adult returns that would increase marine-derived nutrients in the watershed.

Under Alternative 5, habitat conditions as a result of dam removal would be the same under Alternative 1 (i.e., habitat conditions would continue to change as Glines Canyon Dam is removed) (Subsection 2.5, Alternative 5). However, under Alternative 5, the Elwha River juvenile fish release levels for hatchery programs would be reduced by roughly two-thirds relative to Alternative 1 (Subsection 2.5, Alternative 5). Consequently, the total number of salmon and steelhead (hatchery-origin and natural-origin) would decrease relative to Alternative 1 (Table 3), which would reduce the frequency of predator/prey/competitor interactions with other fish species in the watershed.

Under Alternative 5, there would continue to be a moratorium on salmon and steelhead fishing in the Elwha River until 2018. In 2018, the Tribe would initiate a small (less than 50 hatchery-origin steelhead) ceremonial and subsistence fishery on hatchery-origin fish if the natural-origin steelhead abundance is projected to exceed 300 fish. Because adult hatchery-origin steelhead returns to the Elwha River would be reduced in number by roughly two-thirds relative to Alternative 1, the steelhead fishery proposed in 2012 to target 200 to 300 hatchery-origin steelhead would have a decreased likelihood of being implemented (subject to a natural-origin steelhead abundance projected to exceed 500 fish) relative to Alternative 1.

Large fish species such as bull trout have been periodically encountered in tribal subsistence fisheries in the past, but no documented information on total incidental mortality is available at this time (Subsection 3.5, Other Fish and Their Habitat). Tribal fisherman have not encountered any other freshwater fish species when using commercial gillnets, because these species are too small to be captured in the net mesh sizes used by gillnetters to target steelhead (Subsection 3.5, Other Fish and Their Habitat). Certain species may be encountered when hook and line gear is used.

In summary, bull trout may be affected by predation, competition, supply of marine-derived nutrients, and fishing, but, as under Alternative 1, these effects are not expected to be substantial

under Alternative 5 for the following reasons: (1) bull trout would largely benefit from having hatchery-origin salmon and steelhead released into the Elwha River Basin because they eat juvenile salmon and steelhead; (2) although bull trout would be expected to be periodically encountered in the Tribal subsistence fishery, incidental mortalities would be expected to be low; and (3) bull trout are not found exclusively in the Elwha River Basin or nearby marine waters. The Elwha River Basin is a very small percentage of their total range, so any mortalities as a result of implementation of Alternative 5 would not be expected to impact the overall size, health, survival, or status of the species.

As under Alternative 1, despite the occasional presence of eulachon in the Elwha River, the relatively small numbers of straying fish are not likely to be successfully contributing to the annual recruitment of juveniles that would substantially support recovery of the DPS (Gustafson et al. 2010). Therefore, any adverse or beneficial effects on eulachon under Alternative 5 as a result of competition, predation, or supply of marine derived-nutrients is not expected to impact the overall size, health, survival, or status of the species.

Because Pacific lamprey, Western brook lamprey, all rockfish species, and Pacific herring are not located exclusively in the Elwha River Basin or nearby marine waters, and in most cases these areas are a very small percentage of their total range. As under Alternative 1, any adverse or beneficial effects on these species as a result of competition, predation, or supply of marine derived-nutrients is not expected to impact the overall size, health, survival, or status of the species.

4.6. Wildlife

4.6.1. Alternative 1 (No Action) – Do Not Make a Determination under the 4(d) Rule

Under Alternative 1, the hatchery programs and tribal fishery would be operated the same as under baseline conditions (Subsection 2.1, Alternative 1), so there would be no change in the risk of transfer of toxic contaminants from hatchery-origin fish to wildlife, nor in risks associated with operation of weirs at the hatcheries, predator control programs, or habitat disruption from angler access (Subsection 3.6, Wildlife). However, habitat conditions will continue to change as Glines Canyon Dam is removed.

The Department of Interior estimates that more than 380,000 natural-origin salmon and steelhead adults will be produced in the Elwha River once the Glines Canyon Dam is removed and restoration is complete (NPS 1995). These fish and their progeny will provide a source of food for a variety of birds and mammals, perhaps increasing populations of some bird and mammal populations in the Elwha River Basin relative to baseline conditions (NPS 1995). An estimated

817,800 pounds of carcasses are expected to be added to the system relative the baseline conditions (NPS 1995). These carcasses will bring nutrients from the marine ecosystem to the terrestrial ecosystem (i.e., nutrient cycling), which will benefit wildlife.

Similarly, increasing the number of Elwha River salmon and steelhead would increase the amount of food available for marine mammals such as killer whales, seals, and sea lions. However, because Elwha River salmon and steelhead commingle with many other hatchery-origin and natural-origin salmon and steelhead from the Puget Sound, Fraser River, Columbia River, and Washington Coast while in marine waters, the impact on the abundance of marine mammals would likely be negligible (i.e., at the lower levels of detection) relative to baseline conditions.

Increasing the number of salmon and steelhead in the Elwha River Basin would increase the food availability for salmon and steelhead predators and scavengers (e.g., bald eagles), which would have a low beneficial impact on these wildlife populations. Increasing the number of salmon and steelhead in the Elwha River Basin would also increase the number of predators on some invertebrates and amphibian species, which might have a low adverse impact on the abundance of invertebrates and amphibian species in the Elwha River Basin relative to baseline conditions.

Alternative 1 would not be expected to change the size, health, survival, or Federal listing status of Northern spotted owl, marbled murrelet, Southern resident killer whale, and Steller sea lion, because none of these species is located exclusively in the Elwha River Basin or nearby marine waters, and the analysis area represents a very small percentage of their total range.

4.6.2. Alternative 2 (Proposed Action) – Make a Determination that the Submitted HGMPs and Tribal Harvest Plan Meet the Requirements of the 4(d) Rule

Under Alternative 2, habitat conditions as a result of dam removal would be the same as under Alternative 1 (i.e., habitat conditions would continue to change as Glines Canyon Dam is removed). Additionally, the operation of the Elwha River hatchery programs would be the same as under Alternative 1 (Subsection 2.2, Alternative 2), so the hatchery programs would have identical impacts on wildlife as under Alternative 1. There would be no change in the risk of transfer of toxic contaminants from hatchery-origin fish to wildlife, operation of weirs at the hatcheries, predator control programs, predation/competition effects, or nutrient cycling (Subsection 3.6, Wildlife).

Under Alternative 2, the Lower Elwha Klallam Tribe would initiate a small mark-selective, ceremonial and subsistence fishery (50 fish) on hatchery-origin, late-returning steelhead after the

number of natural-origin steelhead returns is projected to exceed 300 adults. Additionally, the Lower Elwha Klallam Tribe would initiate a commercial and recreational fishery (200 to 300 fish) on hatchery-origin, late-returning (i.e., native stock) steelhead after the number of natural-origin steelhead is projected to exceed 500 adults. However, because there has been recreational fishing throughout the Elwha River Basin, fishery access points, roads, and boat launches are already present in the analysis area, and Alternative 2 is not expected to lead to additional impacts on wildlife relative to Alternative 1 from physical damage or disruption of riparian vegetation from angler access or physical disruption of streambed material from wading or motorized boat use.

Alternative 2 would not be expected to change the size, health, survival, or Federal listing status of Northern spotted owl, marbled murrelet, Southern resident killer whale, and Steller sea lion, because none of these species is located exclusively in the Elwha River Basin or nearby marine waters, and in most cases these areas are a very small percentage of their total range.

4.6.3. Alternative 3 (Proposed Hatchery Programs with a Sunset Term) – Make a Determination that Revised HGMPs that Include a Sunset Term and a Revised Tribal Harvest Plan Meet the Requirements of the 4(d) Rule

In the short term, the operation of the Elwha River hatchery programs and habitat conditions as a result of dam removal would be the same under Alternative 3 as under Alternative 1 (i.e., habitat conditions would continue to change as Glines Canyon Dam is removed) (Subsection 2.3, Alternative 3). Therefore, in the short term, there would be no change in the risk of transfer of toxic contaminants from hatchery-origin fish to wildlife, operation of weirs at the hatcheries, predator control programs, habitat disruption from angler access, predation/competition effects, or nutrient cycling (Subsection 3.6, Wildlife).

In the long term, Alternative 3 would eliminate risks associated with the transfer of toxic contaminants from hatchery-origin fish to wildlife, predator control programs, and predation/competition effects relative to Alternative 1 (Subsection 3.6, Wildlife).

Under Alternative 3, the Lower Elwha Klallam Tribe would initiate a small mark-selective, ceremonial and subsistence fishery (50 fish) on hatchery-origin, late-returning steelhead after the number of natural-origin steelhead returns is projected to exceed 300 adults, assuming the natural-origin abundance reaches 300 adults while hatchery-origin fish are returning to the Basin. However, because there has been recreational fishing throughout the Elwha River Basin, fishery access points, roads, and boat launches are already present in the analysis area, and Alternative 3 is not expected to lead to additional impacts on wildlife relative to Alternative 1 from physical

damage or disruption of riparian vegetation from angler access or physical disruption of streambed material from wading or motorized boat use. Since there would be no hatchery-origin fish to support a ceremonial and subsistence or commercial fishery, the Tribe would not initiate any fisheries on hatchery-origin fish.

Alternative 3 would not be expected to change the size, health, survival, or Federal listing status of Northern spotted owl, marbled murrelet, Southern resident killer whale, and stellar sea lion, because none of these species is located exclusively in the Elwha River Basin or nearby marine waters, and the analysis area represents a very small percentage of the total ranges for the species.

4.6.4. Alternative 4 (No Hatchery Programs in the Elwha River) --- Make a Determination that the Submitted HGMPs and Tribal Harvest Plan do Not Meet the Requirements of the 4(d) Rule

Under Alternative 4, habitat conditions as a result of dam removal would be the same as under Alternative 1 (i.e., habitat conditions would continue to change as Glines Canyon Dam is removed). However, under Alternative 4, the Elwha River hatchery programs would be terminated immediately (Subsection 2.4, Alternative 4). Consequently, Alternative 4 would eliminate short- and long-term risks of hatchery programs on wildlife from the transfer of toxic contaminants from hatchery-origin fish to wildlife, predator control programs, or predation/competition effects (Subsection 3.6, Wildlife).

Under Alternative 4, extinction risk for salmon and steelhead populations would be greater than under Alternative 1. If extirpated, there would be less food available for wildlife species that eat salmon and steelhead and up to 817,800 fewer pounds of salmon and steelhead carcasses that would add nutrients from the marine ecosystem to the terrestrial ecosystem (NPS 1995). Thus, the population abundance of some fish-eating bird and mammal species would likely be reduced under Alternative 4 relative to Alternative 1.

Under Alternative 4, there would be no salmon or steelhead fisheries in the Elwha River, so there would be no further risk of impacts on wildlife from physical damage or disruption of riparian vegetation from angler access or physical disruption of streambed material from wading or motorized boat.

Reducing the number of salmon and steelhead in the Elwha River Basin may increase competition for food for wildlife species with shared food preferences, such as gulls and cormorants. It would reduce the number of predators on some invertebrates and amphibian

species, which might have a low beneficial effect on the abundance of invertebrates and amphibian species in the Elwha River Basin.

Alternative 4 would not be expected to change the size, health, survival, or Federal listing status of Northern spotted owl, marbled murrelet, Southern resident killer whale, and Steller sea lion, because none of these species is located exclusively in the Elwha River Basin or nearby marine waters, and these areas are a very small percentage of their total range.

4.6.5. Alternative 5 (Hatchery Programs with Decreased Production Levels) –Make a Determination that Revised HGMPs with Decreased Production Levels and the Tribal Harvest Plan Meet the Requirements of the 4(d) Rule

Under Alternative 5, habitat conditions as a result of dam removal would be the same as under Alternative 1 (i.e., habitat conditions would continue to change as Glines Canyon Dam is removed). However, under Alternative 5, juvenile salmon and steelhead releases from the Elwha River hatchery programs, and hence, adult hatchery-origin return levels to the watershed, would be reduced by roughly two-thirds relative to levels under Alternative 1 (Subsection 2.5, Alternative 5). Consequently, Alternative 4 would reduce short- and long-term risks of hatchery programs on wildlife from the transfer of toxic contaminants from hatchery-origin fish to wildlife, predator control programs, or predation/competition effects (Subsection 3.6, Wildlife).

Under Alternative 5, extinction risk of the native Elwha River salmon and steelhead populations would be greater than under Alternative 1. If extirpated, there would be less food available for wildlife species that eat salmon and steelhead, and substantially fewer pounds of salmon and steelhead carcasses that would add nutrients from the marine ecosystem to the terrestrial ecosystem in the long term. Thus, the population abundance of some fish-eating bird and mammal species would likely be reduced under Alternative 5 in the near term while achieving viable abundance levels, and possibly in the long term if extirpated, relative to Alternative 1.

Under Alternative 5, the Lower Elwha Klallam Tribe would initiate a small mark-selective, ceremonial and subsistence fishery (50 fish) on hatchery-origin, late-returning steelhead after the number of natural-origin steelhead returns is projected to exceed 300 adults. Additionally, the Lower Elwha Klallam Tribe would initiate a commercial and recreational fishery (200 to 300 fish) on hatchery-origin, late-returning (i.e., native stock) steelhead after the number of natural-origin steelhead is projected to exceed 500 adults. However, because there has been recreational fishing throughout the Elwha River Basin, fishery access points, roads, and boat launches are already present in the analysis area, and Alternative 5 is not expected to lead to additional impacts on wildlife relative to Alternative 1 from physical damage or disruption of riparian vegetation from angler access or physical disruption of streambed material from wading or

motorized boat use.

Reducing the number of salmon and steelhead in the Elwha River Basin relative to Alternative 1 would increase competition for food for wildlife species with shared food preferences, such as gulls and cormorants. With reductions in juvenile salmon and steelhead that serve as prey to sustain certain wildlife species, Alternative 5 may reduce the number of predators on some invertebrates and amphibian species, which might have a low beneficial effect on the abundance of invertebrates and amphibian species in the Elwha River Basin.

Alternative 5 would not be expected to change the size, health, survival, or Federal listing status of Northern spotted owl, marbled murrelet, Southern resident killer whale, and Steller sea lion, because none of these species is located exclusively in the Elwha River Basin or nearby marine waters, and these areas are a very small percentage of their total range.

4.7. Socioeconomics

4.7.1. Alternative 1 (No Action) – Do Not Make a Determination under the 4(d) Rule

Under Alternative 1, the hatchery programs would be operated the same as under baseline conditions, so there would be no change in employment opportunities or the local procurement of goods and services for hatchery operations (Subsection 3.7, Socioeconomics).

Under Alternative 1, there would be no salmon or steelhead fishing in the Elwha River, which is identical as under baseline conditions. Therefore, there would be no change in the purchase of fishing-related supplies at local businesses (Subsection 3.7, Socioeconomics) after the 2013-2014 fishing season.

Because the Elwha River salmon and steelhead populations are expected to rebound to harvestable numbers after the Elwha River dams are removed and the Elwha River has recovered, there is long-term potential for the fisheries to add substantially to the regional economy. One National Park Service study found that commercial fishermen could obtain $3.5 million per year of net economic benefits after fish stocks are restored in the Elwha River Basin (NPS 1995). However, under Alternative 1, no fishing plans would be in place for salmon and steelhead in the Elwha River, so although fishing potential would eventually be greater under Alternative 1 than under baseline conditions, the socioeconomic benefits cannot be quantified.

4.7.2. Alternative 2 (Proposed Action) – Make a Determination that the Submitted HGMPs and Tribal Harvest Plan Meet the Requirements of the 4(d) Rule

Under Alternative 2, the operation of the Elwha River hatchery programs would be the same as under Alternative 1, so there would be no change in employment opportunities or the local procurement of goods and services for hatchery operations.

Under Alternative 2, there would be no salmon or steelhead fishing in the Elwha River, which is identical as under Alternative 1. Therefore, there would be no change in the purchase of fishing-related supplies in the short-term (before 2014). There would be a small reduction in the purchase of fishing-related supplies during the fishing moratorium, and, after reinitiating fisheries, there would be long-term increase in the purchase of fishing-related supplies relative to Alternative 1.

There would be no change in long-term potential for fisheries to contribute substantially to the regional economy under Alternative 2 relative to Alternative 1, because salmon and steelhead stocks would be expected to rebound to harvestable numbers at similar rates under both alternatives.

4.7.3. Alternative 3 (Proposed Hatchery Programs with a Sunset Term) – Make a Determination that Revised HGMPs that Include a Sunset Term and a Revised Tribal Harvest Plan Meet the Requirements of the 4(d) Rule

Under Alternative 3, the operation of the Elwha River hatchery programs would be the same as under Alternative 1 in the short term but, in the long term (i.e.**,** it would be expected that the last hatchery-origin fish would be released around 2019), the hatchery programs would be closed and no longer contribute $1.65 million and 14 full-time jobs to the regional economy.

Under Alternative 3, there would be a moratorium on salmon and steelhead fishing until 2018. At that point, the Tribe would initiate a small (less than 50 hatchery-origin steelhead) ceremonial and subsistence fishery on hatchery-origin fish if the natural-origin steelhead abundance is projected to exceed 300 fish. Because hatchery-origin steelhead would stop returning to the Elwha River in approximately 2021, the steelhead fishery would only be ramped up to target 200 to 300 hatchery-origin steelhead for one year, and only if natural-origin steelhead abundance that year is projected to exceed 500 fish. Therefore, Alternative 3 would not lead to any short-term changes (before 2018) in the purchase of fishing-related supplies, but there would be a short-term increase in the purchase of fishing related supplies under Alternative 3 relative to Alternative 1 from approximately 2018 until hatchery-origin fish stopped returning to the Elwha River Basin (in approximately 2021).

There would be no change in long-term potential for fisheries to contribute substantially to the regional economy under Alternative 3 relative to Alternative 1 because salmon and steelhead stocks would be expected to rebound to harvestable numbers under both alternatives, but it would be expected to take salmon and steelhead a much longer time, possibly decades, to reach harvestable numbers under Alternative 3 relative to Alternative 1.

4.7.4. Alternative 4 (No Hatchery Programs in the Elwha River) --- Make a Determination that the Submitted HGMPs and Tribal Harvest Plan do Not Meet the Requirements of the 4(d) Rule

Under Alternative 4, the Elwha River hatchery programs would be terminated immediately (Subsection 2.4, Alternative 4), and hatchery programs would no longer contribute $1.65 million and 14 full-time jobs to the regional economy (Subsection 3.7, Socioeconomics).

Under Alternative 4, like under Alternative 1, there would be no salmon or steelhead fishing in the Elwha River. Therefore, there would be no change in the purchase of fishing-related supplies relative to Alternative 1. However, the long-term potential for Elwha River fisheries to contribute meaningfully to the regional economy would be greatly reduced under Alternative 4 relative to Alternative 1 because, without the Elwha River hatchery programs, it is uncertain whether the Elwha River salmon and steelhead populations will be able to survive the degradation in environmental conditions resulting from dam removal activities. Consequently, Alternative 4 would lead to a $3.5 million annual loss in potential net economic benefits to commercial fishers relative to Alternative 1.

4.7.5. Alternative 5 (Hatchery Programs with Decreased Production Levels) –Make a Determination that Revised HGMPs with Decreased Production Levels and the Tribal Harvest Plan Meet the Requirements of the 4(d) Rule

Under Alternative 5, juvenile fish production by the Elwha River hatchery programs would be reduced by roughly two-thirds (Subsection 2.5, Alternative 5). It is expected that substantially reduced fish production from the hatchery programs under Alternative 5 would have detectable effects on income to the region through reduced harvest and fishing opportunity resulting from fewer returning adult fish. With reduced hatchery salmon production and labor needs, employment at the hatcheries would also be reduced relative to Alternative 1 to at least a medium extent.

Under Alternative 5, there would be a moratorium on salmon and steelhead fishing until 2018. In 2018, the Tribe would initiate a small (less than 50 hatchery-origin steelhead) ceremonial and subsistence fishery on hatchery-origin fish if the natural-origin steelhead abundance is projected

to exceed 300 fish. Because hatchery-origin steelhead would return to the Elwha River at roughly two-thirds of the abundance level expected under Alternative 1, Alternative 5 would likely reduce the chances that the Tribal Harvest Plan target of 200 to 300 hatchery-origin steelhead would be available for harvest as the natural steelhead population is restored. Reduced abundances of naturally spawning native Elwha River hatchery-origin steelhead under Alternative 5 would also reduce the likelihood that natural-origin steelhead abundance would exceed 500 fish, decreasing the likelihood for a tribal steelhead fishery relative to Alternative 1. For these reasons, Alternative 5 would not be expected to lead to any short-term changes (before 2018) in the purchase of fishing-related supplies, but there would be a short-term decrease in the purchase of fishing related supplies under Alternative 5 relative to Alternative 1 after approximately 2018, because prospects for steelhead fisheries would be reduced or delayed.

The long-term potential for Elwha River fisheries to contribute meaningfully to the regional economy would be reduced under Alternative 5 relative to Alternative 1 because with a roughly two-thirds reduction in the Elwha River hatchery programs it is uncertain whether the resultant reduced abundance of Elwha River salmon and steelhead populations would enable the species to persist in degraded environmental conditions resulting from dam removal. Reductions in adult fish returns under Alternative 5 would at least decrease benefits to the local economy relative to Alternative 1 because the availability of returning adult fish for harvest in fisheries and sale would be reduced. Consequently, Alternative 5 would lead to a medium reduction in the estimated annual $3.5 million net economic benefits to commercial fishers expected under Alternative 1.

4.8. Cultural Resources

4.8.1. Alternative 1 (No Action) – Do Not Make a Determination under the 4(d) Rule

Under Alternative 1, there would be no construction or expansion of the hatchery facilities, so no cultural artifacts would be disrupted or destroyed. The hatchery programs would continue to operate as under baseline conditions in both the near and long-term, but environmental conditions would continue to change as freshwater and estuarine habitat improve from dam removal. In the short-term, the hatchery-programs would preserve the remaining extant salmon and steelhead populations while water-quality conditions inhospitable for fish in mainstem reaches of the Elwha River persist (Subsection 4.4., Salmon and Steelhead). In the long-term, the hatchery programs would increase total and natural-origin abundance and spatial structure of salmon and steelhead populations as additional habitat becomes available and first-generation hatchery-origin fish, and the offspring of naturally spawning hatchery-origin fish, return to spawn naturally (Subsection 4.4, Salmon, Steelhead, and Their Habitat). Consequently, under Alternative 1, the survival and well-being of salmon would improve relative to baseline

conditions, which would be expected to improve the well-being of the Lower Elwha Klallam Tribe, because salmon and the Tribe are inextricably linked (Subsection 3.8, Cultural Resources).

The Lower Elwha Klallam Tribe's "usual and accustomed" fishing area includes the entire Elwha River Basin (Subsection 3.8, Cultural Resources). These fisheries have played a central role in the Lower Elwha Klallam Tribe's culture, in particular the fisheries conducted for ceremony and subsistence purposes (Subsection 3.8, Cultural Resources). Under Alternative 1, the Tribe would not have a fishing plans in place for salmon and steelhead in the Elwha River. However, under Alternative 1, the Elwha River salmon and steelhead populations would be expected to rebound to harvestable numbers and recolonize the entire watershed encompassed by the Tribe's "usual and accustomed" fishing area after the Elwha River dams are removed and the Elwha River and estuarine areas have recovered. Therefore, relative to baseline conditions, Alternative 1 would improve the long-term *potential* for Elwha River salmon and steelhead to meaningfully contribute to the Tribe's fisheries.

4.8.2. Alternative 2 (Proposed Action) – Make a Determination that the Submitted HGMPs and Tribal Harvest Plan Meet the Requirements of the 4(d) Rule

Under Alternative 2, environmental conditions would be the same as under Alternative 1. Additionally, the operation of the Elwha River hatchery programs would be the same as under Alternative 1 (Subsection 2.2, Alternative 2), so as under Alternative 1, no cultural artifacts would be disrupted or destroyed. Additionally, in the short-term, the hatchery-programs would preserve the remaining extant salmon and steelhead populations while water-quality conditions inhospitable for fish in mainstem reaches of the Elwha River persist (Subsection 4.4., Salmon and Steelhead). In the long-term, the hatchery programs would increase total and natural-origin abundance and spatial structure of salmon and steelhead populations as additional habitat becomes available and first-generation hatchery-origin fish, and the offspring of naturally spawning hatchery-origin fish, return to spawn naturally (Subsection 4.4, Salmon, Steelhead, and Their Habitat). Consequently, like under Alternative 1, the survival and well-being of salmon would improve under Alternative 2 relative to baseline conditions, which would be expected to improve the well-being of the Lower Elwha Klallam Tribe, because salmon and the Tribe are inextricably linked (Subsection 3.8, Cultural Resources).

The Lower Elwha Klallam Tribe's "usual and accustomed" fishing area includes the entire Elwha River Basin (Subsection 3.8, Cultural Resources). These fisheries have played a central role in the Lower Elwha Klallam Tribe's culture, in particular the fisheries conducted for ceremony and subsistence purposes (Subsection 3.8, Cultural Resources). Under Alternative 2, there would be a moratorium on salmon and steelhead fishing until 2018. After the 2013-2014 steelhead fishing season, the Lower Elwha Klallam Tribe would stop fishing in the Elwha River

Basin until 2018. At that point, the Tribe would initiate a small (less than 50 hatchery-origin steelhead) ceremonial and subsistence fishery on hatchery-origin fish if the natural-origin steelhead abundance is projected to exceed 300 fish. Beginning January of 2020 or later, if the natural-origin component of the steelhead population exceeds 500 fish, the Lower Elwha Klallam Tribe would scale up their fishery to target 200 to 300 hatchery-origin steelhead. Consequently, Alternative 2 would increase the Tribe's harvest of steelhead after the 2013-2014 fishing season, because the Tribe would have a fishing plan in place under Alternative 2 after the 2013-2014 fishing season. However, relative to Alternative 1, Alternative 2 would not change the long-term *potential* for Elwha River salmon and steelhead to meaningfully contribute to the Tribe's fisheries, because salmon and steelhead would be expected to rebound to harvestable numbers and recolonize the entire watershed encompassed by the Tribe's "usual and accustomed" fishing area under both alternatives.

4.8.3. Alternative 3 (Proposed Hatchery Programs with a Sunset Term) – Make a Determination that Revised HGMPs that Include a Sunset Term and a Revised Tribal Harvest Plan Meet the Requirements of the 4(d) Rule

In the short term, the operation of the Elwha River hatchery programs, and environmental conditions, would be the same under Alternative 3 as under Alternative 1 (Subsection 2.3, Alternative 3), so as under Alternative 1, no cultural artifacts would be disrupted or destroyed. Under Alternative 3, there would be a moratorium on salmon and steelhead fishing until 2018. At that point, the Tribe would initiate a small (less than 50 hatchery-origin steelhead) ceremonial and subsistence fishery on hatchery-origin fish if the natural-origin steelhead abundance is projected to exceed 300 fish. Because hatchery-origin steelhead would stop returning to the Elwha River in approximately 2021, the steelhead fishery would only be ramped up to target 200 to 300 hatchery-origin steelhead for one year, and only if natural-origin steelhead abundance that year is projected to exceed 500 fish. Therefore, in the short term, there would be no change in effects on cultural resources relative to Alternative 1.

However, under Alternative 3, the Elwha River hatchery programs would be terminated after the dams have been removed, sediment levels have returned to pre-dam removal levels, and salmon and steelhead have exhibited some natural productivity. The programs would be terminated near the end of the preservation phase (Subsection 1.5.2, Elwha River Fish Restoration Plan), and it would be expected that the last hatchery-origin fish would be released around 2019. Alternative 3 would delay attainment of harvestable salmon and steelhead populations relative to Alternative 1. Therefore, although Alternative 3 would be expected to have similar long-term benefits to cultural resources as under Alternative 1, the attainment of these benefits would be delayed, possibly by decades.

4.8.4. Alternative 4 (No Hatchery Programs in the Elwha River) --- Make a Determination that the Submitted HGMPs and Tribal Harvest Plan do Not Meet the Requirements of the 4(d) Rule

Under Alternative 4, like under Alternative 1, there would be no salmon or steelhead fisheries in the Elwha River.

Because dam removal activities are expected to lead to water-quality conditions that are detrimental, and perhaps lethal, to all fish migrating and rearing in the lower Elwha River (Ward et al. 2008), Alternative 4 would reduce short-term salmon and steelhead abundance relative to Alternative 1. Extinction risk for salmon and steelhead populations would be greater under Alternative 4 relative to Alternative 1. Relative to Alternative 1, Alternative 4 would markedly reduce the likelihood of salmon and steelhead recolonizing the entire watershed encompassed by the Tribe's "usual and accustomed" fishing area, would reduce the Tribe's access to salmon and steelhead for ceremonial and other cultural practices, and would be expected to reduce the well-being of the Tribe. Because there would be no construction under Alternative 4, there would be no change in the likelihood of disrupting or destroying cultural artifacts relative to Alternative 1.

4.8.5. Alternative 5 (Hatchery Programs with Decreased Production Levels) –Make a Determination that Revised HGMPs with Decreased Production Levels and the Tribal Harvest Plan Meet the Requirements of the 4(d) Rule

Under Alternative 5, environmental conditions would be the same as under Alternative 1. Additionally, operational components of the Elwha River hatchery programs that could affect surrounding habitat would essentially be the same as under Alternative 1 (Subsection 2.2, Alternative 2). Consequently, as under Alternative 1, no cultural artifacts would be disrupted or destroyed.

A roughly two-thirds reduction in salmon and steelhead production under Alternative 5 would reduce the likelihood, relative to Alternative 1, that the remaining native Elwha River salmon and steelhead populations would be preserved. Further, water-quality conditions inhospitable for fish in mainstem reaches of the Elwha River would persist (Subsection 4.4., Salmon and Steelhead), which would also adversely impact the abundance of native populations. In the long-term, because of decreased contributions of the hatchery-origin fish to total returns and natural spawning, total and natural-origin Elwha River salmon and steelhead population abundance and spatial structure benefits would decrease relative to Alternative 1. As additional habitat becomes available, under Alternative 1 there would be roughly two-thirds fewer first-generation hatchery-origin fish, and fewer offspring of naturally spawning hatchery-origin fish, that would be produced relative to Alternative 1 (Subsection 4.4, Salmon and Steelhead). Consequently, the

survival and well-being of salmon would decrease under Alternative 5 relative to Alternative 1, which would be expected to adversely affect the well-being of the Lower Elwha Klallam Tribe, because salmon and the Tribe are inextricably linked (Subsection 3.8, Cultural Resources).

The Lower Elwha Klallam Tribe's "usual and accustomed" fishing area includes the entire Elwha River Basin (Subsection 3.8, Cultural Resources). These fisheries have played a central role in the Lower Elwha Klallam Tribe's culture, in particular the fisheries conducted for ceremony and subsistence purposes (Subsection 3.8, Cultural Resources). Under Alternative 5, there would be a moratorium on salmon and steelhead fishing until 2018. After the 2013-2014 steelhead fishing season, the Lower Elwha Klallam Tribe would stop fishing in the Elwha River Basin until 2018. At that point, the Tribe would initiate a small (less than 50 hatchery-origin steelhead) ceremonial and subsistence fishery on hatchery-origin fish if the natural-origin steelhead abundance is projected to exceed 300 fish. Because hatchery-origin steelhead would return to the Elwha River at roughly two-thirds of the abundance level expected under Alternative 1, Alternative 5 would likely reduce the chances that the Tribal Harvest Plan target of 200 to 300 hatchery-origin steelhead would be available for harvest as the natural steelhead population is restored. Reduced abundances of naturally spawning native Elwha River hatchery-origin steelhead under Alternative 5 would also reduce the likelihood that natural-origin steelhead abundance would exceed 500 fish, decreasing the likelihood for a tribal steelhead fishery relative to Alternative 1. For these reasons, Alternative 5 would not be expected to lead to any short-term differences in cultural resource effects relative to Alternative 1 before 2018. However, Alternative 5 would decrease cultural resource benefits relative to Alternative 1 after 2018, because prospects for steelhead fisheries valuable to the Lower Elwha Klallam Tribe would be reduced or delayed.

The long-term potential for Elwha River fisheries to contribute meaningfully to the cultural resources would be reduced under Alternative 5 relative to Alternative 1 because, with a roughly two-thirds reduction in the Elwha River hatchery programs, it is uncertain whether the resultant reduced abundance of Elwha River salmon and steelhead populations would enable the species to persist in degraded environmental conditions resulting from dam removal. Reductions in adult fish returns under Alternative 5 will at least decrease at a medium level cultural benefits to the Lower Elwha Klallam Tribe relative to Alternative 1.

4.9. Human Health and Safety

4.9.1. Alternative 1 (No Action) – Do Not Make a Determination under the 4(d) Rule

Under Alternative 1, the Elwha River hatchery programs would continue as under baseline conditions, and there would be no change in the risk of exposure of hatchery workers to

chemicals or pathogens. Likewise, there would be no change in the potential nutritional benefits of the hatchery programs to human health and no change in the risk of consumer exposure to toxic contaminants relative to baseline conditions (Subsection 3.9, Human Health and Safety).

4.9.2. Alternative 2 (Proposed Action) – Make a Determination that the Submitted HGMPs and Tribal Harvest Plan Meet the Requirements of the 4(d) Rule

Under Alternative 2, the Elwha River hatchery programs would continue as under Alternative 1, and there would be no change in the risk of exposure of hatchery workers to chemicals or pathogens. Likewise, there would be no change in the potential nutritional benefits of the hatchery programs to human health and no change in the risk of consumer exposure to toxic contaminants relative to Alternative 1 (Subsection 3.9, Human Health and Safety).

4.9.3. Alternative 3 (Proposed Hatchery Programs with a Sunset Term) – Make a Determination that Revised HGMPs that Include a Sunset Term and a Revised Tribal Harvest Plan Meet the Requirements of the 4(d) Rule

In the short term, the operation of the Elwha River hatchery programs and environmental conditions would be the same under Alternative 3 as under Alternative 1 (Subsection 2.3, Alternative 3). Therefore, in the short term, there would be no change in the risk of exposure of hatchery workers to chemicals or pathogens. Likewise, there would be no change in the potential nutritional benefits of the hatchery programs to human health and no change in the risk of consumer exposure to toxic contaminants relative to Alternative 1 (Subsection 3.9, Human Health and Safety).

However, under Alternative 3, the last hatchery-origin fish would be released around 2019. Therefore, in the long term, Alternative 3 may reduce the risk of exposure of hatchery workers to chemicals or pathogens. Likewise, Alternative 3 would reduce the potential nutritional benefits of the hatchery programs to human health (e.g., improved cardiovascular health), and it would reduce the risk of consumer exposure to toxic contaminants relative to Alternative 1 (Subsection 3.9, Human Health and Safety), as the number of hatchery-origin fish and, potentially, the total number of fish returning to the Elwha River would be reduced relative to Alternative 1.

4.9.4. Alternative 4 (No Hatchery Programs in the Elwha River) --- Make a Determination that the Submitted HGMPs and Tribal Harvest Plan do Not Meet the Requirements of the 4(d) Rule

Under Alternative 4, the Elwha River hatchery programs would be terminated immediately. Therefore, in the short and long term, Alternative 4 may reduce the risk of exposure of hatchery

workers to chemicals or pathogens. Likewise, Alternative 4 would reduce the potential nutritional benefits of the hatchery programs to human health and reduce the risk of consumer exposure to toxic contaminants relative to Alternative 1 (Subsection 3.9, Human Health and Safety).

4.9.5. Alternative 5 (Hatchery Programs with Decreased Production Levels) –Make a Determination that Revised HGMPs with Decreased Production Levels and the Tribal Harvest Plan Meet the Requirements of the 4(d) Rule

Under Alternative 5, because annual juvenile fish production from the hatchery programs would be reduced by roughly two-thirds, there would be a reduced risk of exposure of hatchery workers to chemicals or pathogens relative to Alternative 1. Likewise, Alternative 5 would reduce the potential nutritional benefits of the hatchery programs to human health (e.g., improved cardiovascular health), and it would reduce the risk of consumer exposure to toxic contaminants relative to Alternative 1 (Subsection 3.9, Human Health and Safety), as the number of hatchery-origin fish and the total number of fish returning to the Elwha River would be reduced relative to Alternative 1.

4.10. Environmental Justice

4.10.1. Alternative 1 (No Action) – Do Not Make a Determination under the 4(d) Rule

In the analysis area, one county (Clallam County) and one Native American Tribe (Lower Elwha Klallam Tribe) have been identified as environmental justice communities of concern (Subsection 3.8, Environmental Justice). There are no other communities in the analysis area, so all effects under Alternative 1 as described in Subsections 4.2 (Water Quantity) through Subsection 4.9 (Cultural Resources) would disproportionately impact environmental justice communities.

Under Alternative 1, the hatchery programs would be operated the same as under baseline conditions. There would not be any fisheries in the Elwha during the 5-year moratorium that ends in 2018.

Because the Elwha River salmon and steelhead populations are expected to rebound to harvestable numbers after the Elwha River dams are removed and the Elwha River has recovered, there is long-term *potential* for the fisheries to add substantially to personal income within environmental justice communities. One National Park Service study found that commercial fishermen could obtain $3.5 million per year of net economic benefits after fish

stocks are restored in the Elwha River Basin (NPS 1995). However, under Alternative 1, no fishing plans would be in place for salmon and steelhead in the Elwha River, so the socioeconomic benefits cannot be quantified.

Water quality conditions in the Elwha River would be expected to change in the short and long term from dam removal (Table 10). In the short term, sediment levels would increase immediately after removal of the Glines Canyon Dam, but water temperature conditions throughout the lower river would be expected to improve immediately (Ward et al. 2008). In the long term, sediment levels will dissipate and temperatures in the lower Elwha River would be reduced (NPS 2005).

There would be no change in water quantity, employment opportunities, or the local procurement of goods and services in environmental justice communities relative to baseline conditions (Subsection 4.2, Water Quantity; Subsection 4.3, Water Quality; Subsection 4.7, Socioeconomics). Under Alternative 1, there would be no change in the nutritional benefits of the hatchery programs to human health within environmental justice communities and no change in the risk of consumer exposure to toxic contaminants relative to baseline conditions (Subsection 4.9, Human Health and Safety).

Because the Elwha River salmon and steelhead populations are expected to rebound to harvestable numbers after the Elwha River dams are removed and the Elwha River has recovered, there is long-term *potential* for the various tribal fisheries in the Strait of Juan de Fuca to benefit from the increased adult fish returning to the Elwha River. However, because the proportion of the harvestable salmonids in the Strait of Juan de Fuca that would be represented by Elwha River fish is small, it is unlikely that the benefit would be discernible outside of near-shore marine areas.

4.10.2. Alternative 2 (Proposed Action) – Make a Determination that the Submitted HGMPs and Tribal Harvest Plan Meet the Requirements of the 4(d) Rule

In the analysis area, one county (Clallam County) and one Native American Tribe (Lower Elwha Klallam Tribe) have been identified as environmental justice communities of concern (Subsection 3.8, Environmental Justice). There are no other communities in the analysis area, so all effects under Alternative 2 as described in Subsections 4.2 (Water Quantity) through Subsection 4.9 (Cultural Resources) would disproportionately impact environmental justice

communities[17].

Under Alternative 2, the operation of the Elwha River hatchery programs would be the same as under Alternative 1. Under Alternative 2, there would be a 5-year moratorium on salmon and steelhead fishing until 2018. At that point, the Tribe would initiate a small (less than 50 hatchery-origin steelhead) ceremonial and subsistence fishery on hatchery-origin fish if the natural-origin steelhead abundance is projected to exceed 300 fish. Beginning January of 2020 or later, if the natural-origin component of the steelhead population exceeds 500 fish, the Lower Elwha Klallam Tribe would scale up their fishery to target 200 to 300 hatchery-origin steelhead.

The following ecological, cultural, human health, economic, or social impacts on environmental justice communities would be expected in both the short and long term:

- Additional fishing and cultural benefits to the Lower Elwha Klallam Tribe from implementation of steelhead fisheries relative to Alternative 1 (Subsection 4.8, Cultural Resources)

There would be no change in water quantity or quality, employment opportunities, or the local procurement of goods and services in environmental justice communities (Subsection 4.2, Water Quantity; Subsection 4.3, Water Quality; Subsection 4.7, Socioeconomics). There would be no change in long-term *potential* for fisheries to contribute substantially to personal income within environmental justice communities under Alternative 2 relative to Alternative 1, because salmon and steelhead stocks would be expected to rebound to harvestable numbers at similar rates under both alternatives. For the same reason, there would be no discernible change in benefits to tribal fisheries in usual and accustomed areas in the Strait of Juan de Fuca outside of near-shore marine areas. Under Alternative 2, there would be no change in the potential nutritional benefits of the hatchery programs to human health within environmental justice communities and no change in the risk of consumer exposure to toxic contaminants relative to Alternative 1 (Subsection 4.9, Human Health and Safety).

4.10.3. Alternative 3 (Proposed Hatchery Programs with a Sunset Term) – Make a Determination that Revised HGMPs that Include a Sunset Term and a Revised Tribal Harvest Plan Meet the Requirements of the 4(d) Rule

In the analysis area, one county (Clallam County) and one Native American Tribe (Lower Elwha Klallam Tribe) have been identified as environmental justice communities of concern

[17] According to the Lower Elwha Klallam Tribe, Alternative 2 is the only alternative analyzed in the Environmental Assessment that would prevent denial of environmental justice to the Lower Elwha Reservation Community (Appendix A).

(Subsection 3.8, Environmental Justice). There are no other communities in the analysis area, so all effects under Alternative 3 described in Subsections 4.2 (Water Quantity) through Subsection 4.9 (Cultural Resources) would disproportionately impact environmental justice communities.

Under Alternative 3, hatchery programs would be operated at levels similar to those under Alternative 1 until the dams have been removed, sediment levels have returned to pre-dam removal levels, and salmon and steelhead have exhibited some natural productivity. The hatchery programs would be terminated near the end of the preservation phase, and it would be expected that the last hatchery-origin fish would be released in approximately 2019. There would be a 5-year moratorium on salmon and steelhead fishing until 2018. At that point, the Tribe would initiate a small (less than 50 hatchery-origin steelhead) ceremonial and subsistence fishery on hatchery-origin fish if the natural-origin steelhead abundance is projected to exceed 300 fish. Because hatchery-origin steelhead would stop returning to the Elwha River in approximately 2021, the steelhead fishery would only be ramped up to target 200 to 300 hatchery-origin steelhead for one year, and only if natural-origin steelhead abundance that year is projected to exceed 500 fish.

Therefore, in the short term, there would be no expected impacts on environmental justice communities relative to Alternative 1. However, in the long term (i.e., after the hatchery programs are terminated), the following ecological, cultural, human health, economic, or social impacts on environmental justice communities would be expected:

- A small increase in the amount of surface and ground water that would be available to environmental justice communities relative to Alternative 1 (Subsection 4.2, Water Quantity)
- A loss of $1.65 million through the local procurement of goods and services and the loss of 14 full-time jobs in environmental justice communities relative to Alternative 1 (Subsection 4.7, Socioeconomics)
- Additional fishing and cultural benefits to the Lower Elwha Klallam Tribe from implementation of steelhead fisheries relative to Alternative 1 (Subsection 4.8, Cultural Resources)
- A reduction in the potential nutritional benefits of the hatchery programs to human health within environmental justice communities relative to Alternative 1 (Subsection 4.9, Human Health and Safety)
- A reduction in the risk of consumer exposure to toxic contaminants relative to Alternative 1 (Subsection 4.9, Human Health and Safety)

There would be no change in long-term *potential* for fisheries to contribute substantially to personal income within environmental justice communities under Alternative 3 relative to

Alternative 1. This is because salmon and steelhead stocks would be expected to rebound to harvestable numbers under both alternatives, but it would be expected to take salmon and steelhead a much longer time, possibly decades, to reach harvestable numbers under Alternative 3 relative to Alternative 1. For tribal fisheries in usual and accustomed areas in the Strait of Juan de Fuca, the slower increase in abundance of Elwha River salmon and steelhead under Alternative 3 relative to Alternative 1 would not be discernible outside of near-shore marine areas, because the hatcheries would not be expected to contribute substantially to the total number of harvestable fish in those areas. This delay would also delay attainment of $3.5 million annually in *potential* net economic benefits to environmental justice communities relative to Alternative 1 (Subsection 4.7, Socioeconomics).

4.10.4. Alternative 4 (No Hatchery Programs in the Elwha River) --- Make a Determination that the Submitted HGMPs and Tribal Harvest Plan do Not Meet the Requirements of the 4(d) Rule

In the analysis area, one county (Clallam County) and one Native American Tribe (Lower Elwha Klallam Tribe) have been identified as environmental justice communities of concern (Subsection 3.8, Environmental Justice). There are no other communities in the analysis area, so all effects under Alternative 4 described in Subsections 4.2 (Water Quantity) through Subsection 4.9 (Cultural Resources) would disproportionately impact environmental justice communities.

Under Alternative 4, the Elwha River hatchery programs would be terminated. The following ecological, cultural, human health, economic, or social impacts on environmental justice communities would be expected in both the short and long term:

- A small increase in the amount of surface and ground water that would be available to environmental justice communities relative to Alternative 1 (Subsection 4.2, Water Quantity)
- A loss of $1.65 million through the local procurement of goods and services and the loss of 14 full-time jobs in environmental justice communities relative to Alternative 1 , including the loss of four full-time jobs for Lower Elwha Klallam Tribal members from the Lower Elwha Hatchery (Subsection 4.7, Socioeconomics)
- A loss of $3.5 million annually in *potential* net economic benefits to environmental justice communities relative to Alternative 1 (Subsection 4.7, Socioeconomics)
- A reduction in the Tribe’s access to salmon and steelhead for ceremonial and other cultural practices relative to Alternative 1 (Subsection 4.8, Cultural Resources)
- A reduction in the potential nutritional benefits of the hatchery programs to human health within environmental justice communities relative to Alternative 1 (Subsection 4.9, Human Health and Safety)

- A reduction in the risk of consumer exposure to toxic contaminants relative to Alternative 1 (Subsection 4.9, Human Health and Safety)
- A small reduction in the number of harvestable salmon and steelhead in the tribal fisheries in usual and accustomed areas in the Strait of Juan de Fuca relative to Alternative 1 (Subsection 4.10, Environmental Justice)

Alternative 4 would reduce population abundance of salmon and steelhead relative to Alternative 1, placing the Elwha River populations at increased risk of extirpation. There would be a reduced long-term potential for fisheries to contribute substantially to personal income within environmental justice communities under Alternative 4 relative to Alternative 1. For tribal fisheries in usual and accustomed areas in the Strait of Juan de Fuca, the potential extirpation of Elwha River salmon and steelhead would not have a discernable effect on fisheries outside of near-shore marine areas, because the Elwha River populations do not contribute substantially to the total number of harvestable fish in those areas.

4.10.5. Alternative 5 (Hatchery Programs with Decreased Production Levels) –Make a Determination that Revised HGMPs with Decreased Production Levels and the Tribal Harvest Plan Meet the Requirements of the 4(d) Rule

In the analysis area, one county (Clallam County) and one Native American Tribe (Lower Elwha Klallam Tribe) have been identified as environmental justice communities of concern (Subsection 3.8, Environmental Justice). There are no other communities in the analysis area, so all effects under Alternative 3 described in Subsections 4.2 (Water Quantity) through Subsection 4.9 (Cultural Resources) would disproportionately impact environmental justice communities.

Under Alternative 5, hatchery programs would be operated at reduced levels relative to Alternative 1. There would be a 5-year moratorium on salmon and steelhead fishing until 2018. At that point, the Tribe would initiate a small (less than 50 hatchery-origin steelhead) ceremonial and subsistence fishery on hatchery-origin fish if the natural-origin steelhead abundance is projected to exceed 300 fish. However, under Alternative 5, there would be less certainty that natural-origin steelhead abundance would increase above current, extremely low levels for many years. Given current average natural-origin adult steelhead return levels averaging under 150 fish (Subsection 3.4 Salmon and Steelhead), and the uncertain term for the restoration of lower river and estuarine areas critical to steelhead survival and productivity to a healthy status, abundances would not likely exceed 300 natural-origin steelhead in the short term. Under Alternative 5, there would, therefore, be a decreased likelihood, relative to Alternative 1, of implementation of a tribal ceremonial and subsistence fishery for steelhead in the short term.

Under Alternative 5, the following ecological, cultural, human health, economic, or social impacts on environmental justice communities would be expected:

- A small increase in the amount of surface and ground water that would be available to environmental justice communities relative to Alternative 1 (Subsection 4.2, Water Quantity)
- A decrease in economic benefits of $1.65 million estimated to accrue under Alternative 1 through reduced local procurement of goods and services, and the loss of a proportion of the 14 full-time jobs in environmental justice communities relative to Alternative 1 (Subsection 4.7, Socioeconomics)
- Reductions in fishing and cultural benefits to the Lower Elwha Klallam Tribe from the reduced likelihood for implementation of steelhead fisheries relative to Alternative 1 (Subsection 4.8, Cultural Resources)
- A reduction in the potential nutritional benefits of the hatchery programs to human health within environmental justice communities relative to Alternative 1 (Subsection 4.9, Human Health and Safety)
- A reduction in the risk of consumer exposure to toxic contaminants relative to Alternative 1 (Subsection 4.9, Human Health and Safety)

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.

Chapter 3, Affected Environment describes baseline conditions, which reflect the effects of past and existing actions (including hydropower, habitat loss, harvest, and hatchery production). Chapter 4, Environmental Consequences, evaluates the direct and indirect effects of the Proposed Action on baseline conditions. Chapter 4 evaluates the effects of the Proposed Action in the context of changes that are expected in the Elwha River Basin as a result of the removal of the Elwha and Glines Canyon Dams. Chapter 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 action 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 Elwha River salmon and steelhead in the Pacific Ocean and habitat restoration actions identified under the Monitoring and Adaptive Management Plan for the Elwha Restoration Project (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. If the cumulative effects of other hatchery programs, fisheries, ocean conditions, or conservation efforts do not allow sufficient escapement of returning adult salmon and steelhead to the action area to meet recovery goals while providing for the operation of the proposed hatchery programs, adjustments to fisheries and to the hatchery production levels and management actions would likely be proposed.

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 action area may be substantially diminished. 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. Finally, the presence of hatchery-origin fish, like natural-origin fish, within the Olympic Wilderness Area is compatible with Wilderness Act policy.

5.3. Climate Change

The climate is changing in the Pacific Northwest due to human activities that increase greenhouse gasses in the atmosphere, 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.

In the Elwha River Basin, impacts from climate change may be similar to those described above. The Elwha River is fed largely by glaciers and snow melt; if climate change reduces the average snow pack, then reductions in summer-time flows would result, which may reduce the suitable habitat for salmon and steelhead yearling rearing, decreasing their abundance. Climate change may also increase the frequency of major flood events that can scour redds. Lower summer flows due to a reduced winter snow pack may increase water temperatures, which may lead to an increase in the abundance of non-native warm water species that can compete with and prey on listed salmon and steelhead. Warmer water temperatures may also increase the incidence of disease outbreaks and virulence in both the natural-origin and hatchery-origin juveniles.

If climate change contributes to a substantial decline in the abundance of listed salmon and steelhead populations in the Elwha River Basin through impacts on habitat and from changes in ocean conditions, the proposed hatchery programs may continue to be used as a "safety net"

program to maintain genetic resources. The adult and earliest life stages of fish held in the proposed hatchery programs are somewhat protected from the possible increase in disease prevalence from warmer water temperatures because well water water is used during these periods and the fish are tested at spawning, during rearing, and prior to release to limit disease transmission to the natural-origin populations.

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 proposed hatchery management described in the HGMPs and the associated monitoring provide the ability to evaluate hatchery program risks and benefits as abundances change, making adjustments possible.

6. AGENCIES CONSULTED

Lower Elwha Klallam Tribe
Washington Department of Fish and Wildlife
Northwest Indian Fisheries Commission

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8. FINDING OF NO SIGNIFICANT IMPACT

Finding of No Significant Impact for NMFS' Determination that Five Hatchery Programs for Elwha River Salmon and Steelhead as Described in Joint State-Tribal Hatchery and Genetic Management Plans satisfy the Endangered Species Act Section 4(d) Rule

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 state 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.

Five Hatchery and Genetic Management Plans (HGMPs) and one Tribal Harvest Plan were submitted by the Washington Department of Fish and Wildlife (WDFW) and the Lower Elwha Klallam Tribe (applicants) pursuant to the Endangered Species Act (ESA) 4(d) Rule. Implementation of the proposed hatchery plans and Tribal Harvest Plan may potentially affect the ESA-listed Puget Sound Chinook Salmon Evolutionarily Significant Unit (ESU) and the Puget Sound Steelhead and Southern Pacific Eulachon Distinct Population Segments (DPS).

As described in the draft Environmental Assessment, NMFS evaluated the five HGMPs and the Tribal Harvest Plan collectively in one Environmental Assessment because they overlap in geography, were submitted to NMFS at approximately the same time, and rely on a common approach based upon the Elwha River Fish Restoration Plan (Ward et al. 2008). The final decisions on the HGMPs and Tribal Harvest Plan are pursuant to separate authorities and will be made in separate ESA documents (Subsection 1.1, Background). In the case of the harvest plan, ESA determinations are likely to occur in 2015. At this time, NMFS has completed an ESA section 7 biological opinion on the five HGMPs and can analyze the significance of NMFS' ESA determination on the submitted HGMPs based on the NAO 216-6 criteria and CEQ's context and intensity criteria[18]. These include:

[18] The Proposed Action for this Finding of No Significant Impact (FONSI) is NMFS's determination that the proposed HGMPs meet ESA 4(d) criteria. The Tribal Harvest Plan is not ripe for a decision at this time and, therefore, is not included in the definition of NMFS' Proposed Action for this FONSI analysis.

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

The proposed hatchery programs intend to produce hatchery-origin spring Chinook salmon, coho salmon, pink salmon, fall chum salmon, and steelhead. These are the target species. Impacts on these species are expected to be negligible to low, as described below:

- There would be minimal risks associated with genetic effects, competition and predation, facility effects, natural population status masking, incidental fishing effects, or disease transfer.
- The hatchery programs would continue to preserve genetic diversity during Elwha River dam removal activities.
- The hatchery programs would add marine-derived nutrients to the aquatic and terrestrial systems above Glines Canyon Dam.
- The hatchery program would increase total and natural-origin abundance and spatial structure of the salmon and steelhead population as additional habitat becomes available and as first-generation hatchery-origin fish, and the offspring of naturally spawning hatchery-origin fish, return to spawn naturally.
- In the short-term, the hatchery programs would preserve the Elwha River salmon and steelhead populations when turbidity levels are high and detrimental to natural-origin fish survival due to dam removal activities.
- In the long-term, spatial structure and abundance of the Elwha River steelhead population would be expected to continue to improve relative to current conditions because salmon and steelhead would continue to re-seed habitat that has been inaccessible since dam construction.

The effect of the proposed hatchery programs on ESA-listed ESUs and DPSs on overall range-wide abundance, distribution, and productivity would be small because the proposed plans are specifically designed to minimize known impacts on ESA-listed fish and to evaluate uncertainties. The proposed hatchery programs include explicit steps to monitor and evaluate these uncertainties and include adaptive management actions that allow for the timely adjustment to risks that might arise.

In addition, an ESA section 7 consultation was completed on the impacts of the proposed hatchery programs on ESA-listed fish, and it concluded that the effects of the hatchery programs would not jeopardize the continued existence of the Puget Sound Chinook Salmon ESU or the Puget Sound Steelhead and Southern Pacific Eulachon DPSs (NMFS 2014).

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 programs. The proposed hatchery programs may affect non-target species in the Elwha River Basin in two ways: through incidental impacts in fisheries targeting fish returning to the proposed programs and through ecological interactions.

Fish: The proposed hatchery programs are not expected to jeopardize the sustainability of any of these non-target species because few non-target species would be intercepted in fisheries targeting salmon and steelhead. Although some non-target fish species may compete or be preyed upon by hatchery-origin salmon and steelhead, others may benefit by preying upon salmon and steelhead produced by the proposed hatchery programs.

Non-target, ESA-listed fish that may be affected include bull trout and eulachon. An ESA section 7 consultation on the proposed HGMPs was completed by NMFS on species under NMFS's jurisdiction, and it concluded that the effects of the programs would not jeopardize the continued existence of eulachon (NMFS 2014). An ESA section 7 consultation has been completed between NMFS and the U.S. Fish and Wildlife Service concerning incidental impacts on bull trout, and it concluded that the effects of the programs would not jeopardize the continued existence of bull trout (USFWS 2012).

Avian and Terrestrial Wildlife: Impacts on avian and terrestrial wildlife may occur from predator control programs, habitat disruption from angler access, or contribution of hatchery-origin fish to the diet of avian and wildlife species. No avian or terrestrial wildlife are expected to be impacted by predator control programs at the hatchery facilities because the hatchery facilities would use nets to exclude predators instead of hazing potential predators. 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 the Elwha River Basin, 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 programs would have little or no effect on ocean and coastal habitats and/or essential fish habitat for any fish species, including Chinook salmon, coho salmon, pink

salmon. The proposed hatchery programs do not include any construction or habitat modification. The proposed hatchery programs would provide small benefits to essential fish habitat by providing marine-derived nutrients through the decomposition of hatchery-origin salmon and steelhead carcasses.

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

The proposed hatchery programs would not be expected to have a substantial adverse impact on public health or safely because there would be no change in the risk of exposure of hatchery workers to chemicals or pathogens. Likewise, there would be no change in the potential nutritional benefits of the hatchery programs to human health and no change in the risk of consumer exposure to toxic contaminants relative to current conditions.

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 programs would result in minimal risks to ESA-listed 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 programs would continue to benefit population viability and nutrient cycling. ESA-listed eulachon may be eaten by or compete with hatchery-origin fish produced under the proposed hatchery programs, but the proposed hatchery programs would only affect a small portion of the total eulachon in the ESA-listed DPS. An ESA section 7 consultation on the proposed HGMPs was completed by NMFS on species under our jurisdiction, and it concluded that the effects of the programs would not jeopardize the continued existence of Puget Sound steelhead, Puget Sound Chinook salmon, or Pacific eulachon (NMFS 2014).

ESA-listed bull trout may be intercepted in steelhead fisheries. All bull trout captured in steelhead fisheries would be released. An ESA section 7 consultation has been completed between NMFS and the U.S. Fish and Wildlife Service concerning incidental impacts on bull trout, and it concluded that the effects of the programs would not jeopardize the continued existence of bull trout (USFWS 2012).

The southern resident killer whale diet consists of a high percentage of Chinook salmon, with an overall average of 82 percent Chinook salmon (Hanson et al. 2010). However, because Elwha River salmon and steelhead co-occur with many other hatchery-origin and natural-origin salmon and steelhead populations from the Puget Sound, Fraser River, Columbia River, and Washington Coast while in marine waters, Elwha River salmon and steelhead are not expected to be a

substantial component of their diet. The proposed hatchery programs are intended to result in increased numbers of salmon and steelhead over the duration of the proposed hatchery programs, though the proportion of the total prey base represented by Elwha River salmonids would still be small.

There are no expected impacts on critical habitat for endangered or threatened species because activities associated with the HGMPs (e.g., broodstock collection, and rearing and release of fish) would not be expected to remove or destroy critical habitat elements. The effects of the programs on critical habitat were considered in the ESA section 7 consultation (NMFS 2014).

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 programs are not expected to have a substantial impact on biodiversity within the affected area. Although salmon and steelhead 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 and steelhead 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.

However, because the proposed hatchery programs would increase the spatial structure of salmon and steelhead in the Elwha River Basin and contribute marine-derived nutrients to areas that were previously inaccessible to salmon and steelhead, the proposed hatchery programs 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. The proposed hatchery programs would provide jobs at hatchery facilities and to local communities through the procurement of goods. The proposed hatchery programs would also provide fishing and cultural benefits to the Lower Elwha Klallam Tribe by providing opportunity for steelhead fisheries.

Over the long-term, the proposed hatchery programs would increase total and natural-origin abundance and spatial structure of salmon and steelhead populations as additional habitat becomes available and first-generation hatchery-origin fish, and the offspring of naturally spawning hatchery-origin fish, return to spawn naturally. Consequently, the proposed hatchery

programs would be expected to increase the survival and well-being of the Lower Elwha Klallam Tribe, because salmon and the Tribe are inextricably linked (NMFS 2012c).

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 hatchery programs on listed fish. However, the controversy surrounding the Elwha hatchery programs is related to whether or not hatchery fish should be used as part of the Elwha River Ecosystem Restoration. This issue was fully analyzed in two National Park Service EISs and one supplemental EIS on Elwha River Ecosystem Restoration and Elwha River Ecosystem Restoration Implementation (Subsection 1.5.2, Elwha River Ecosystem Restoration EIS; Subsection 1.5.3, Elwha River Ecosystem Restoration Implementation EIS; NPS 1995; NPS 1996; NPS 2005). The effects of the proposed hatchery programs as described in the submitted HGMPs are not highly controversial because their effects are consistent with implementation of the hatchery programs over prior years and are beneficial to the affected human communities.

Two comment letters were received in response to the Proposed Action analyzed in the draft EA, one criticism by the party currently in litigation over the matter and one comment letters in support of the Proposed Action. Since NMFS received only one comment letter criticizing the Proposed Action, 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 programs 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 they do not involve the construction of any new infrastructure, and because none of the proposed activities occur in such areas. Designated critical habitat for the ESA-listed Puget Sound Chinook salmon, Puget Sound steelhead, and Pacific eulachon is within the affected area; however, all habitat impacts would be small under the proposed hatchery programs as described in Subsection 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 programs include 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 programs 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 programs have been considered in the Environmental Assessment and in an associated biological opinion (NMFS 2014). The take of ESA-listed species will be limited to a maximum 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. The proposed hatchery programs are 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 Bureau of Indian Affairs and U.S. Fish and Wildlife Service provide periodic funding to the LEKT for operation and maintenance of the tribal hatchery. The National Park Service plays a role in funding the WDFW Elwha Channel Hatchery by recommending disbursement of funds to WDFW by the National Park Foundation, and provides treated water in support of operation of both the WDFW Hatchery and the LEKT Hatchery, assists in broodstock collection and transport from both hatcheries, and may provide future funding for operation of the LEKT Hatchery consistent with applicable biological opinions. The effects of these funding actions are entirely encompassed within the effects of the hatchery programs themselves and, therefore, the funding actions do not cumulatively increase or otherwise alter the effects of the action.

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 programs do not include any new construction, and is therefore unlikely to adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places.

The action area includes a portion of the Olympic National Park. In 1976, Olympic National Park became a Biosphere Reserve under the Man and Biosphere Program (Subsection 1.5.18, Man and Biosphere Program). One of the primary objectives of the Man and Biosphere Program is to achieve a sustainable balance between the goals of conserving biological diversity, promoting economic development, and maintaining associated cultural values. The Proposed Action furthers these goals by conserving the biological diversity of salmon and steelhead populations in the Elwha River during and after dam removal activities, helping rebuild salmon and steelhead populations to harvestable levels, and maintaining an important cultural resource for the Lower Elwha Klallam Tribe.

In 1981, the Olympic National Park was designated as a World Heritage Site under the World Heritage Convention (Subsection 1.5.19, World Heritage Convention) because (1) the Park contains superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance and (2) the Park is an outstanding example of on-going ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals (UNESCO 2014b). More specifically, the Park contains the world's highest and largest stand of temperate rainforest. The beauty and outstanding characteristics of the Park would not be affected by the Proposed Action.

In 1988, Congress designated 95 percent of the Olympic National Park as wilderness under the Wilderness Act (Subsection 1.5.17, The Wilderness Act). Releasing fish into a wilderness area is not incompatible with the goals, objectives, and policies of the Wilderness Act. There is no information to suggest that commercial harvest would occur in the Wilderness Area as a result of the release of hatchery fish; such activity is likely illegal under the Wilderness Act and would be under the regulatory purview of the National Park Service.

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

The proposed hatchery programs would not result in the introduction or spread of a non-indigenous species because the action considered in this Environmental Assessment is limited to

production of salmon and steelhead, which are indigenous to the Elwha River. Though some non-indigenous fish species may benefit from the additional prey available from the hatchery-production, the programs 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 programs are 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 programs are 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 programs, which would inform co-managers of the effects of the program. The proposed hatchery programs would support precedence already set for monitoring and adaptive management, which reduce 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 programs are 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 programs were developed in the broader context of consultations involving Federal and state agencies charged with recovery planning and implementation of the ESA. The review of the proposed hatchery programs pursuant to the 4(d) rule, 50 CFR 223.203, is designed to ensure compliance with the ESA, which is part of the purpose and need for action. The proposed hatchery programs comply with other applicable local, state, and Federal laws. National Pollution Discharge Elimination System permits related to this action would be 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 programs 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 programs have been considered in this Environmental Assessment and in the associated biological opinion (NMFS 2014).

8.1. List of Reviewers

- Kate Hawe, West Coast Region NEPA Coordinator
- Robert Bayley, Sustainable Fisheries Division QA/QC
- Christopher Fontecchio, General Counsel Northwest

8.2. Determination

In view of the information presented in this FONSI and the supporting Supplemental Environmental Assessment to Analyze Impacts of NMFS's Determination that Five Hatchery Programs for Elwha River Salmon and Steelhead as Described in Joint State-Tribal Hatchery and Genetic Management Plans and One Tribal Harvest Plan Satisfy the Endangered Species Act Section 4(d) Rule, it is hereby determined that the approval by NMFS of the proposed hatchery programs will not significantly impact the quality of the human environment. In addition, all beneficial and adverse impacts of the proposed hatchery programs have been considered in reaching a FONSI. Accordingly, preparation of an Environmental Impact Statement is not necessary to further analyze the potential for significant impacts resulting from approval by NMFS of the proposed hatchery programs.

Barry Thom, Deputy Regional Administrator
West Coast Region, NMFS

Dec. 19, 2014
Date

APPENDIX A

SMITH & LOWNEY, P.L.L.C.
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July 21, 2014

Via Hand Delivery
Allyson Purcell
National Marine Fisheries Services
Sustainable Fisheries Division
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Re: Draft Supplemental Environmental Assessment to Analyze Impacts of NOAA's National Marine Fisheries Service Determination that Five Hatchery Programs for Elwha River Salmon and Steelhead as Described in Joint State-Tribal Hatchery and Genetic Management Plans and One Tribal Harvest Plan Satisfy the Endangered Species Act Section 4(d) Rule

Dear Honorable Civil Servants:

Please accept these comments submitted on behalf of the Wild Fish Conservancy, the Wild Steelhead Coalition, the Federation of Fly Fishers Steelhead Committee, and Wild Salmon Rivers d/b/a the Conservation Angler (collectively, "Commenters") on the Draft Supplemental Environmental Assessment to Analyze NOAA's National Marine Fisheries Service Determination that Five Hatchery Programs for Elwha River Salmon and Steelhead as Described in Joint State-Tribal Hatchery and Genetic Management Plans and one Tribal Harvest Plan Satisfy the Endangered Species Act Section 4(d) Rule ("Draft Supplemental EA").

The Commenters provided comments on the previous environmental assessment prepared by the National Marine Fisheries Service ("NMFS") for its review and approval of the Elwha River hatchery and genetic management plans ("HGMPs"). Those comments remain applicable to the Draft Supplemental EA. To avoid redundancy, those comments are provided herewith and incorporated by this reference.

I. Introduction.

The removal of the Elwha River dams constitutes the largest dam removal and salmonid restoration project in United States history, opening up over seventy miles of river habitat to salmonids. These efforts have been mandated by an act of Congress directing the full restoration of the Elwha River ecosystem and native anadromous fisheries, and are expected to cost taxpayers approximately $325 million. This project, as envisioned by Congress, affords a unique opportunity for wild salmonids to quickly re-colonize large expanses of pristine habitat.

The Elwha River Restoration Project offers unprecedented opportunities to study how a major river system, its ecosystem, and fish populations heal after a century of degradation caused by dams. The proposed decision to approve large-scale hatchery programs destroys these opportunities and ignores the lessons learned during the last half-century about the harm hatcheries cause to wild salmonid populations and their ability to recover from a depressed state. As stated by Jim Lichatowich, special-consultant to the congressionally-chartered Hatchery Scientific Review Group in its evaluation of the Elwha River hatchery programs:

> The evidence has been accumulating and today the weight of that evidence is clear: hatcheries are part of the salmon's problem. The myth that hatcheries are the solution to the problem of the salmon's declining abundance is still strong and it is a formidable impediment to the incorporation of our current scientific understandings of the effects of hatcheries into salmon management and recovery programs. A situation clearly exemplified by the Elwha recovery program.

First Declaration of Jim Lichatowich, ¶ 18 (a copy of which is provided herewith).

There is little indication that Elwha River salmonids would be extirpated by the dam removal process in the absence of the hatchery programs, and overwhelming evidence demonstrating that the remaining fish populations would naturally recolonize the upper watershed. Even if concerns regarding possible extirpation from increased suspended

sediments were justified, such concerns do not support the magnitude of hatchery programs proposed. These massive releases of hatchery fish will overwhelm the depressed wild salmonid populations and severely impede their ability to recover following dam removal. Accordingly, any hatchery programs approved should be appropriately sized to achieve the objective of preserving the stocks during dam removal while minimizing risks to the wild populations. This requires indentifying the objectives of the hatchery program with some level of specificity and then conducting a risk assessment to determine what level of hatchery production is sufficient to achieve those objectives while also minimizing the harm caused by hatchery programs. Certainly a project of this magnitude and significance warrants such an evaluation.

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The Western District of Washington held that NMFS violated the National Environmental Policy Act ("NEPA") by approving the Elwha River HGMPs without adequately considering alternatives to the approved programs. *Wild Fish Conservancy v. Nat'l Park Service*, No. C12-5109-BHS, 2014 U.S. Dist. LEXIS 41715, at *24-31 (March 26, 2014). The Court rejected NMFS' contention that there is not a viable alternative to the massive releases of steelhead and coho salmon that had been approved:

> The Court finds NMFS' conclusion that there is not a meaningful difference, or viable alternative, [for the percentage of the steelhead return that constitutes hatchery fish] between 0% and 90% is suspect.
>
> **** **** **** **** **** ****
>
> Again, the Court finds that there is a meaningful difference, or viable alternative, [for the percentage of the coho return that constitutes hatchery fish] between 0% and 82%, and the record fails to contain even a brief discussion of why a reduced release would result in substantially similar consequences as no release at all.

Id. at *28-29. NMFS' Draft Supplement EA does not adequately address the Court's concerns.

While the new NEPA document includes an alternative with smaller hatchery releases, there is no quantitative risk analysis for the alternatives that evaluates the supposed risk of extirpation and the harms caused by hatchery programs. Further, there are no clearly articulated objectives for the action that allow a meaningful evaluation as to the likelihood of any of the alternatives being able to achieve those objectives. Much of the Draft Supplemental EA appears to be copied from the previous NEPA process without any consideration of data and information obtained since the prior EA was issued. Has NMFS taken into account the recent redd surveys and other fish return data in this NEPA process? If so, how does the data compare to NMFS' original assumptions (*e.g.*, how do the smolt-to-adult return numbers compare to those predicted in NMFS' prior EA)? Has NMFS taken into account the failure of the Elwha River mainstem weir and, if so, what tools will be used to in lieu of the weir to accomplish monitoring and adaptive management?

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The Commenters urge NMFS to clearly define the objectives of the hatchery programs (*i.e.*, numerically) and then conduct a quantitative risk assessment, utilizing the best currently available data and information, to determine what scale of hatchery releases would adequately mitigate against any risk of extirpation and achieve the objectives while also minimizing the adverse effects of hatchery programs through mechanisms such as genetic introgression.

II. The HGMPs do not Meet the Criteria of Limit 5.

NMFS' regulations require that public comment be taken as to whether HGMPs submitted as part of a joint plan under Limit 6 of the 4(d) Rule meet the criteria of Limit 5. NMFS' 4(d) Implementation Guidance indicates that NMFS will evaluate HGMPs submitted under Limit 6 in the same manner as it evaluates HGMPs submitted under Limit 5. NMFS should decline to approve the joint plan because the HGMPs do meet the criteria of Limit 5 of the 4(d) Rule. In addition to the brief comments provided below, the deficiencies with the

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joint plan and associated HGMPs are identified in the declarations, reports, comments and other documents provided herewith and incorporated by this reference.

A. The HGMPs do not have Clearly Stated Objectives.

The first criterion of Limit 5 of the 4(d) Rule requires that:

> The HGMP has clearly stated goals, performance objectives, and performance indicators that indicate the purpose of the program, its intended results, and measurements of its performance in meeting those results. Goals shall address whether the program is intended to meet conservation objectives, contribute to the ultimate sustainability of the natural population, and/or intended to augment tribal, recreational, or commercial fisheries. Objectives should enumerate the results desired from the program that will be used to measure the program's success or failure.

50 C.F.R. § 223.203(b)(5)(i)(A). The HGMPs submitted as part of the joint plan do not meet these requirements.

2 The statements of program goals, performance objectives, and performance indicators in each of the HGMPs is inappropriately general and vague at best. The HGMPs state a primary goal of conservation motivated by the belief that high levels of suspended sediments in the Elwha River downstream of Elwha Dam resulting from the removal of the two dams will threaten the continued existence of the remaining populations of native salmon and steelhead. Yet, no detailed argument and evidence are provided to support this fundamental claim. This claim is highly controversial and uncertain, yet none of the HGMPs nor the Draft Supplemental EA acknowledge this controversy and attempt to provide reasoned support for the claim.

All HGMPs state objectives in vague, general terms and phrases that ignore relevant and substantive biological issues that arise in conservation contexts. For example, Table 1.1 of the steelhead HGMP states "Conserve abundance" as a goal of the "Preservation" phase. In light of the considerable concerns regarding the effectiveness of hatchery supplementation of steelhead due to negative effects on the fitness and adaptive potential of the target wild

population, vaguely stated “conservation of abundance” is an inappropriately vague goal statement. The HGMP should instead state unambiguous target levels of numbers of returning adult by origin (captive brood, hatchery-origin adult, natural-origin (wild) adults), target adult age composition and sex ratio.

The statement of “objectives” associated with the general goal statement (“conserve abundance”) is also inappropriately vague: “prevent extinction”, “retain genetic identity and diversity”, “hatchery returns increase adult abundance”, “successful natural production in mid- and upper basin MS & tribs”, “supplement spawning (maintain upstream migration passage as well as move returning adults into areas of watershed unaffected by dam removal). Of these five objectives, only the last is stated in language specific enough to clearly understand what is required to verify whether or not the objective is being achieved. No text in the HGMP related to table 1.1 remedies this lack of specificity. Regarding the preservation of genetic diversity, which is a fundamental and critical performance and monitoring variable, none of the HGMPs provide specifics regarding the kind(s) of genetic markers to be measured, how many loci for each marker are to be measured, what genetic parameters are to be monitored using the markers (expected and observed levels of heterozygozity, allelic richness, etc.), and what target levels of genetic parameters are to be achieved. As a result, none of the HGMPs can state what corrective actions will be taken when target levels of genetic diversity are not attained.

Moreover, none of the HGMPs provide any substantive text that explains the relationship of listed performance indicators to associated performance standards and goals. No proper justification is provided for the indicators and standards. Rather, goals, standards, and indicators are largely simply asserted.

B. The HGMPs do not Utilize the Concepts of Viable Salmonid Populations.

The second criterion of Limit 5 of the 4(d) Rule requires that:

> The HGMP utilizes the concepts of viable and critical salmonid population threshold, consistent with the concepts contained in the technical document entitled "Viable Salmonid Populations" (NMFS, 2000b). Listed salmonids may be purposefully taken for broodstock purposes only if the donor population is currently at or above the viable threshold and the collection will not impair its function; if the donor population is not currently viable but the sole objective of the current collection program is to enhance the propagation or survival of the listed EUS; or if the donor population is shown with a high degree of confidence to be above critical threshold although not yet functioning at viable levels, and the collection will not appreciably slow the attainment of viable status for that population.

50 C.F.R. § 223.203(b)(5)(i)(B). The HGMPs submitted as part of the joint plan do not adequately utilize the Viable Salmonid Population ("VSP") concepts and do not meet these requirements.

2 The Chinook salmon HGMP (section 2.2.2) does not state either the critical or the viable population size identified by NMFS for the Elwha Chinook population, nor does the HGMP relate the proposed size of the program and the program goals for adult abundance to these or related target levels of abundance. The winter-run steelhead HGMP (section 2.3.2) does state the preliminary critical and viable abundance thresholds identified by the Puget Sound Steelhead Technical Recovery Team for the Elwha population. However, the HGMP fails to note that these thresholds apply to a recovered population with unobstructed access to the entire Elwha River baisn, and does not discuss how these abundance levels should be related to the current condition of the population. The HGMP also states that the "co-managers' harvest plan for Puget sound steelhead sets the critical threshold for Elwha steelhead at 100" (HGMP page 10) but neither explains the significance or justification for this number, nor how this threshold level is to be related to the current condition of the population or to the proposed hatchery program.

C. The HGMPs' Broodstock Programs do not Reflect Appropriate Priorities.

The third criterion of Limit 5 of the 4(d) Rule requires that:

> Taking into account health, abundances, and trends in the donor population, broodstock collection programs reflect appropriate priorities. The primary purpose of broodstock collection programs of listed species is to reestablish indigenous salmonid populations for conservation purposes. Such programs include restoration of similar, at-risk populations within the same ESU, and reintroduction of at-risk populations to underseeded habitat. After the species' conservation needs are met and when consistent with survival and recovery of the ESU, broodstock collection programs may be authorized by NMFS such for secondary purposes, as to sustain tribal, recreational, and commercial fisheries.

50 C.F.R. § 223.203(b)(5)(i)(C). The broodstock programs described in the HGMPs submitted as part of the joint plan do not reflect appropriate priorities.

The primary motivation for and justification of the proposed programs is the alleged threat posed by suspended sediment levels in the Elwha River mainstem below Elwha Dam that are expected to occur intermittently for a period of one or more years following the initiation of the removal of the two dams. This corresponds to the vaguely characterized "Preservation Phase" of the Elwha native fish restoration process. As noted above, there is no small scientific controversy regarding this alleged threat, which NMFS and the authors of the HGMP seem intent not to acknowledge. A truly adaptive approach to the uncertainty attending this risk factor would be to treat the threat as a hypothesis to be evaluated and consequently to shape the conservation hatchery actions in light of the hypothetical nature of the threat. This would require an explicit research and monitoring program to evaluate suspended sediment levels at time throughout the year and using metrics that are biologically relevant to the fish species of concern that are potentially affected by the suspended sediment.

Consistent with such an adaptive approach, but independent of it, even if the alleged short-term (one to two steelhead generations) threat from the dam removal process were accepted at face value, an appropriate conservation hatchery program for each species should

be much smaller than proposed by the HGMPs. This is especially true for the programs for the two listed species. In view of the considerable genetic risks imposed on wild populations by captive brood and supplementation hatchery programs, the duration of the programs should be strictly limited to the Preservation Phase itself, and to the level of risk from suspended sediment levels that is actually revealed by monitoring the sediment threat hypothesis. For this reason, NMFS should only consider granting any approval of any of the HGMPs for a period of no more than five years.

In this regard, it is also relevant that available information indicates that adequate funding has not been secured for regular monitoring of the concentration of suspended sediment in the Elwha River mainstem and side-channels below Elwha Dam. The USGS is currently monitoring turbidity remotely using infrared reflectance (FNUs) and plans to continue this monitoring, pending funding. However, measurement of turbidity does not translate readily to suspended sediment concentration (mg-per-liter), which is the metric that can be directly related to impacts on fish health. Consequently, direct field-based measurements of suspended sediment concentration need to be made regularly in addition to the remote turbidity measures. But the available Monitoring and Adaptive Management Plan dated February 2014 ("MAMP"), a copy of which is provided herewith, does not indicate the frequency that such measurements should be made, and Table 16 shows that those measurements that are planned are not fully funded. Yet, this is the single environmental parameter on which the entire motivation for the conservation hatchery programs rests.

1. The Winter-Run Steelhead HGMP Broodstock Program.

The broodstock program described in the winter-run steelhead HGMP does not reflect appropriate priorities. The Elwha River winter-run steelhead population is part of the Puget Sound steelhead DPS listed as threatened under the Endangered Species Act ("ESA").

Accordingly, the primary purpose of any broodstock collection program should be conservation. The broodstock program proposed is far in excess of what is appropriate for a conservation program, and is instead designed to expedite harvests. Such a program is not appropriate until the species' conservation needs are met.

2. The Chinook Salmon HGMP Broodstock Program.

The broodstock program described in the Chinook salmon HGMP does not reflect appropriate priorities. The Elwha River Chinook salmon population is part of the Puget Sound Chinook salmon ESU listed as threatened under the Endangered Species Act ("ESA"). Accordingly, the primary purpose of any broodstock collection program should be conservation. The broodstock program proposed is far in excess of what is appropriate for a conservation program, and is instead designed to expedite harvests. Such a program is not appropriate until the species' conservation needs are met. Moreover, the proposed program is an extension of the program that has existed for several decades and for which data exists regarding the performance of the program since 1999. The smolts-to-adult return data for both sub-yearlings and yearlings is extremely low, and is among the poorest performing Chinook salmon hatchery programs in all of Puget Sound. This data indicates that the fitness of the hatchery Chinook population has been driven very low by hatchery domestication selection.[1] Continuation of the hatchery program on the large scale on which the program has operated in the past will most likely only further erode natural spawning fitness and compromise the ability of the native Elwha Chinook salmon population to rebuild and

[1] The poor performance of the Chinook program also casts doubt on the assertions made in the EA that a minimum broodstock size of 500 per generation (further adjusted upward to account for the survival of hatchery offspring to adulthood) is required even for short-term supplementation hatchery programs. Table 7.4.2, page 29 of the 2012 Chinook HGMP shows that annual broodstock numbers for this program since 1999 has averaged nearly twice the EA's estimated minimum (EA Table 13, page 81) of 526 adults. This has not prevented hatchery domestication from driving the fitness of this population to extremely low levels.

recolonize the newly accessible upper watershed. A much smaller program is required and would be more appropriate to serve a short-term, risk-averse conservation purpose.

D. The HGMPs do not Minimize Harm to Wild Populations.

The fifth criterion of Limit 5 of the 4(d) Rule requires that:

> The HGMP evaluates, minimizes, and accounts for the propagation program's genetic and ecological effects on natural populations, including disease transfer, competition, predation, and genetic introgression caused by the straying of hatchery fish.

50 C.F.R. § 223.203(b)(5)(i)(E). The HGMPs submitted as part of the joint plan do not meet these requirements.

The hatchery programs proposed in the Chinook, Coho, and Steelhead HGMPs impose significant threats of harm to Elwha Chinook salmon and winter-run steelhead populations. Genetic and ecological effects are not appropriately evaluated and accounted for, or minimized. Specifically, the steelhead and Chinook salmon programs pose significant genetic risks of reduced fitness to the wild populations that will impair the survival and recovery of these populations. The steelhead program does not adequately acknowledge the risk of fitness loss that is likely to be caused by the steelhead program and, therefore, does not consider appropriate monitoring and measures to detect and avoid such impacts. For example, there is no explicit monitoring or research to evaluate the relative reproductive success of hatchery-origin steelhead and of crosses between hatchery-origin and natural origin adults. Explicit geneotyping of all hatchery parents, with full details regarding what kind of genetic markers will be used, how many markers will be used, what genetic parameters will be monitored and what the threshold levels of those parameters will be should be provided in the HGMP. The Chinook HGMP fails to consider the evidence from the past hatchery program indicating that the fitness of the remaining Elwha Chinook has been driven extremely low by hatchery

domestication selection. This is clearly evidenced by the extremely low levels of smolt-to-adult survival of yearling and sub-yearling smolts over the past 20 years.

The coho salmon HGMP does not minimize risks to wild salmonid populations. The HGMP proposed to release 425,000 smolts that will be approximately 140 millimeters (5.5 inches) of more in length. This is generally larger than the size of the average wild coho salmon smolt. The number and size of the smolts released impose a non-negligible risk of competition for food and rearing space of wild Elwha coho smolts, wild steelhead smolts, rearing steelhead parr, and rearing and outmigrating Chinook smolts in the lower Elwha River and estuary. A short-term, risk-averse conservation hatchery program for coho that would support the recolonization of the upper Elwha by native Elwha coho salmon does not require the large scale proposed in the HGMP. An appropriate program one-quarter or smaller than the size proposed in the HGMP would both meet any legitimate conservation concern while greatly reducing the risks posed to the listed species.

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Further, the HGMPs and NMFS' various evaluations thereof rely extensively on a weir in the mainstem of the Elwha River to implement monitoring and adaptive management strategies the minimize adverse effects to wild salmonids. That weir is not functioning and there do not appear to be any viable alternatives thereto. Accordingly, the HGMPs will not be implemented as described and the harm caused by the hatchery programs will not be sufficiently minimized.

E. The Adequacies of the Hatchery Facilities.

The seventh criterion of Limit 5 of the 4(d) Rule requires that:

> Adequate artificial propagation facilities exist to properly rear progeny of naturally spawned broodstock, to maintain population health and diversity, and to avoid hatchery-influenced selection or domestication.

50 C.F.R. § 223.203(b)(5)(i)(G). The HGMPs do not meet this requirement.

The Chinook salmon and winter-steelhead HGMPs propose to incorporate large numbers and high percentages of hatchery-origin adults into the annual hatchery broodstocks. Such practice will significantly increase the probability of domestication selection that will reduce the fitness of hatchery progeny in the wild. *See First Declaration of Gordon Luikart* (a copy of which is provided herewith). To the extent that such practice may be unavoidable in the near-term given the depressed state of the wild populations that the conservation hatchery programs are intended to aid, the high risk of domestication further argues for as small a program as possible to meet the conservation risk and be sustained for as short a term as possible. This is further reason to limit any approval of any of the HGMPs to a period of no longer than five years, and to require specific monitoring with secure funding to evaluate domestication risks to the wild populations.

2

The HGMPs and NMFS' various evaluations thereof rely extensively on a weir in the mainstem of the Elwha River to implement monitoring and adaptive management strategies. That weir is not functioning and there do not appear to be any viable alternatives thereto. Accordingly, the hatchery programs do not have sufficient facilities to conduct monitoring and adaptive management.

F. The HGMPs Lack Adequate Monitoring and Evaluation.

The eighth criterion of Limit 5 of the 4(d) Rule requires that:

> Adequate monitoring and evaluation exist to detect and evaluate the success of the hatchery program and any risks potentially impairing the recovery of the listed ESU.

50 C.F.R. § 223.203(b)(5)(i)(H). The HGMPs do not meet these requirements.

There is not adequate monitoring and evaluation of the hatchery programs' success and risks to listed species. As noted herein, there is no detailed, approved, and publically available MAMP. This fact alone violates this criterion. Further, as evidenced in the available

MAMP (Table 16), adequate funding does not exist to conduct even the minimally necessary monitoring and evaluation related to genetics and fitness. It is worth noting, by contrast, that according to the Chinook salmon and winter-run steelhead HGMPs, significant and sufficient funds have been provided for operating the proposed hatchery programs. The scarce funds required for monitoring the recolonization of the Elwha River basin by native salmonids have been re-directed to hatchery programs of questionable scale and need. Without adequate monitoring, there are likely to be severe adverse impacts to listed Chinook salmon and steelhead.

Further, the HGMPs and NMFS' various evaluations thereof rely extensively on a weir in the mainstem of the Elwha River to implement monitoring and adaptive management strategies. That weir is not functioning and there do not appear to be any viable alternatives thereto. Accordingly, the hatchery programs do not have adequate monitoring and evaluation strategies in place to monitor the success of the programs or the harm they are inflicting on wild salmonids.

2

G. The HGMPs do not Include Adequate Adaptive Measures.

The ninth criterion of Limit 5 of the 4(d) Rule requires that:

> The HGMP provides for evaluating monitoring data and making any revisions of assumptions, management strategies, or objectives that data show are needed.

50 C.F.R. § 223.203(b)(5)(i)(I). The HGMPs do not meet these requirements.

The failure of the HGMPs to identify relevant measureable genetic and life history parameters and to specify corresponding quantitative threshold or target levels to avoid risks to listed populations means that no adaptive measures exist for altering program practices in the light of data. Even were some adaptive measures provided, the absence of adequate and/or assured funding of the essential monitoring activities

means that the data necessary to implement adaptive measures will not be obtained in an appropriately timely manner, which is tantamount to having no adaptive management at all. However, in general the HGMPs provide no explicit set of decision procedures or protocols by which monitoring data will be acquired, analyzed, and by which program practices are to be changed based on the results of those analyses.

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Furthermore, the HGMPs and NMFS' various evaluations thereof rely extensively on a weir in the mainstem of the Elwha River to implement monitoring and adaptive management strategies. That weir is not functioning and there do not appear to be any viable alternatives thereto. Accordingly, the hatchery programs do not have adequate strategies to effectively implement any monitoring and adaptive management.

III. Lack of Adequate Monitoring and Adaptive Management.

In addition to the MAMP not being fully finalized and put out for public review, the currently available MAMP dated February 2014 admits that funding to undertake even the minimally necessary annual monitoring is inadequate and adequate funding necessary to determine whether or not restoration is succeeding and why it is or is not succeeding has not been secured. Absent an ability to undertake the minimally necessary monitoring of the likely adverse impacts of the conservation hatchery programs on the Elwha Chinook salmon and winter-run steelhead populations, NMFS should not approve the HGMPs because it cannot be assured (and cannot assure the public) that likely adverse impacts to listed species will be minimized or even that they will be detected in a timely enough manner to identify and undertake corrective actions. Further, as noted, the Elwha River mainstem weir is not functioning and there do not appear to be any viable alternatives thereto. Accordingly, the hatchery programs lack the ability to effectively implement adaptive management.

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IV. The Joint Plan Does not Meet the "No Jeopardy" Standard.

The HGMPs submitted under Limit 6 of the 4(d) Rule as a joint plan may be approved only if the implementation and enforcement of the joint plan will not appreciably reduce the likelihood of survival and recovery of affected threatened ESUs. 50 C.F.R. § 223.203(b)(6)(i). The submitted HGMPs do not meet this requirement. In addition to the brief comments provided below, the threats to ESA-listed species and their ability to recover are described in the declarations, reports, comments and other exhibits provided herewith.

Recovery of the native Elwha River winter-run steelhead population and the native Elwha River Chinook salmon population is essential to the recovery of the Puget Sound steelhead distinct population segment and the Puget Sound Chinook salmon ESU. The size and pristine condition of the Elwha River watershed provide enormous potential population sizes for these species. This watershed constitutes a unique component of the geographic and evolutionary diversity of the Puget Sound steelhead DPS and the Chinook salmon ESU. Threats to the recovery of native Elwha River winter steelhead and native Elwha River Chinook salmon therefore pose a significant threat to the recovery and de-listing of the Puget Sound steelhead DPS and the Puget Sound Chinook salmon ESU.

As discussed herein and in the documents provided herewith, the HGMPs pose severe risks and will impede the recovery of threatened salmonids. These threats are compounded by the lack of adequate monitoring, evaluation and adaptive management and the failure of the mainstem Elwha River weir.

V. NMFS' Approval of the HGMPs Requires Preparation of an EIS.

The purpose of NEPA is, *inter alia*, to declare a national policy that will encourage productive and enjoyable harmony between man and his environment, to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the

health and welfare of man, and to enrich the understanding of the ecological systems and natural resources important to the Nation. 42 U.S.C. § 4321. NEPA requires federal agencies undertake processes to "insure that environmental information is available to public officials and citizens before decisions are made and before actions are taken" and that are "intended to help public officials make decisions that are based on understanding of environmental consequences." 40 C.F.R. §§ 1500.1(b) and (c).

To accomplish these purposes, NEPA requires federal agencies to prepare a "detailed statement" regarding all "major Federal actions significantly affecting the quality of the human environment." 42 U.S.C. § 4332(2)(C). The "detailed statement," commonly known as an environmental impact statement ("EIS"), is to describe the environmental impact of the proposed action, any adverse environmental effects which cannot be avoided should the proposal be implemented, alternatives to the proposed action, the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented. The requirement to prepare an EIS serves two important purposes: 1) it ensures the agency, in reaching its decision, will have available, and will carefully consider, detailed information concerning significant environmental impacts, and 2) it guarantees that the relevant information will be made available to the larger audience that may also play a role in both the decision making process and the implementation of that decision. *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 349 (1989).

Before preparing an EIS, an agency may prepare an Environmental Assessment ("EA") if it is uncertain whether a proposed action may have a significant effect on the environment. 40 C.F.R. § 1508.9. The purpose of an EA is to provide the agency with

sufficient evidence and analysis for determining whether to prepare an EIS or to issue a FONSI. *Metcalf v. Daley*, 214 F.3d 1135, 1143 (9th Cir. 2000) (citing 40 C.F.R. § 1508.9).

NMFS' proposed decision to approve the HGMPs as a joint plan and thereby authorize the release of 7.5 million hatchery fish each year into the Elwha River will have a significant effect on the environment. Accordingly, NMSF must prepare an EIS as required by NEPA. In addition to the brief comments provided below, the need to prepare an EIS is supported by the declarations, reports, comments and other exhibits provided herewith. Further, the need for an EIS is supported by the comments provided above regarding the deficiencies of the HGMPs under the 4(d) Rule standards.

An EIS is required if a proposed action *may* have a significant effect on the environment. *Nat'l Parks & Conservation Ass'n*, 241 F.3d at 730; *Ocean Advocates v. U.S. Army Corps of Eng'rs*, 402 F.3d 846, 864-865 (9th Cir. 2005) ("if substantial questions are raised as to whether a project . . . *may* cause significant degradation…" (internal quotations omitted)). "This is a low standard." *Klamath Siskiyou Wildlands Ctr.*, 468 F.3d at 562.

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"Significantly" is defined to require an analysis of both the "context" and "intensity" of effects. 40 C.F.R. § 1508.27. The context of the action includes "society as a whole (human, national), the affected region, the affected interests, and the locality," as well as short- and long-term effects. *Id.* § 1508.27(a). There are ten non-exclusive intensity factors to be considered in the significance determination:

> (1) Impacts that may be both beneficial and adverse. A significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial.
>
> (2) The degree to which the proposed action affects public health or safety.
>
> (3) Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.

> (4) The degree to which the effects on the quality of the human environment are likely to be highly controversial.
>
> (5) The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.
>
> (6) The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.
>
> (7) Whether the action is related to other actions with cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.
>
> (8) The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.
>
> (9) The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.
>
> (10) Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment.

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Id. § 1508.27(b). The potential presence of even one of these factors is sufficient to require an EIS. *See Ocean Advocates*, 402 F.3d at 865; *and see Ctr. for Biological Diversity v. Nat'l Hwy. Traffic Safety Admin.*, 538 F.3d 1172, 1220 (9th Cir. 2008). NMFS' proposed approval of the HGMPs warrants and EIS because each of these criteria is implicated. NMFS purports to have determined that the risks of extirpation outweigh the harm caused by the hatchery programs. However, such balancing is not appropriate in an EA, but rather requires and EIS.

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The hatchery programs proposed in the Draft Supplemental EA meet the threshold for preparation of an EIS because of the programs' significant adverse effects. Various scientific studies, technical memoranda, and agency documents highlight the serious ecological risks that hatchery fish pose to native salmonids. The artificial propagation programs will harm

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ESA-listed species and impede their ability to recover through genetic interactions (lowering reproductive fitness), ecological interactions (competition for resources), predation, and facility effects (migration impediments). The hatchery programs also pose significant risks associated with diseases and pathogens. Native salmonids will be even more vulnerable to the risks posed by hatchery practices due to the degraded environmental conditions caused by the dam removal process in the Elwha River, such as large sediment loads.

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These are not just general problems with hatcheries—specific aspects of the hatchery programs proposed in the Draft Supplemental EA are likely to have significant adverse effects on wild fish species. The several expert declarations provided herewith highlight some of the specific problems that the activities and programs pose for threatened fish species. NMFS' failure to acknowledge these significant effects and analyze them in an EIS would violate NEPA requirements.

NMFS recognizes that "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." Despite acknowledging these adverse effects, the Draft Supplemental EA fails to provide a detailed discussion of the effects of hatchery programs on salmon, steelhead, and their habitat, deferring instead to the outdated and unrelated draft EIS for the Columbia River Basin. The failure to provide a more robust discussion in the Draft Supplemental EA about the effects of hatchery operations on wild fish results in a NEPA document that fails to provide the analysis required.

9

A. <u>The Context is Extraordinary</u>.

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The location, the multitude of affected interests, and broad ranging temporal and spatial impacts magnify the significance of NMFS' approval of the hatchery programs.

Restoration of the Elwha River is unparalleled in the world and brings with it unprecedented opportunities. There is immense national scientific, cultural, and recreational interest in restoration of the river's historic salmon runs, as well as immense taxpayer investment. The watershed is one of the largest, mostly intact in the conterminous United States. The basin and nearshore waters provide habitat for numerous ESA-listed and other species of concern. Elwha River Chinook salmon and steelhead are key populations of threatened Puget Sound Chinook salmon and Puget Sound steelhead. Interests in the project span beyond the United States, as most of the watershed is within an International Biosphere Reserve and a World Heritage Site. The intensity factors discussed below must be considered in light of this context. *See* 40 C.F.R. § 1508.27.

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B. **The Actions will have Significant Effects on Unique Characteristics of the Geographic Area.**

The intensity analysis requires a consideration of effects to "[u]nique characteristics of the geographic area such as proximity to . . . park lands, . . . wetlands, wild and scenic rivers, or ecologically critical areas." 40 C.F.R. § 1508.27(b)(3). The actions will unquestionably have a significant effect on such areas that mandates preparation of an EIS.

The Elwha River basin is located largely in the Olympic National Park and Olympic Wilderness Area. The park has been designated an International Biosphere Reserve and a World Heritage Site. These areas of the watershed above the dams are "pristine habitats because they have not been altered by anthropogenic activities *and have no ongoing hatchery supplementation activities*."

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The hatchery programs are *designed* to produce large numbers of returning adult hatchery fish that will pass (or be transported) above the dams to spawn in these protected pristine environments. The actions therefore destroy one of the most significant unique attributes of the upper Elwha River—the absence of hatchery fish. There are healthy

populations of wild resident rainbow trout in the upper watershed. Hatchery steelhead will now have access to these rainbow trout populations, with unknown harmful consequences. Further, it is undisputed that salmonids would naturally re-colonize the watershed in the absence of hatchery supplementation. The loss of one of the most significant characteristics of these unique geographic areas—the absence of hatchery fish—is a significant effect requiring an EIS.

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C. **<u>The Actions may Establish a Precedent</u>.**

The "degree to which the action may establish a precedent for future actions with significant effects" warrants an EIS. *See* 40 C.F.R. § 1508.27(b)(6).

Removal of the dams on the Elwha Rivers is unprecedented. "There is no template available for a similarly scaled dam removal project…" NMFS' decisions to approve large scale hatchery programs to flood the newly-opened river with hatchery fish therefore have the potential to establish a significant precedent for future dam removal projects throughout the United States.

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Further, currently before NMFS are over 100 HGMPs for all Puget Sound hatcheries that have been submitted for approval under the 4(d) Rule. NMFS has determined that the cumulative effects of these HGMPs require evaluation in a programmatic EIS. *See* 69 Fed. Reg. 26,364; *and see* 76 Fed. Reg. 45,515. The Elwha River HGMPs were the first of these Puget Sound HGMPs approved. This action therefore required an EIS because it may establish a precedent for other actions that cumulatively have a significant impact on the environment, including NMFS' programmatic review of the Puget Sound HGMPs and the Elwha River component of that programmatic review.

D. <u>The Effects of the Actions are Uncertain</u>.

The extent to which the effects of an action are highly uncertain or involve unique or unknown risks must be considered in determining whether to prepare an EIS. 40 C.F.R. § 1508.27(5). An EIS was required because the harm posed by the hatcheries is uncertain. In addition to the uncertainties described below, this letter and the materials submitted herewith describe extensive uncertainties.

The hatchery programs will cause reduced reproductive fitness in the wild populations. NMFS admits that it cannot predict the *magnitude or duration* of such fitness loss. NMFS considers the collection and analysis of fitness data for some programs a high priority. The Hatchery Scientific Review Group ("HSRG") found that pro-longed hatchery influence could reduce or delay restoration. The duration of the approved plans is dependent upon achievement of abundance and productivity thresholds and is "highly uncertain." There are thus significant uncertainties regarding whether the hatchery programs will hinder more than assist in achieving the purported objective of self-sustaining natural populations. Moreover, there is insufficient data and analysis to evaluate the risks strays from the Elwha River hatchery programs pose to salmonid populations in other watersheds.

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Compounding these issues are the uncertainties regarding mitigation measures. NMFS' proposed approval of the HGMPs relies extensively on a belief that there will be effective monitoring and adaptive management that will avoid excessive adverse effects to wild salmonids. The HSRG reviewed the hatchery programs in January of 2012, and identified inadequate monitoring, evaluation, and structured adaptive management as a key concern—finding that they lack a structured process for implementation, fail to adequately define the respective roles of the entities involved, and provide no evidence of adequate funding.

The HGMPs were revised subsequent to the HSRG's review, but each of these deficiencies persists. The HGMPs rely on a MAMP that had not even been completed when they were submitted. What is apparently the "final" MAMP, dated February 2014, remains incomplete. The Executive Summary of the MAMP (page 1) is very clear that the "guidelines presented in this document provide a framework for *developing goals that define project success* and for monitoring project implementation and responses…" (emphasis added). Further, there does not appear to be any long-term funding for the monitoring and evaluation needs. The Draft Supplemental EA vaguely admits that some of the actions described in the MAMP "are not reasonably certain to occur."

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Further, the HGMPs and NMFS' various evaluations thereof rely extensively on a weir in the mainstem of the Elwha River to implement monitoring and adaptive management strategies. That weir is not functioning and there do not appear to be any viable alternatives thereto. Accordingly, the ability to actually implement any monitoring and adaptive management strategies is highly uncertain.

E. <u>The Effects of the Actions are Controversial</u>.

An EIS is required if the effects of the action are controversial—if there is "'a substantial dispute [about] the size, nature, or effect" of the action. *See Blue Mountains,* 161 F.3d at 1212; *and* 40 C.F.R. §1508.27(b)(4). Where "conservationists, biologists, and other knowledgeable individuals" are "highly critical of the EA" and dispute the EA's conclusions regarding the effects of the proposed action, an EIS must follow. *Found. for N. Am. Wild Sheep v. U.S. Dep't of Agric.*, 681 F.2d 1172, 1182 (9th Cir. 1982); *and see Sierra Club v. U.S. Forest Serv.*, 843 F.2d 1190, 1193-94 (9th Cir. 1988). The effects of the actions are highly controversial, and demonstrated by these comments and the documents provided herewith, including some of the extensive media coverage related to these hatchery programs,

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and Commenters' previous comments. Controversy and disputes exist over the size, nature, and effects of the programs. Even NMFS' Northwest Regional Administrator has acknowledged the "prominence of the Elwha and the *broad* attention to the hatchery/wild topic area in general." (emphasis added).

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F. <u>There are Significant Adverse Impacts on Protected Species</u>.

The degree to which an action *may* adversely affect ESA-listed species or their critical habitat must be considered in determining whether to prepare an EIS. 40 C.F.R. §1508.27(b)(9). The actions have significant adverse effects on threatened salmonids warranting an EIS as briefly described below and as further described throughout this letter and the materials submitted herewith.

The hatchery programs are "likely to adversely affect," and cause take of, ESA-listed Chinook salmon and steelhead. "Standing alone, this suggests the need for an EIS." *Klamath-Siskiyou Wildlands Ctr. v. U.S. Forest Serv.*, 373 F. Supp. 2d 1069, 1080 (E.D. Cal. 2004). Further, these hatchery programs will delay, and even prevent, full recovery of the Elwha River salmonid populations. Recovery of these local populations is critical to the recovery and ESA delisting of the Puget Sound Chinook salmon ESU and the Puget Sound steelhead DPS to which they belong. An EIS is required given the undisputed adverse genetic and other effects to these populations critical to recovery of the listed species.

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The actions further adversely affect Puget Sound Chinook salmon critical habitat. Critical habitat for this species includes the Elwha River watershed and adjacent marine waters, and primary constituent elements considered essential for such habitat include freshwater rearing sites free from excessive predation. The actions will reduce space for rearing and cause predation of wild salmonids.

An EIS is required because, *at a minimum*, there are substantial questions regarding whether there will be a significant impact on the environment given the known adverse effects to threatened salmonids, the uncertainties regarding the magnitude and duration of those effects, and the uncertainties regarding adaptive management necessary to mitigate such effects. *See Cascadia Wildlands v. U.S. Forest Serv.*, No. 6:12-CV-00804-AA, 2013 U.S. Dist. LEXIS 43759, at *32 (D. Or. Mar. 21, 2013).

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G. <u>There are Cumulatively Significant Impacts</u>.

Agencies must consider whether an action is related to other actions with cumulatively significant impacts. 40 C.F.R. § 1508.27(b)(7). Significance exists, requiring an EIS, "if it is reasonable to anticipate a cumulatively significant impact on the environment," and an agency cannot avoid preparation of the EIS by "breaking it down into small component parts." *Id.* A cumulative impact "results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions . . . ." *Id.* at § 1508.7. The Elwha River hatchery programs are related to the other hatchery programs in Puget Sound that have cumulatively significant impacts on wild fish. An EIS is therefore required because NMFS' pending review and approval of all the Puget Sound hatcheries under the ESA 4(d) Rule unquestionably has cumulatively significant effects.

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1. <u>The Puget Sound Hatchery Programs have Cumulatively Significant Impacts that Require an EIS</u>.

The Elwha River hatchery programs are related to the numerous other hatchery programs throughout Puget Sound that constitute past, present, and reasonably foreseeable future actions, which therefore have a cumulative impact. *See* 40 C.F.R. § 1508.7. There are approximately 100 hatchery programs throughout the Puget Sound and coastal Washington, most of which have been operating for many years. These programs flood Puget Sound and surrounding waters with a massive number of hatchery fish that can interact with wild fish

from the Elwha River. These hatchery programs are reasonably foreseeable future actions because the program operators have submitted HGMPs to NMFS for evaluation and approval under the ESA 4(d) Rule and NMFS has recently issued a draft EIS therefor. *See* 69 Fed. Reg. 26364; *and* 76 Fed. Reg. 45515; *and see* documents provided herewith related to NMFS' draft EIS.

NMFS has determined that the Puget Sound hatchery programs have cumulatively significant impacts such that a programmatic EIS is required for approval of them under the 4(d) Rule. 69 Fed. Reg. 26364; *and* 76 Fed. Reg. 45515. On July 16, 2014, NMFS issued a draft of that EIS (a copy of which is provided herewith along with other related documents and NMFS' website printouts) that purports to collectively analyze the Puget Sound hatchery programs, including those on the Elwha River, and discuss the cumulative effects of these programs. http://www.westcoast.fisheries.noaa.gov/hatcheries/ps_deis/ps_overview.html. The Draft Supplemental EA fails to even acknowledge this document. The programs cumulatively have significant impacts on the continued existence and recovery of the threatened Puget Sound Chinook salmon ESU and the Puget Sound steelhead DPS. Notably, when asked why the Elwha River HGMPs are being evaluated in the programmatic EIS along with all of the other Puget Sound HGMPs, Tim Tynan testified under oath on behalf of NMFS as follows:

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> Because collectively the Puget Sound programs in total have cumulative effects on listed fish populations, especially in marine areas. The suite of hatchery programs leads to the production of millions of salmon. And for us to have an accurate evaluation, we have to include all programs.

Deposition Transcript of Tim Tynan, p. 134, lns. 3-7 (provided herewith). The HSRG similarly noted:

> Hatchery fish released in each subbasin will interact with wild and hatchery fish from other subbasins as they migrate through the downstream corridor, estuary and ocean. The effects of these interactions are heightened as the

> cumulative number of hatchery fish released into the Puget Sound for harvest increases. Therefore….the cumulative natural and hatchery production should take into account the carrying capacity of the migratory corridor, estuary and ocean.

A single EIS is required because, at a minimum, there are "substantial questions as to whether [NMFS' approval of the Puget Sound HGMPs] will have significant cumulative environmental effects." *See Thomas*, 753 F.2d at 759. The Puget Sound hatchery operators, including those on the Elwha River, have submitted a total of 114 HGMPs to NMFS for review and approval. NMFS has determined that its approval of the programs requires a programmatic EIS. This is precisely the type of action that triggers the need for evaluation in a single EIS. *See Kleppe v. Sierra Club*, 427 U.S. 390, 410 (1976). An EIS is required to evaluate the cumulative effects of releases of hatchery fish into Puget Sound because, while releases from any single program may not jeopardize recovery of Puget Sound salmonids, the cumulative effects of all hatchery releases may. *See Or. Natural Res. Council Fund v. Goodman*, 505 F.3d 884, 893 (9th Cir. 2007).

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2. <u>NMFS cannot break review of the Elwha River HGMPs out of the programmatic EIS</u>.

Where related actions have cumulatively significant impacts, NEPA prohibits the agency from breaking its review down into small component parts in an effort to avoid preparation of an EIS. 40 C.F.R. § 1508.27(b)(7).

The Puget Sound hatchery operators, including those on the Elwha River, submitted 114 HGMPs for approval under the 4(d) Rule. NMFS determined that a programmatic EIS is required to evaluate the cumulative effects of these programs. *See* 69 Fed. Reg. 26364; *and* 76 Fed. Reg. 45515; *and* NMFS015908, 15911. NMFS then reversed course and approved the Elwha River hatcheries outside of the programmatic EIS under an EA and FONSI that ignore cumulative effects of other Puget Sound hatchery programs and seems poised to do so

again. This violates 40 C.F.R. § 1508.27(b)(7). *See Natural Res. Def. Council v. Callaway*, 524 F.2d 79, 89 (2d Cir. 1975).

H. <u>The action causes a significant loss of scientific resources</u>.

Agencies must consider the extent to which a proposed project may cause loss or destruction of significant scientific resources in evaluating whether an EIS is required. 40 C.F.R. § 1508.27(b)(8). NMFS' approval of the hatchery programs will cause the loss of a significant opportunity to further our scientific understanding of salmonid response to ecosystem restoration—this warrants full consideration in an EIS before undertaking.

There has never been a dam removal and salmon restoration project of the magnitude involved on the Elwha River. The project thus provides the first opportunity to learn how salmonids naturally recolonize a watershed in response to large scale dam removal. As one NPS official stated:

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> Scientists from many natural and social science disciplines seek to study ecosystem responses to the removal of the two dams in what will be a critical scientific research program to take full advantage of this once-in-a-lifetime ecosystem restoration opportunity. Results from the research program will have national significance, not only with regard to restoration ecology, but also with regard to basic scientific understanding of how terrestrial, freshwater aquatic, and marine ecosystem components interact.

The HSRG recognized this unique opportunity to study natural recolonization. The massive hatchery programs destroy this unprecedented opportunity, and thus require an EIS before moving forward. *Cf. Puerto Rico Conservation Found. v. Larson*, 797 F. Supp. 1066, 1070-71 (D.P.R. 1992) (project that could taint rainforest research likely significant).

VI. The Draft Supplemental EA Does Not Comply With NEPA.

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NMFS' Draft Supplemental EA does not satisfy the intent or requirements of NEPA because it fails to take a hard look at the effects of the proposed hatchery programs—which present an abundance of known and potentially significant adverse effects on the

environment, and in particular, on threatened fish species—and alternatives thereto. In addition to the deficiencies described below, the inadequacies of the Draft Supplemental EA are demonstrated by the comments provided above regarding the failure of the HGMPs to comply with the 4(d) Rule standards and by the materials provided herewith.

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A. **The Draft Supplemental EA does not take a hard look at the effects of the hatchery programs and alternatives thereto.**

The Draft Supplemental EA fails to take a hard look at the effects of the hatchery programs and alternatives thereto. NMFS has failed to adequately define the objectives of its action or to conduct any meaningful assessment of the likelihood of the various alternatives at achieving. The Draft Supplement EA is deficient for failing to conduct any quantitative risk assessment of the various alternatives.

The purpose and need statement is a crucial part of crafting and evaluating a reasonable range of alternatives because only a sufficiently broad statement will allow full development of an adequate range of alternatives. *See, e.g., Simmons v. U.S. Army Corps*, 120 F.3d 664 (7th Cir. 1997); *Davis v. Mineta*, 302 F.3d 1104, 1118 (10th Cir. 2002). Agencies cannot unnecessarily limit or interpret their purpose and thereby place unnecessary limits on the range of alternatives. *Id.*; *see also Van Abbema v. Fornell*, 807 F.2d 633, 638 (7th Cir. 1986), *see also 'Ilio'ulaokalani Coalition v. Rumsfeld*, 464 F.3d 1083 (9th Cir. 2006).

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NMFS' description of the purpose and need is too vague to conduct any meaningful analysis of the alternatives. NMFS explains that the purposes include to "[m]eet NMFS' tribal treaty rights stewardship responsibilities" and to "[f]ullfill treaty-reserved fishing rights…as the populations recover, but NMFS does not provide any quantitative description of what is necessary to achieve these objectives. Similarly, NMFS states that another purpose is to "[e]nsure substantial progress towards fish restoration in the Elwha River within a 20- to

30-year time frame." Again, NMFS does not provide any meaningful explanation as to what is required to meet this goal. NMFS' failure to adequately define the purpose and need of the programs prevents any meaningful evaluation of the alternatives.

In order to evaluate the alternatives for hatchery production listed in the Draft Supplemental EA, there needs to be a common currency in terms of which each alternative is measured in order that the probable outcomes of adopting one or another of the alternatives can be estimated and compared to one another. The requisite currency must be objective and quantitative if the comparison is to provide a basis for sound and responsible public decision making, as required by NEPA. Where several, objectives are to be pursued – for example, avoiding extinction, preserving the genetic diversity, fitness, and evolutionary potential of the extant wild salmon and steelhead populations, assuring "substantial progress toward fish restoration" within some relevant time frame, meeting "…tribal treaty rights stewardship responsibilities" – these objectives must also be interpreted in terms of a common currency and evaluated accordingly. The Draft Supplemental EA fails to approach the comparison of alternatives in this way.

To illustrate what is required, consider the primary issues of the short-term extinction risk of Elwha winter-run steelhead and the preservation of the fitness and recovery potential of the wild population. This is a case of what is generally termed "population viability analysis (PVA)", which itself is a subset of ecological risk assessment. PVA shares with other environmental risk assessment contexts the presence of relevant uncertainties. These uncertainties fall into three general kinds: (1) parameter uncertainty: uncertainty about the values of the parameters governing the relevant physical, ecological and biological processes of interest (such as population growth rates, survival rates in freshwater between egg deposition and smolt outmigration, and survival rates in the ocean from smolt entry to adult

return); (2) model uncertainty: uncertainty about the form of the ecological/biological processes governing the populations of interest and reflected in the statistical models of population behavior and the appropriate statistical model to employ to estimate the processes of interest; and (3) process uncertainty: uncertainty due to the natural variability of the processes governing the populations of interest. Each kind of uncertainty affects the estimation of the probability that the population of interest will persist for a period of time or will increase by a certain amount or attain a specific level of abundance over a given period of time of interest to managers, by increasing the range (variance) of the distribution of probabilities (of persistence time or population growth). Of these three kinds, only parameter uncertainty can be reduced by collecting more data.

19 An important feature of a probabilistic assessment of population viability is that the uncertainty (due to whichever of the three sources) contributes to the risk. The greater the uncertainty, the greater the risk. The standard approach to quantify risk in a PVA is to estimate the time required to attain some threshold level – typically, total abundance of the population of concern. The threshold may be a minimum abundance below which a dire outcome such as extinction is considered very likely to occur, or it may be a minimum abundance above which some beneficial outcome such as limited harvest may occur. Adopting this bright-line conception and considering a dire outcome (e.g., extinction) the risk is the proportion of the probability distribution of times at which the population will drop below the critical threshold. Considering a beneficial outcome such as attaining a threshold population size above which some harvest will be permitted, the risk is the proportion of the probability distribution of times to attain the threshold abundance that exceeds some future time of management interest (for example, 20 years following dam removal).

To illustrate by attaching some numbers to these examples, if it is considered that the steelhead population will be considered extinct if there are 10 or fewer spawners in any year, and the management target is to assure that this does not occur for at least 100 years from the present, we will need an estimate of the probability distribution of times (from the present) at which the population will drop below the 10 spawner threshold. If, for some candidate management approach (Alternative) 95% of that distribution is above the 100 year threshold, there would be a 5% chance that the extinction threshold will occur in less than 100 years. If we are comfortable with assuring that extinction so defined will not occur in less than 100 years, we would conclude that the risk of this occurring is no greater than 5%. If it is considered that limited fishing of the recovering population can occur once the population attains an annual spawning abundance of 300 and it is a management target that this occur no later than 20 years from now, we would require a probability distribution of times to attain 300 spawners for each management approach (Alternative) under consideration, and for each alternative the risk of not achieving the 300 annual spawner threshold is the proportion of the probability distribution of times to attain the threshold that exceed the 20 year target. Considering the alternatives for the Elwha winter-run steelhead program, there are relevant uncertainties about the total size of the combined hatchery-plus-wild population necessary to minimize the risk of catastrophic loss of the wild population due to high sediment levels during and shortly after the removal of the two dams, and uncertainties about the duration of this post-dam-removal period itself. But none of the relevant quantities pertaining to this risk have been estimated. The probability level that constitutes sufficient minimization of the risk of failing to assure population persistence during this (short-term) period has not been determined as a matter of management policy. That is, the relevant risk tolerance policy itself has not been articulated. The minimum size of the annual or generational population in terms

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of numbers and composition by age and sex required to achieve the desired minimum risk level has not been estimated.

In addition to uncertainties about the risk of catastrophic loss due to high sediment levels there is uncertainty about the likelihood and magnitude of the loss of fitness of the wild population due to loss of fitness of hatchery fish that is expected due to domestication selection in the hatchery and the interbreeding of these hatchery fish with wild fish in the wild. These uncertainties concern both the amount by which the fitness of hatchery-origin fish is reduced, the additional reduction in hatchery fitness that may result from incorporating first-generation hatchery-origin adults into the hatchery broodstock, the magnitude of the reduction in the fitness of the combined hatchery-origin-plus-wild-origin population spawning in the wild resulting from the interbreeding of hatchery-origin with wild-origin fish in the wild, the consequences of any such reduction in fitness for the growth rate of the total wild-spawning population (which directly affects the risk of extinction of the population, its ability to recolonize the newly available habitat upstream of the former dams, and the rate at which that recolonization may occur). These uncertainties affect all of the alternatives, and only a quantitative, probabilistic risk assessment that incorporates estimates of these and other relevant uncertainties in one or more quantitative population models can provide the objective grounds for weighing the various risks involved, and thus making an informed decision as to which Alternative on balance does the best job of balancing these competing risks and management objectives.

Similar issues attend the determination of the minimum population abundance required to constitute “substantial progress toward fish restoration,” and the evaluation of the time required to attain that abundance with and without particular levels of hatchery production. These determinations have to be made in order to be able to weigh the genetic

risks to population fitness from various levels of hatchery production against the time required to achieve particular levels of population rebuilding that may be desired for reasons of social policy. We have noted that the Draft Supplemental EA asserts a vaguely defined objective of making "substantial progress toward fish restoration within 20 to 30 years," but provides no substantive, quantitative estimate of how the Alternatives may be evaluated with respect to this objective. What is required is a credible objective determination of the level of population abundance (and related population characteristics such as age-structure) that constitutes "substantial progress toward restoration." Once this is in hand, each Alternative can be assessed in terms of the probability distribution of times to attain this level of abundance, and compared to the distribution of times for other Alternatives. And similarly for other relevant parameters that are at issue. Only after the relevant probability distributions for all key parameters for all alternatives are available can a reasonable, balanced, decision be made to adopt one or another of the Alternatives (or some variant of one or more of the alternative that has not yet been considered).

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The Draft Supplemental EA manifestly fails to even hint at the need for -- much less the existence of -- such a risk assessment. Instead, the Draft Supplemental EA resorts to bald assertions of the consequences of one or another of the alternatives that provides no basis for understanding the risks posed by one or another of the alternatives, much less how different levels of risk are to be compared and balanced.

The Draft Supplemental EA fails to take a hard look at the proposed action's effects because there is inadequate consideration of data and other information obtained or developed since NMFS' prior EA for the Elwha River hatchery programs. Such data and information includes that related to salmonid return numbers and redd surveys.

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The Draft Supplemental EA further fails to take a hard look at the effects of the hatchery programs because it does not adequately evaluate monitoring, evaluation and adaptive management. The Draft Supplemental EA states that the MAMP is not self-implementing and therefore only those portions of the MAMP that are specifically incorporated into the HGMPs or are required by other agency decisions (*e.g.*, an incidental take statement) are reasonably certain to occur and therefore relied upon. However, the HGMPs do not specify which components of the MAMP will be implemented as part of the hatchery programs, but rather indicate that the MAMP "creates and implements monitoring and management strategies." It is thus entirely unclear which components of the MAMP are relied upon in the Draft Supplemental EA. Moreover, the Draft Supplemental EA does not even specify which MAMP it references. Which MAMP does the Draft Supplemental EA consider and which components of that plan does NMFS consider reasonably certain to occur?

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Further, the Draft Supplemental EA does not acknowledge the failure of the Elwha River mainstem weir. Has NMFS taken this into account in its current NEPA process? What tools does NMFS believe can be used in lieu of the weir for effective monitoring and adaptive management?

B. The Draft Supplemental EA Inappropriately Includes Illegal Hatchery Programs in the Baseline.

The Draft Supplemental EA states that the environmental baseline includes a continuation of hatchery programs. These programs operated illegally without approval under the ESA 4(d) Rule for years. Further, these programs are funded by the United States government. *See* Contracts Between Secretary of the Interior and the Lower Elwha Klallam Tribe. The HGMPs indicate that all funding for the Lower Elwha Klallam Tribe's hatchery programs is provided by the federal government. Is this accurate? What portion of funding

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for the Elwha River hatchery programs has come from the federal government since 2010? The environmental baseline cannot assume that illegal conduct and federal funding will continue.

22 To fully assess the effects of the hatchery programs, NMFS should have compared the proposed action to a baseline without any continued hatchery influence. In the absence of any differences between the proposed action and the baseline conditions, NMFS cannot meaningful understand or evaluate the effects these hatchery programs have on the environment.

C. The "No Action" Alternative Inappropriately Assumes a Continuation of Illegal Hatchery Programs.

Agencies must include a no action alternative in their NEPA analyses and give the no action alternative "meaningful consideration" in order to avoid violating NEPA's mandates. *See Bob Marshall Alliance v. Hodel*, 852 F.2d 1223, 1230 (9th Cir. 1988). "The no action alternative is meant to provide a baseline against which the action alternative . . . is evaluated." *Ctr. for Biological Diversity v. U.S. Dep't. of Interior*, 623 F.3d 633, 642 (9th Cir. 2010). A no action alternative is supposed to "facilitate comparison of the environmental impacts of the proposal and the alternatives." *Valley County v. United States Dep't of Agric.*, 23 2012 U.S. Dist. LEXIS 106667 (D. Idaho July 27, 2012) (citing 40 CFR § 1502.14) (internal quotation omitted). NEPA's required no action alternative "is meaningless if it assumes the existence of the very plan being proposed." *Friends of Yosemite Valley v. Scarlett*, 439 F. Supp. 2d 1074, 1105 (E.D. Cal. 2006) (finding that a no-action alternative could not properly include elements of an illegal plan).

The Draft Supplemental EA defines the "no action" alternative as NMFS taking no action on the submitted joint plan. The Draft Supplemental EA assumes that, under such circumstances, the illegal hatchery operations would continue under baseline conditions.

These programs have been conducted illegally without approval under the ESA 4(d) Rule and are the subject of litigation challenging their continuation. Further, these programs are funded by the United States government. *See* Contracts Between Secretary of the Interior and the Lower Elwha Klallam Tribe. Accordingly, the "no action" alternative cannot assume that the illegal conduct will continue and be funded with federal tax dollars. The "no action" alternative should assume the programs and funding therefor will be discontinued. By failing to include a true "no action alternative," NMFS did not compare the effects of the proposed action against the effects of taking no action, thereby rendering NMFS' analysis virtually meaningless. As a result, the Draft Supplemental EA fails to meet the NEPA's purpose and mandate regarding the no action alternative.

23 NMFS' assumption that the hatchery programs will continue regardless of the agency's NEPA decision ignores the fact that the federal government has the ability to affect the size and scope of these hatchery programs through its funding and/or Rule 4(d) approval. Indeed, the federal government has been and plans to continue providing significant funding for these hatchery programs. *See* Contracts Between Secretary of the Interior and the Lower Elwha Klallam Tribe. NMFS should have incorporated into the no-action alternative an evaluation of the hatchery programs in the absence of federal funding or support, which could have resulted in an analysis of a no-action alternative that included substantially smaller hatchery activities.

D. The Action Area is Too Narrow.

NMFS' proposed action area is drawn too narrowly because it ignores the effects that

24 hatchery fish will have outside of the area where "Elwha River fish would be spawned, incubated, reared, acclimated, released, or harvested." The hatchery fish will travel beyond these areas and harm wild fish far outside of the action area. Such areas include the entire

Elwha River watershed and other rivers where hatchery fish may stray. NMFS should have drawn the action area to include the full range of the hatchery fish to ensure that all of the true effects of the proposed action were considered.

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E. NMFS Has Relied Upon Faulty Assumptions.

NEPA requires that agencies provide high quality information before making decisions and taking actions. *W. Watersheds Project v. Kraayenbrink*, 632 F.3d 472, 492 (9th Cir. 2011). Yet the Draft Supplemental EA relies upon a series of false assumptions and questionable scientific conclusions to analyze and eliminate alternatives from consideration.

The Draft Supplemental EA relies on monitoring, evaluation, and adaptive management—some of which is described in the Elwha River HGMPs and NMFS' approval thereof, the monitoring and adaptive management plans, and biological opinions and incidental take statements related to the Elwha River project and hatcheries—that are not funded and not reasonably likely to occur. Most notably, the Elwha River mainstem weir—which was a primary component of the monitoring, evaluation and adaptive management strategy that NMFS has relied on in its various reviews and approvals of the hatchery programs—is no longer functioning and there are no apparent sufficient alternatives. What components of which monitoring and adaptive management plans has NMFS relied upon as reasonably certain to occur in this NEPA process?

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The Draft Supplemental EA finds that wild fish populations would not recover in the Elwha River basin as quickly, and fishing opportunities would be delayed and even prevented, if hatchery production was reduced as proposed under Alternative 5 relative to the massive releases in the Proposed Action of Alternative 2. There is no support in the Draft Supplemental EA for this determination and the weight of scientific literature provides otherwise. NMFS' determination that the massive releases in the Proposed Action are

necessary to achieve recovery while the reduced releases described in Alternative 5 would not achieve recovery is exceedingly suspect given the arbitrary manner in which the release numbers were chooses. *See* Deposition Transcript of Larry Ward. Further, NMFS' conclusion is based upon an incorrect understanding of the number of adult fish needed to be removed from the river to supply hatchery broodstock in order to maintain effective population numbers that adequately preserve genetic diversity. *See* Fourth Declaration of Gordon Luikart (provided herewith).

None of the parties involved in the current litigation related to the Elwha River hatchery programs appear to deny that if there were no risk of catastrophic loss of any native population due to dam removal all populations would begin recolonizing parts of the newly accessible habitat upstream of the former dam sites and that population rebuilding would eventually occur. The only disagreement concerns how rapidly and to what absolute levels of abundance each wild population would rebuild – and even here the disagreement concerns the number of decades at most, ranging from one to three at the optimistic end to five to ten at the pessimistic. And, as noted previously, none of these are informed by a comprehensive, quantitative risk assessment based upon appropriate population models.

The justification for the hatchery program using native broodstock concerns hedging bets against the short term possibility of catastrophic loss due to high levels of suspended sediment. Our experts have demonstrated that a relatively small program releasing 50,000 steelhead (and coho) smolts annually provides sufficient insurance against this risk and at the same time provides a much greater probability of preserving the extant witness of the wild populations than the larger programs of the preferred alternatives. The smaller program would arguably assure a greater probability that the per capita rate of population increase (recolonization) would be closer to maximal than with the larger program given the high

probability that per capita fitness (and hence rebuilding rate) would be lower in the aggregate naturally spawning population that would result from the larger program. In other words, it is plausible to expect a reasonably rapid rate of recolonization with the smaller hatchery programs. However, as explained above, a full quantitative risk assessment is required to provide appropriately detailed estimates of population rebuilding rates.

Similarly, Alternative 3's critique was based upon a highly controversial and baseless assumption—that the lack of hatchery programs after 2019 may increase the risk of extirpation and delay attainment of a viable abundance level for fish species. To the extent that there is a question about how long it will take for conditions in the Elwha River to support abundant populations, NMFS should not rely upon the more risky answer to provide carte blanche for the hatcheries to continue past 2019. Additionally, the Draft Supplemental EA also relies upon the false assumption that under Alternative 3, after hatchery programs are terminated, the total number of salmon and steelhead would decrease. NMFS' assumption is highly questionable and does not acknowledge that wild fish could thrive after discontinuation of the hatchery programs.

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Similarly, Alternative 4 was criticized because of the controversial assumption that the hatchery operations will provide beneficial effects and will preserve the species, and that dam removal activities may potentially be lethal to all fish migrating and rearing in the lower Elwha River. This statement is questionable, as fish have already been observed surviving the dam removal thus far and migrating upstream. The Draft Supplemental EA also falsely assumes that genetic diversity will be improved through the introduction of hatchery fish—indeed, the risks that hatchery fish will produce genetically inferior populations is much greater than any purported gains in genetic diversity that will result from the hatchery operations.

The Draft Supplemental EA continues to rely on outdated and faulty assumptions about sedimentation, effects of the dam removal process on salmonids, and the risk of extirpation, rather than incorporating new information that has become available as the dam removal process has proceeded, including redd survey and adult return data.

Andy Ritche, a project hydrologist with the National Park Service, has estimated that "40 to 50 percent of the total expected sediment has come down the river so far" and said that the remaining sediment may not make its way down the river entirely. Spokesman Review, "As dams fall, Elwha River makes stunning recovery," July 7, 2014, available at http://www.spokesman.com/stories/2014/jul/07/as-dams-fall-elwha-river-makes-stunning-recovery/. Despite the large amount of sediment that has already passed, salmonids have been making their way up the Elwha River and into the tributaries – biologists from NOAA and the Lower Elwha Klallam Tribe have noted that 108 redds were found in Indian Creek and Little River. *Id.* These examples, combined with other information released to the public from the agencies and the Lower Elwha Klallam Tribe, indicate that there is ample data available on which to re-evaluate the previous assumptions made in the original EA that would support additional analysis in the Supplemental Draft EA based on this new information and that would support a decision to chose an alternative with lower hatchery release numbers. NMFS' decision to ignore updated data was arbitrary and failed to fulfill NEPA's requirement that the agency take a "hard look" at the impacts of the decision and rely on high quality scientific information in the process.

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F. NMFS Cumulative Impacts Analysis is Insufficient.

The Draft Supplemental EA is deficient because it does not adequately evaluate cumulative impacts. Notably, NMFS has not addressed the cumulative impacts—such as

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those to the Puget Sound steelhead DPS and the Puget Sound Chinook salmon ESA—from the cumulative effects of hatchery programs throughout the Puget Sound region.

In addition to the proposed action, agencies must consider other actions, "which when viewed with other proposed actions have cumulatively significant impacts." 40 C.F.R. § 1508.25(a)(2). A cumulative impact is defined as "the impact on the environment which results from the incremental impact of the actions when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions." 40 C.F.R. § 1508.7. Cumulative impacts include direct as well as indirect effects, "which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable." 40 C.F.R. § 1508.8(a).

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The Draft Supplemental EA ignores the long-term foreseeable cumulative impacts of the proposed actions on fish species. In particular, the Draft Supplemental EA ignores the compounding adverse genetic effects and the reduced fitness levels that will become more pronounced overtime as the hatchery programs continue. Rather than acknowledging that these genetic problems could get worse over time when combined with the negative potential effects from climate change, the Draft Supplemental EA suggests that the proposed hatchery programs will actually have positive genetic effects through a genetic "safety net."

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The cumulative impacts discussion admits some of the significant adverse effects that climate change will pose to the environment and ESA-listed fish species. Some of these effects, such as increased incidence of disease breakouts and virulence in juveniles, will be exacerbated by the increased effects of disease and pathogens introduced by the hatchery programs. The Draft Supplemental EA's cumulative impacts conclusion is based upon the false assumption that the monitoring and adaptive management program would protect ESA-listed species and mitigate potential adverse cumulative impacts. As these comments have

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explained, the adaptive management and monitoring programs are insufficient and unfunded and exceedingly uncertain given the failure of the Elwha River mainstem weir. Therefore, the Draft Supplemental EA has wrongly relied on these programs to ignore the significant impact of cumulative impacts. As a result, the Draft Supplemental EA fails to propose any limitations on the proposed actions or less harmful alternatives. 28

Finally, the Draft Supplemental EA fails to account for the cumulative impacts resulting from other hatchery programs in the Puget Sound region. Many of these programs have been operating without 4(d) approval and are currently under review by NMFS. 29

VII. Incorporation of Documents.

In addition to the comments provided herein, Commenters hereby incorporate with this reference the declarations, articles, agency documents, and other exhibits and documents provided herewith. These materials provide further details regarding the issues and concerns addressed by Commenters herein. 30

Thank you for your consideration of these comments.

Very truly yours,

SMITH & LOWNEY, P.L.L.C.

By: *s/ Brian A. Knutsen*
Brian A. Knutsen

NMFS Response to Comments Submitted on Behalf of the Wild Fish Conservancy, the Wild Steelhead Coalition, the Federation of Fly Fishers Steelhead Committee, and Wild Salmon Rivers d/b/a the Conservation Angler

1. This comment consists largely of overview statements made by the commenter. To that extent, NMFS has not provided specific responses to these comments here. With respect to specific assertions, please see the following responses:

    - Response Number 19 addresses the commenter's suggestion that the draft Supplemental Environmental Assessment did not adequately address the court's concern.

    - Response Number 19 addresses the commenter's suggestion that the Environmental Assessment should include a quantitative risk analysis.

    - Response Number 2 and Response Number 19 address the commenter's concern that the hatchery programs do not have clearly articulated objectives.

    - Response Number 3 describes how NMFS considered new information obtained since the prior Environmental Assessment was issued.

    - Response Number 4 and Response Number 13 addresses the commenter's monitoring and evaluation concerns.

2. The commenter suggests that the HGMPs do not meet the criteria of Limit 5. These comments pertain to the submitted HGMPs and not the Supplemental Environmental Assessment. The sufficiency of the submitted HGMPs are not the subject of this Supplemental Environmental Assessment; that determination is made pursuant to 50 CFR 223.203(b)(5), and NMFS recently published for comment its draft determination that the HGMPs do in fact meet the regulatory standards. The commenter did not submit any comments on that draft determination. However, to the extent these comments pertain to the sufficiency of the HGMPs, they will be considered in NMFS's preparation of its final regulatory determination. For the purposes of NEPA, comments on the sufficiency of the HGMPs are inapposite, insofar as they do not assist NMFS in making its finding as to whether the Proposed Action will result in significant impacts to the human environment. Therefore, these comments will not be addressed here.

    The commenter also suggests that there is no evidence that high levels of suspended sediments in the Elwha River following dam removal will threaten the continued existence of the remaining populations of native salmon and steelhead. They believe this assumption is controversial and uncertain, and they suggest that the draft Supplemental Environmental Assessment does not acknowledge or provide reasoned support for this claim. NMFS notes that this sedimentation is an effect of dam removal, not hatchery

operations, and the extent to which dam removal has led to or will lead to elevated sedimentation is an effect which was studied in the EISs prepared by the National Park Service, and which was further considered in NMFS's Biological Opinion issued in 2006 to the National Park Service regarding dam removal. The process for considering dam removal and its effects should not be conflated with the Proposed Action considered in the Supplemental Environmental Assessment regarding the hatchery programs, which is not assessing the effects of dam removal but rather considers those effects as part of the environmental baseline.

To the extent the commenter asserts that there is no evidence of elevated sedimentation, or that this is a threat to native salmonids, both the sediment levels and their impacts to salmonids are a matter of recorded fact, as noted in the Supplemental Environmental Assessment. As described in Subsection 3.3, Water Quality, during the spring of 2013 thousands of yearling Chinook salmon released into the lower Elwha River from WDFW's conservation hatchery program died very shortly after release from effects associated with high turbidity (Figure 2). Histopathological examinations of fish recovered from the river banks confirmed that high turbidity was the cause of these mortalities. Turbidity levels in the river when the event occurred were detected at 1,600 ppm. Turbidity levels during the juvenile fish seaward migration period this year have often exceeded 2,000 ppm. Last summer and fall, during the adult migration periods for Chinook, coho, and chum salmon, turbidity levels in the lower river exceeded 5,000 ppm for the majority of a several week period (Curran et al. 2014).

In addition to fine sediment loading, coarser sediments stored behind the dams have deposited in the river and adversely affected the vast majority of salmon and steelhead habitat below Glines Canyon Dam. This condition is expected to persist for up to 10 years (BOR 1996). Recent observations by NMFS Northwest Fisheries Science Center staff indicate that up to 10 feet of sediment material has overwhelmed portions of the lower Elwha River (Figure 3) (NPS 2014; George Pess, NMFS, pers. comm., November 28, 2012). Aggradation levels at these amounts affect river channel morphology by increasing the width-to-depth ratio of the channel cross section, filling pool habitat used by juvenile and adult fish, and reducing the quality of rearing habitat (Ward et al. 2008). As previously forecasted, stored sediment releases are adversely affecting water quality and negatively impacting the condition of river channel areas needed to support juvenile fish survival. Rather than persisting as refugia for natural origin fish, Elwha River floodplain channel areas downstream of the dam sites have instead become sediment repositories that are inhospitable to fish survival (Figure 4, Figure 5). Water quality has also been impaired by interstitial filling of the gravel beds with fine sediment from the release of stored sediments. This condition has degraded migration and spawning habitat in these and other lower river areas.

Regarding the objectives of the hatchery program, the comment urges NMFS to define the objectives of the hatchery programs. The objectives are properly defined in both the HGMPs and the Supplemental Environmental Assessment. Both NMFS's objectives and the applicants' objectives are clearly stated in the Supplemental Environmental Assessment's statement of purpose and need for action (Section 1, Purpose of and Need

for the Proposed Action). The project operator's objectives are described in more detail in the submitted HGMPs. Each of the Lower Elwha Klallam Tribe's HGMPs contains a series of tables (Table 1.1, Table 1.2, and Table 1.3) that lay out the program's specific objectives for each phase of the Elwha River recovery, and performance standards that apply to the specific objective. The WDFW HGMP for Chinook salmon describes in section 1.7 the objectives for each phase of recovery, referencing the Hatchery Scientific Review Group's assessment of those objectives (which were incorporated into the HGMPs), as well as the Elwha River Fish Restoration Plan (ERFRP), a collaborative technical memorandum that articulates strategies for the effective use of hatcheries in restoring Elwha River salmonids.

See Response Number 4 with regard to the Elwha River mainstem weir.

3. There is no evidence that the historically low survival rates in the Chinook salmon hatchery program are a result of hatchery domestication. Further, there are no studies that have shown domestication effects in salmon released as subyearlings. The historically low survival rates are likely the result of degraded habitat conditions. Specifically, the Elwha River dams largely eliminated the Elwha River estuary. Without the estuary, subyearlings emigrating from the Elwha River have not had adequate rearing habitat for their transition from freshwater to saltwater fish. Finally, the Supplemental Environmental Assessment does not assert that a minimum 500 fish per generation effective size is required for any hatchery program (Subsection 4.3, Salmon and Steelhead). However, 500 fish per generation is a common benchmark used by geneticists for maintenance of genetic diversity.

4. Comments on the MAMP confuse the obligations of the applicant pursuant to the HGMPs. The MAMP is a collection of proposals to monitor and adaptively manage resources in the Elwha Basin for the benefit of restoring the river, but it is not a proposal slated for implementation by any particular authority. It is a collaboratively-prepared list of potential projects related to mitigation, monitoring, and adaptive management, which may be implemented by any party willing to take responsibility. Preparers of the MAMP expect the National Park Service to fund and implement several of the measures; the HGMP applicants would not be responsible for implementation, except to the extent they incorporate MAMP recommendations into an HGMP. Therefore, as explained in the Supplemental Environmental Assessment, in assessing the environmental effects of the action, NMFS has not relied upon *all* of the actions outlined in the MAMP, but rather has relied upon the measures that are listed in the HGMPs, that an entity has committed to implement, and which are reasonably certain to occur. These reasonably certain measures are further described in Response Number 13.

   NMFS disagrees with the commenter's suggestion that the measures are inadequate. To the extent MAMP measures are incorporated into the HGMP, they are part of the Proposed Action; other measures are not considered by the Supplemental Environmental Assessment because they are not reasonably certain to occur (Subsection 1.5.5, Monitoring and Adaptive Management Plans for the Elwha Restoration Project).

The commenter suggests that the HGMPs and NMFS's Supplemental Environmental Assessment rely extensively on a weir in the mainstem of the Elwha River to implement monitoring and adaptive management strategies. The HGMPs, and NMFS's evaluation of them, do not rely on a functioning weir in the mainstem of the Elwha River to implement monitoring and adaptive management, or mitigation strategies. Because the Elwha weir is no longer in operation, NMFS did not integrate this weir into evaluations in the Supplemental Environmental Assessment or into monitoring and adaptive management strategies. Instead, the weir's potential monitoring functions have been assumed by sonar-based surveys, which NMFS has preliminarily found adequate to meet the requirements of the 4(d) regulations with respect to minimizing harm to wild populations.

Initiated in 2010, the operation of the mainstem weir was viewed by researchers as experimental and dependent on river flow and post-dam removal bedload conditions that would allow for its successful operation. As described in USFWS (2012) in the agency's consultation with NMFS regarding Elwha hatchery effects on USFWS listed species, "the feasibility of continuing to effectively operate the mainstem weir is currently under review. High spring and early summer flows carry high debris loads, limiting its operation and capture efficiency, which calls to question its continued operation beyond 2013." Recognizing that flow and sediment conditions in the river had a high potential to prevent successful operation of the weir, in its ESA section 7 Biological Opinion, NMFS noted that the co-managers will "operate the mainstem Elwha River weir if feasible" (NMFS 2012a). As recognized by NMFS and USFWS, the release of large amounts of coarse sediment stored behind the dams, combined with high river flows during salmon and steelhead migration periods, caused operation of the mainstem resistance board weir to become infeasible.

These conditions, including burial of weir components under large quantities of sediment, prevented the weir from meeting its purposes, which included enumerating migrating adult fish populations, and augmenting Chinook salmon broodstock collection actions implemented at the hatcheries and in the mainstem river (Anderson and Ackley 2013). Consistent with the adaptive management intent for adjusting monitoring and evaluation actions (Peters et al. 2014), the mainstem weir program was terminated after 2013, and replaced with a DIDSON (sonar) salmon and steelhead abundance census program. Salmon and steelhead population abundance monitoring and evaluation objectives originally proposed through mainstem weir operation are now being met through successful implementation of the DIDSON program (Denton et al. 2013). Broodstock collection actions implemented in the river (seines, gill nets, hook and line) and at the hatcheries are providing required numbers of adult salmon to sustain the co-manager supportive breeding program without contributions from the mainstem weir (WDFW 2014). Additional clarification regarding the operation of the weir has been added to Subsection 1.2, Description of the Proposed Action and Subsection 1.5.5, Monitoring and Adaptive Management Plans for the Elwha Restoration Project.

5. The commenter suggests that the joint plan does not meet the “no jeopardy” standard. NMFS has previously concluded in its Biological Opinion for the approval of the HGMPs (NMFS 2014) that continued operation of the HGMPs does not jeopardize endangered or threatened species. Therefore, NMFS disagrees with this comment.

6. A determination of significance is made in the NEPA decision document. National Oceanic and Atmospheric Administration Administrative Order 216-6 (NAO 216-6) contains criteria for determining the significance of the impacts of a Proposed Action. In addition, the CEQ regulations at 40 C.F.R. 1508.27 state that the significance of an action should be analyzed both in terms of “context” and “intensity.”

   Notably, the Supplemental Environmental Assessment is not the only NEPA document supporting the use of hatchery conservation programs on the Elwha River. Three prior EISs have been prepared in anticipation of Elwha River dam removal and subsequent river restoration. The prior Federal actions have analyzed the dam removal activities, subsequent sediment releases, and their resulting impacts on salmonid populations. The need for supplementation of existing Elwha River salmonid populations with hatchery programs was also previously discussed, and identified by the National Park Service as a mitigation measure to be carried out as part of the selected alternative for Elwha River restoration. This Supplemental Environmental Assessment properly tiers to the prior analyses prepared pursuant to NEPA.

   Having incorporated by reference the previous NEPA analyses related to Elwha River dam removal and restoration, and after meaningful evaluation of the effects of the Proposed Action (both beneficial and adverse) on the human environment, NMFS has determined that the Proposed Action will not have a significant effect on the environment (Section 8.0, Finding of No Significant Impact). All pertinent and best available information was fully analyzed in the Supplemental Environmental Assessment or incorporated by reference from the National Park Service EISs. NMFS properly concluded in its FONSI that the potential effects of the Proposed Action would not be a significant impact to resources analyzed in the Supplemental Environmental Assessment based on CEQ criteria for context and intensity. Since NMFS supports a FONSI, an Environmental Impact Statement is not required because the Proposed Action would not significantly affect the quality of the human environment (42 U.S.C. 4332(2)(C)).

7. Regarding the commenter’s assertion that the Supplemental Environmental Assessment “determined that the risks of extirpation outweigh the harm caused by the hatchery programs,” and that another EIS is therefore, required, this comment is incorrect. The decision to use hatchery supportive breeding programs as a mitigation measure to guard against the adverse sediment impacts from dam removal was made in 1996, and analyzed in the 1996 EIS for Elwha River Restoration Implementation. That EIS contemplated dam removal activities, adverse sediment impacts on salmonids, and supplementation of the salmonid populations with hatchery programs to help ensure survival and recolonization of native Elwha salmonid populations. Therefore, the use of hatchery supplementation programs as part of Elwha River restoration has already been analyzed in previous EISs prepared as part of Elwha River restoration.

8. NMFS used the best available science in assessing effects on the human environment from the Proposed Action, which supports its FONSI determination. The three prior EISs related to Elwha River restoration, including Appendix 2 to the 1996 Implementation Environmental Impact Statement (NPS 1996), discussed the use of hatcheries, and each of the impacts alleged by the commenter (e.g., genetic interactions, ecological interactions, predation, etc.) was further analyzed in the Supplemental Environmental Assessment. NMFS's rationale for supporting a FONSI are addressed in detail in the Supplemental Environmental Assessment and in the Biological Opinion (NMFS 2014), which both represent the use of best available science.

9. The commenter asserts that NMFS has not discussed the effects of hatcheries in sufficient detail. NMFS disagrees with the comment, because NMFS appropriately incorporated prior impact information by reference in the Supplemental Environmental Assessment. The standards for NEPA documentation encourage NMFS to incorporate material by reference "when the effect will be to cut down on bulk without impeding agency and public review of an action" (40 C.F.R. 1502.21). Consequently, in the Supplemental Environmental Assessment NMFS briefly described the general mechanisms through which a hatchery program can affect salmon, steelhead, and their habitat to provide baseline information (Subsection 3.4, Salmon and Steelhead). The Supplemental Environmental Assessment then refers the reader to the final EIS to Inform Columbia River Basin Hatchery Operations and the Funding of the Mitchell Act Hatchery Programs (NMFS 2014) for the purpose of providing a more detailed background discussion of these general mechanisms (Subsection 3.4, Salmon and Steelhead). The effects of the Proposed Action and its alternatives are not incorporated by reference, but are fully analyzed in Subsection 4.0, Environmental Consequences, of the Supplemental Environmental Assessment.

   Further, NMFS did not rely on its Environmental Impact Statement to Inform Columbia River Basin Hatchery Operations and the Funding of the Mitchell Act Hatchery Programs to analyze impacts in the Supplemental Environmental Assessment. NMFS relied on the best available scientific information in making its Supplemental Environmental Assessment analyses, which was updated prior to completion of the Supplemental Environmental Assessment.

10. The commenter asserts that an EIS is required because of the nature of the Elwha River, watershed, and basin. An additional EIS is not required because the nature of the river, watershed, and basin has already been addressed in prior EISs. To the extent the affected environment is extraordinary because hatcheries will occur in a river as important as the Elwha River, the National Park Service EISs already considered the unique affected environment in relation to the use of hatcheries to mitigate the effects of dam removal on the Elwha River. These evaluation documents were the Elwha River Ecosystem Restoration EIS (NPS 1995), the Elwha River Ecosystem Restoration Implementation EIS (NPS 1996), and the Elwha River Ecosystem Restoration Supplemental EIS (NPS 2005).

11. The commenter asserts that an EIS is required to look at the effects of hatchery fish in the upper watershed because of its unique characteristics. The issue of dam removal and Elwha River restoration and these effects on the unique characteristics of the upper watershed were evaluated in the Elwha River Ecosystem Restoration EIS (NPS 1995) and the Elwha River Ecosystem Restoration Implementation EIS (NPS 1996; NPS 2005). These EISs, particularly the final dam removal EIS, included the use of hatchery programs in the analyses of the restoration of the Elwha River. Furthermore, NMFS's action under review in the Supplemental Environmental Assessment is limited to the decision of whether to approve HGMPs submitted by WDFW and the Lower Elwha Klallam Tribe.

12. Once again the commenter asserts that an EIS is required, because dam removal is unprecedented. NMFS disagrees because this was the subject of earlier EISs, see Response Number 11 .

    Further, the Puget Sound Hatcheries Draft EIS does not represent a determination by NMFS that the cumulative effects of HGMPs in the region require an EIS. An initial Environmental Assessment was not prepared by NMFS on the two resource management plans (comprised of 117 HGMPs) that are the Proposed Action in the Puget Sound Hatcheries Draft EIS. As such, NMFS did not use the Environmental Assessment process to first determine whether or not there are potential significant impacts requiring an EIS. Furthermore, an environmental assessment was not prepared that concluded an Environmental Impact Statement is warranted based on potentially significant cumulative effects. Instead, NMFS made a determination to proceed with an EIS directly for the assessment of potential effects from Puget Sound hatchery operations. The preparation of an Environmental Impact Statement for the 117 hatchery programs does not imply that cumulative effects would be significant in the Puget Sound region, nor does it imply that an additional Environmental Impact Statement is then required for any single hatchery program subsequently approved under the ESA from the 117 programs programmatically analyzed.

    NMFS disagrees with the comment that the proposed Elwha hatchery programs are likely to establish a precedent for future actions with significant effects or to represent a decision in principle about a future consideration because the programs are similar in nature and scope to other hatchery actions over the past several years. The review process for the Elwha River HGMPs is not precedential; other HGMPs involving captive breeding or supplementation (e.g., Snake River fall Chinook salmon and Hood Canal Summer Chum) in the Pacific Northwest have been analyzed through similar ESA determinations and NEPA reviews.

13. The commenter claims that an EIS is required because the harm posed by the hatcheries is uncertain. NMFS disagrees. First, as the commenter acknowledges, the standard is not "uncertain" but "highly uncertain." NMFS disagrees that the effects of the hatcheries are "highly uncertain." Although NMFS recognizes the unsettled science and potential risks

applicable to hatcheries generally, NMFS applied best available science and information to the analyses of impacts resulting from each alternative, including the Proposed Action. The Supplemental Environmental Assessment relies on the most recent studies and takes a hard look at the effects of hatchery operations, and the Biological Opinion (NMFS 2014) does so in even greater detail. Finally, to the extent the uncertainty cited by commenter pertains to the decision to use hatcheries or to the dam removal, those determinations were previously the subject of EISs.

The commenter asserts that the uncertainty of mitigation measures also requires an EIS, but in this case the commenter is confusing the likelihood of actions happening with scientific uncertainty as it relates to effects. NMFS has resolved any uncertainty as to monitoring and mitigation measures occurring in accordance with NEPA law and guidance, relying on monitoring and adaptive management strategies currently being implemented as part of the Proposed Action as well as by the National Park Service (Subsection 1.5.5, Monitoring and Adaptive Management Plans for the Elwha Restoration Project), while excluding from consideration any other measures that are not reasonably certain to occur. Regarding the MAMP, its status as a stand-alone document is irrelevant, as discussed above. What is relevant is whether the measures identified by the MAMP, or any other source, are in fact being implemented. NMFS disagrees with the inference that it is relying on any measures that are not reasonably certain to occur.

Like the Elwha River Fish Restoration Plan (Ward et al. 2008), the monitoring and adaptive management plan provides the recommendations of the authors, and is not self-implementing or action-forcing. The plan relies on various entities' subsequent actions, such as the proposed hatchery plans, to implement recommendations. Many of the actions and goals recommended by the monitoring and adaptive management plan (as well as by the HSRG report) have been incorporated into the submitted HGMPs and Tribal Harvest Plan. As described in the NMFS Biological Opinions (NMFS 2012a; NMFS 2014), hatchery-related monitoring and evaluation actions in the HGMPs complement and/or augment the core monitoring actions identified in the monitoring and adaptive management plan. These core monitoring and evaluation actions will be used to both assess listed Chinook salmon and steelhead population viability status and hatchery program performance and effects. Other actions have an identified funding source, such as those implemented as part of the National Park Service consultation regarding dam deconstruction effects (NMFS 2012b), and are, therefore, reasonably certain to occur. However, there are many actions identified in the monitoring and adaptive management plan that may be too costly for implementation in the near future. Therefore, as clearly described in Subsection 1.5.5, Monitoring and Adaptive Management Plans for the Elwha Restoration Project, these actions are not relied upon in NMFS's determinations based on this Supplemental Environmental Assessment because they are not reasonably certain to occur.

Monitoring and evaluation actions included in the HGMPs (in certain instances partially or wholly funded as part of the National Park Service dam removal action), include:

- Operation of weirs at the Elwha Channel and Lower Elwha Fish hatcheries to count hatchery-origin and any stray natural-origin adult returns, and allow for biological sampling of returning fish (note that these weirs are different than the Elwha River mainstem weir)

- Operation of juvenile outmigrant traps to collect fish for identification of species, origin, and biological characteristics

- Foot and boat surveys to census salmon and steelhead spawning abundance and to sample carcasses to identify fish origin

- Monitoring and reporting of fish harvests by species and by origin

- Monitoring of broodstock collection, egg take, and smolt release levels for each program

- Fish health monitoring and reporting

- Genetic analyses of naturally produced smolts, and unmarked adults to measure the extent of genetic exchange between hatchery-origin and natural-origin fish

- Other activities needed to determine hatchery program effects and performance

In addition, as part of NMFS requirements set forth in the reinitiated dam deconstruction Biological Opinion (NMFS 2012b), the following other monitoring and evaluation actions will be implemented (funded by National Park Service) to complement HGMP-related monitoring and evaluation efforts:

- Spawning ground surveys to assess listed adult fish abundance and distribution

- Operation of juvenile fish outmigrant traps to determine the productivity of naturally-spawning fish upstream of dam sites

- Operation of DIDSON to assess adult salmon and steelhead spawning escapement abundance

- Aerial Spawning Ground Surveys to assess adult fish spawning escapement abundance and distribution in the upper watershed

- Fish health surveys and sampling to identify fish disease pathogen status in wild fish

- Upstream transport and release of adult salmon and steelhead to increase spawner escapement abundances in middle and upper river reaches

- Fish tagging and tracking to Monitor and assess salmon and steelhead distribution

- Monitoring and tracking of habitat conditions in the watershed as they recover from dam deconstruction effects

NEPA does not require the action agency to dismiss from its analysis any mitigation measures (or monitoring and adaptive management components) included in the Proposed Action simply because they rely on future funding. NMFS considers mitigation measures, future funding notwithstanding, in its analyses as long as they are part of the Proposed Action and there is a reasonable expectation that funding will occur.

See Response Number 4 with regards to the Elwha River mainstem weir.

14. This comment begins with an incorrect premise: that any controversial action must be accompanied by an EIS. The CEQ regulations do not contain any such requirement. An EIS is required for major Federal actions significantly affecting the human environment. In determining significance, agencies analyze the context and intensity of an action and its effects. Among other factors, the "degree to which the effects on the quality of the human environment are likely to be highly controversial" is one of 10 factors that "should be considered in evaluating intensity" (40 CFR 1508.27). Thus, whether an action is likely to be highly controversial is one factor to consider in the determination of whether an EIS is warranted.

    In making its significance determination NMFS has considered the likelihood that the Proposed Action could be highly controversial (Section 8.0, Finding of No Significant Impact). The use of hatcheries can be controversial, and NMFS must carefully consider potential adverse effects of hatchery programs on listed fish. However, the controversy surrounding the Elwha hatchery programs is primarily about whether or not hatchery fish should be used as part of the Elwha River Ecosystem Restoration, which was fully analyzed in one National Park Service EIS and one supplemental EIS on Elwha River Ecosystem Restoration and Elwha River Ecosystem Restoration Implementation (NPS 1996; NPS 2005). While the subject of some disagreement, the effects of the proposed hatchery programs as described in the Supplemental Environmental Assessment are not highly controversial, as demonstrated by the fact that only one comment letter opposing approval of the Proposed Action described in the Supplemental Environmental Assessment was received.

    Four comment letters were received on NMFS's 2012 Draft Environmental Assessment - one criticism by the party currently in litigation over the matter, and three comment letters in support of the Proposed Action. Two letters were received in response to the NMFS's 2014 Draft Supplemental Environmental Assessment - one criticism by the

party currently in litigation over the matter, and one comment letter in support of the Proposed Action. Regarding scientific community opinion, the Hatchery Scientific Review Group panel of scientists already provided its input and general support, which resulted in several changes to the HGMPs pursuant to its recommendations. Thus, in considering whether the Proposed Action is likely to be highly controversial, NMFS acknowledges the disagreement contained in this comment letter and recognizes that scientific research on the effects of hatchery operations remains ongoing, and will likely continue to develop. However, NMFS's analysis of the environmental effects of the State and Tribal HGMPs relies upon the best available science, and NMFS disagrees that the approval of the HGMPs is "highly controversial" or that an additional EIS is required.

15. The commenter asserts that an EIS is required because the Proposed Action will have significant impacts on species listed as threatened or endangered pursuant to the ESA. NMFS disagrees. In the Supplemental Environmental Assessment (Subsection 4.0, Environmental Consequences), NMFS made a determination of the expected effects on protected species (both beneficial and adverse) under a full range of alternatives. Although the Proposed Action would be expected to have some adverse effects on species listed as endangered or threatened under the ESA, NMFS found that the degree to which adverse effects may occur would not be significant (40 CFR 1508.27(9))(see attached Finding of No Significant Impact). CEQ significance factors are not limited to whether an action may have an effect on listed species, but the degree to which this impact may occur. All pertinent and best available information was fully analyzed in the Supplemental Environmental Assessment or incorporated by reference from the National Park Service EISs (40 CFR 1502.22). Moreover, the use of hatcheries in the basin was previously the subject of the three National Park Service EISs, addressing among other issues the question mentioned in the comment regarding the potential delay or inhibition of species recovery. The comment regarding uncertainty was previously addressed in Response Number 13.

16. The commenter asserts that an EIS is required because the cumulative effects of hatcheries amount to a significant impact when combined with the effects of the Proposed Action. NMFS disagrees. The effects of other Puget Sound hatchery programs were appropriately captured in the baseline conditions in Chapter 3, Affected Environment, since they are ongoing programs and have resulted in current conditions in the action area. The effects of these other Puget Sound hatchery programs were then considered along with the effects of the Proposed Action in NMFS's analysis of Environmental Consequences (Section 4, Environmental Consequences). There are no other hatchery program proposals at this time that would increase straying into the Elwha River Basin or cause other hatchery effects. If such proposals are presented to NFMS for future ESA approval, NMFS would consider their effects in conjunction with the ongoing effects from this Proposed Action, other baseline activities, and reasonably foreseeable future actions and conditions within the analysis area.

NMFS did not "reversed course" in analyzing Elwha River hatchery programs in an Environmental Assessment separate from other Puget Sound hatchery programs. The

hatchery conservation programs associated with Elwha River restoration have been contemplated since 1996, and since that time have proceeded along a planning track dictated by dam removal, river restoration activities, and the need for timely mitigation of associated adverse impacts.

See also Response Number 12.

17. The commenter suggests that an EIS is required because the action constitutes a "significant loss of scientific resources." NMFS disagrees that a mere opportunity to study the environment in its natural state (i.e., in the absence of a proposed project) constitutes a "scientific resource" that could be lost, within the meaning of the CEQ regulations. Moreover, the loss of scientific resources is merely one factor to be considered in determining whether an EIS is required; it does not trigger an EIS on its own.

    Finally, the decision to use hatcheries was the subject of three EISs, as discussed above, and the loss of scientific resources (to the extent this occurred) would have flowed from the National Park Services' record of decision, not the implementation of the HGMPs. In making that decision, the National Park Service, in consultation with NMFS and others, determined that the risk of decimation or extirpation of native salmonid populations resulting from sediment outflow following dam removal weighed heavily against treating the Elwha River restoration as an experiment in the ability of salmonid populations to recover, in highly turbid and frequently changing river conditions, without supportive breeding programs.

18. Because this is an overview statement, NMFS will not respond here, but instead respond below to specific issues raised by the commenter.

19. NMFS conducted a hard look assessment of potential effects by assessing impacts to all potentially affected environmental and human resources from five alternatives, including a No-action Alternative that represents the status quo condition. In addition, NMFS incorporated by reference the National Park Service EISs on Elwha River Ecosystem Restoration and Elwha River Ecosystem Restoration Implementation for a robust analysis of direct, indirect, and cumulative effects (Section 5, Cumulative Impacts). The Supplemental Environmental Assessment analyses are consistent with the analyses in these EISs.

    The purpose and need for this action is not "too vague" to conduct any meaningful analysis of the alternatives. The Environmental Assessment includes a clear description of NMFS's purpose and need as well as the co-manager's purpose and need for the Proposed Action. As described in Subsection 1.3, Purpose and Need for Action, the purpose of the Proposed Action is to ensure that the hatchery programs operated by the Lower Elwha Klallam Tribe and WDFW for the production of Chinook salmon, steelhead, coho salmon, fall chum salmon, and pink salmon as described in the five HGMPs and the Tribal Harvest Plan comply with the requirements of the ESA, and are reviewed for potential approval under the ESA 4(d) Rule.

NMFS's need for the Proposed Action is two-fold:

- Ensure the proposed hatchery programs and harvest plan comply with the requirements of the ESA

- Meet NMFS's tribal treaty rights stewardship responsibilities

These two components of the "need" statement mean that NMFS has a responsibility pursuant to the 4(d) regulations to process HGMPs when received in a form ready for analysis, and in particular to respond to Tribal plans as part of its stewardship responsibilities.

The applicants' need for the Proposed Action is five-fold:

- Preserve and assist in the recolonization of all native salmon and steelhead populations in the Elwha River Basin during and after the removal of two dams

- Ensure substantial progress towards fish restoration in the Elwha River within a 20- to 30-year time frame

- Fulfill treaty-reserved fishing rights on steelhead and Chinook, pink, chum, and coho salmon as the populations recover

- Provide fishing opportunities for citizens of Washington State as the populations recover

- Use existing hatchery facilities to meet the recovery objectives for the Elwha River

The commenter suggests that the Purpose and Need Statement should include a quantitative description of what would be necessary to meet each objective within the purpose and need statement. NMFS disagrees with the commenter. Attaching a numerical value to each objective in many cases would have been arbitrary. In addition, it would have resulted in a Purpose and Need statement so narrow that it would have artificially constrained the range of reasonable alternatives.

The commenter suggests that the Supplemental Environmental Assessment use a "common currency" to measure effects of each alternative. NMFS has included common currencies in its comparison of the effects on the alternatives (referred to as "metrics"). These include:

- The amount and percentage of surface water diverted from the Elwha River, Hurd Creek, Sol Duc River or Puget Sound from operating the Elwha River hatchery programs (Subsection 3.2, Water Quantity; Subsection 3.3, Water Quantity)

- The discharge of ammonia, nutrients, biological oxygen demand, pH, suspended solids levels, antibiotics, fungicides, disinfectants, steroid hormones, pathogens, anesthetics, pesticides, and herbicides into the Elwha River, Hurd Creek, Sol Duc River or Puget Sound from operating the Elwha River hatchery programs (Subsection 3.3, Water Quality; Subsection 4.3, Water Quality)

- Viable Salmonid Population (VSP) parameters for each salmon and steelhead population. The VSP parameters are abundance, productivity, diversity, and spatial structure (Subsection 3.4, Salmon and Steelhead; Subsection 4.4, Salmon and Steelhead)

- Harvest opportunity (Subsection 3.4, Salmon and Steelhead; Subsection 4.4, Salmon and Steelhead)

- Employment opportunities and the local procurement of goods (Subsection 3.7, Socioeconomics; Subsection 3.8, Socioeconomics)

- Effects on tribal ceremonial and subsistence fisheries (Subsection 3.8, Cultural Resources; Subsection 4.8, Cultural Resources; Section 3.10, Environmental Justice; Section 3.11, Environmental Justice)

The commenter suggests that a quantitative "probabilistic risk assessment," such as population viability analysis (PVA), should have been used to determine what alternative does the best job of balancing competing risks and management objectives. NMFS disagrees. Although PVA can be used to estimate extinction risk, the results are often imprecise (Fieberg and Ellner 2000). The Viable Salmonid Population approach that NMFS relied upon in its Supplemental Environmental Assessment is an appropriate and well-established method for evaluating hatchery actions that directly affect natural populations and for which incremental increases in extinction risk may be difficult or impossible to accurately quantify (McElhany et al. 2000). In addition, PVA has a very narrow scope in that it focusses solely on extinction risk without consideration of other management objectives. For example, PVA may predict that two alternatives have a similar extinction risk, but it would not provide meaningful information on the ability of the alternatives to meet other management objective (i.e., rebuilding population abundance or increasing spatial structure). The Viable Salmonid Approach provides a broader scope of analysis, allowing NMFS to better understand the risks and benefits of each alternative compared to use of the PVA approach.

The Viable Salmonid Approach is described in NMFS's technical memorandum, *Viable Salmonid Populations and the Recovery of Evolutionarily Significant Units* (McElhany et al. 2000). Four parameters form the key to evaluating population viability status: abundance, productivity, spatial structure, and diversity. These are the same parameters that are used by NMFS in its delisting decisions. NMFS relied upon best available

science in its application of the Viable Salmonid Approach (Subsection 4.4, Salmon and Steelhead).

20. The commenter asserts that the Supplemental Environmental Assessment is deficient because it fails to account for new information. NMFS disagrees. The Supplemental Environmental Assessment includes new information on sedimentation (Subsection 3.3, Water Quality) and adult returns (Subsection 3.4, Salmon and Steelhead), and NMFS's FONSI takes this new information regarding effects into account.

21. See Response Number 4 and Response Number 13.

22. The commenter asserts that the Supplemental Environmental Assessment should not include ongoing hatchery programs as part of the baseline because they are "illegal." NMFS disagrees. NMFS is required under NEPA to make its best estimate of what effects have occurred and will likely continue to occur to understand the potential effects of implementing the Proposed Action. The legal status of all actions leading to those effects is irrelevant to the analysis of impacts on current environmental conditions. The commenter also suggests that NMFS should have compared the Proposed Action to a baseline with no hatchery operations continuing. This would have been a missrepresentation of the baseline, existing environmental conditions. However, NMFS included Alternative 4, which assessed the effects of terminating hatchery operations and effectively considered the scenario the commenter raises.

23. The commenter asserts that NMFS erred by determining that hatcheries would continue under the No-action Alternative because continued operation is "illegal." NMFS disagrees. The No-action Alternative correctly represents NMFS's best estimate of what would happen in the absence of the proposed Federal action, which is NMFS's ESA approval of the HGMPs. The scope of the No-action Alternative is consistent with CEQ's 40 Most Asked Questions. Specifically, "There are two distinct interpretations of "no action" that must be considered, depending on the nature of the proposal being evaluated. The first situation might involve an action such as updating a land management plan where ongoing programs initiated under existing legislation and regulations will continue, even as new plans are developed. In these cases "no action" is "no change" from current management direction or level of management intensity. To construct an alternative that is based on no management at all would be a useless academic exercise. Therefore, the "no action" alternative may be thought of in terms of continuing with the present course of action until that action is changed." (CEQ 1981)

    As to the commenter's assertions regarding the legal status of the programs, NMFS does not make definitive determinations regarding statutory compliances when fulfilling its NEPA responsibilities (NMFS notes that the commenter's allegations of illegal action are vague and conclusory. Although NMFS's 2012 Environmental Assessment was partially vacated, neither NMFS's 2012 determination pursuant to the ESA 4(d) Rule nor NMFS's prior Biological Opinions related to Elwha River restoration—and the associated incidental take statement—were vacated).

The alternatives analyzed in the Supplemental Environmental Assessment are based on NMFS's best estimates of what would occur under each scenario. NMFS is not aware of any reason, funding or otherwise, why the HGMPs would not continue to be implemented as previously authorized. The speculative assertions raised by the commenter do not support an assumption by NMFS that the programs would be terminated prematurely. Finally, the commenter suggests that NMFS could have included a no-funding component of the no-action alternative. While we do not agree that such an approach is required by NEPA, we note that the biological significance of the commenter's proposal – to create an alternative which assumes no hatchery operations – is already the subject of Alternative 4.

24. The action area (or project area) for this Supplemental Environmental Assessment is the geographic area where the Proposed Action would take place (Subsection 1.4, Action Area). However, because the effects of a Proposed Action can occur outside of the action area, an analysis area is determined for each potentially affected resource (Subsection 1.4, Action Area). 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. For example, Alaska is not in the action area, but because fish produced in the Elwha River hatchery programs may be intercepted in Alaskan fisheries, Alaska is included in the analysis area for socioeconomics.

25. NMFS applies best available science and information in its NEPA analyses, and employed this practice in making all assessments (e.g., Alternative 3 and Alternative 4 conclusions) (40 CFR 1502.22). The commenter's disagreement with NMFS's conclusions is noted. The Supplemental Environmental Assessment contains the rationale for all conclusions with supporting science.

    See Response Number 4 and Response Number 13 with regard to monitoring and adaptive management.

    See Response Number 4 regarding the Elwha weir.

    The commenter claims that "Alternative 3's critique is based on a highly controversial and baseless assumption – that that lack of hatchery programs after 2019 may increase risk of extirpation and delay attainment of a viable abundance level for fish species." However, there is no statement in the Supplemental Environmental Assessment that Alternative 3 would increase risk of extirpation (Subsection 4.4, Salmon and Steelhead). Instead, the Supplemental Environmental Assessment describes the following:

    > In the long term, Alternative 3 would eliminate risks associated with genetic effects, competition and predation, facility effects, natural population status masking, incidental fishing effects, or disease transfer from hatchery programs, because the hatchery programs would be terminated in approximately 2019. Similarly, population viability and nutrient cycling benefits would be eliminated after hatchery-origin fish stop returning to the Basin to spawn (Subsection 3.4, Salmon and Steelhead). However, it would

> take longer for the species to recolonize the Elwha River Basin to a viable population level without hatchery programs (Ward et al. 2008). Salmon and steelhead would have similar access to high-quality habitat throughout the Elwha River Basin under Alternative 3 as under Alternative 1, so there would be no change in the spatial structure or productivity of the Elwha River steelhead population relative to Alternative 1, but the pace in achieving benefits to these parameters might be reduced by decades relative to Alternative 1 because of decreases in total population abundance. Because certain hatchery programs can reduce the genetic diversity and fitness of a salmon population, eliminating the hatchery programs in approximately 2019 would reduce genetic diversity and fitness loss risks associated with hatchery production relative to Alternative 1.

The commenter also claims that NMFS relies on the "false" assumption that total abundance of salmon and steelhead would decrease after termination of the hatchery program under Alternative 3's sunset term. NMFS does not understand why the commenter would call this a false assumption. Before the sunset, over 90 percent of the adult fish returning to the Elwha River would be hatchery-origin fish (Subsection 4.4, Salmon and Steelhead). Even if the natural-origin fish are more reproductively successful than the hatchery-origin fish, total abundance (i.e., hatchery-origin plus natural-origin fish) would be lower for many years following termination of the hatchery programs responsible for producing 90 percent of returning adults.

The commenter claims that Alternative 4, which would immediately terminate the hatchery programs, was criticized because of "the controversial assumptions that the hatchery operations will provide beneficial effects and will preserve the species, and that dam removal activities may be potentially lethal to all fish migrating and rearing in the lower Elwha River." However, the analysis of Alternative 4 describes the following (Subsection 4.4, Salmon and Steelhead):

> Alternative 4 would eliminate short- and long-term risks associated with genetic effects, competition and predation, facility effects, natural population status masking, incidental fishing effects, and disease transfer from the hatchery programs . . . Dam removal activities are leading to water quality conditions that are reducing the survival rate of all fish migrating, spawning, and rearing in the Elwha River below Glines Canyon Dam. Consequently, fish that spend less time in the Elwha River during adverse water quality conditions (i.e., fish in the hatcheries) are going to have a higher survival rate when compared to fish that are rearing and spawning in the Elwha River. The Elwha River steelhead population is an ESA-listed threatened population that is considered at high risk of extinction and has low abundance relative to population viability parameter target levels (Subsection 3.4.2, Puget Sound Steelhead). The natural-origin steelhead population averages only 141 fish (Subsection 3.4.2, Puget Sound Steelhead), and these numbers are expected to decline as a result of the adverse sediment impact period during and immediately following dam

> removal. Therefore, Alternative 4 would reduce short-term steelhead abundance relative to Alternative 1 (Table 13), directly increasing extinction risk. Any steelhead that survive dam removal activities would have access to high-quality habitat throughout the Elwha River Basin but, because abundance levels would be expected to be critically low (with possible extirpation of the population), the spatial structure, productivity, and genetic diversity status of the species would be markedly reduced relative to Alternative 1, which would also increase extinction risk.

None of these assumptions are controversial.

The commenter claims that the Supplemental Environmental Assessment should re-evaluate its previous assumptions because 108 fish redds have been observed in Indian Creek and Little River. NMFS disagrees. NMFS's Supplemental Environmental Assessment assumes the following, "Dam removal activities are leading to water quality conditions that are reducing the survival rate of all fish migrating, spawning, and rearing in the Elwha River below Glines Canyon Dam" (Subsection 4.4, Salmon and Steelhead). The observance of fish redds above the Glines Canyon Dam does not conflict with this assumption.

The commenter claims that the Draft Supplemental Environmental Assessment also "falsely assumes that genetic diversity will be improved through the introduction of hatchery fish." However, the Supplemental Environmental Assessment's analysis describes the following:

> As fish colonize new areas, they would be subject to a broader array of selective pressures, which would be expected to increase genetic diversity relative to baseline conditions (Subsection 4.4, Salmon and Steelhead).

This genetic effect would not be due to the "introduction of hatchery fish." These genetic effects would be due to the recolonization of new habitat.

Finally, the commenter claims that NMFS's analysis provides "carte blanche" for hatcheries to continue past 2019. To the contrary, as described in Subsection 1.2, Description of the Proposed Action, NMFS's determination would apply only for the duration of the preservation and recolonization phases of fish restoration in the Elwha River Basin, as defined in the HGMPs. These phases would encompass the periods during removal of the two Elwha River dams, and for a period following that removal as river habitat, and the productivity of salmon and steelhead populations, recover from dam removal effects.

26. See Response Number 16 regarding cumulative effects.

27. The commenter asserts that the Supplemental Environmental Assessment is deficient because it does not account for long-term foreseeable impacts, particularly genetic effects. NMFS disagrees. Genetic risks are a direct effect on salmoind populations and

are, therefore, appropriately discussed in Subsection 4.0, Environmental Consequences. Genetic effects are also discussed in even greater detail in the Biological Opinion for the HGMPs.

28. The commenter asserts that the Supplemental Environmental Assessment is deficient because it does not adequately account for climate change, but instead, relies on adaptive management to protect species. The inclusion of adaptive management and monitoring programs as a means to track and mitigate long-term effects from climate change is a reasonable approach given the unknown outcomes of future conditions on the landscape.

    See Response Number 4 and Response Number 13 with regard to monitoring and adaptive management.

    See response to Response Number 4 regarding the Elwha weir.

29. See Response Number 16 regarding cumulative impacts.

30. Documents noted.

Lower Elwha Klallam Tribe

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Via email to ElwhaHatcheries.wcr@noaa.gov

July 21, 2014

Ms. Allyson Purcell
National Marine Fisheries Services,
Sustainable Fisheries Division
1201 N.E. Lloyd Boulevard, Suite 1100
Portland, OR 97232

Re: Lower Elwha Klallam Tribe's Comments on the Draft Supplemental EA for Elwha River Hatcheries

Dear Ms. Purcell:

As Chairperson of the Lower Elwha Klallam Tribe ("the Tribe"), I submit these comments on behalf of the Tribe regarding NMFS's Draft Supplemental Environmental Assessment (DSEA) for the five Hatchery and Genetic Management Plans (HGMPs) for five species of salmon and steelhead in the Elwha River of Washington State in accordance with the notice at 79 Fed.Reg. 35318 (June 20, 2014). As you know, the Tribe is the proponent of four of the five HGMPs addressed in the notice (for ESA-listed steelhead and for non-listed fall chum, pink, and coho salmon); the State of Washington is the proponent of a fifth HGMP (for ESA-listed Puget Sound Chinook). The Tribe supports the findings of the DSEA, and in particular supports the adoption of Alternative 2, the Proposed Action. This alternative best meets the preservation and restoration goals of listed chinook and steelhead, as well as chum, coho, and pink salmon stocks in the Elwha River, while meeting the Endangered Species Act requirements of Limit 6 of the 4(d) Rule.

As you know, dam removal on the Elwha River is unprecedented in scope and represents new territory for resource managers. When NMFS released the original Environmental Assessment for the Elwha HGMPs, we had models and predictions regarding the impact that dam removal would have on the river, but the effects were just starting to be seen. As described on pages 27-28 of the DSEA, initial stages of dam

removal were expected to produce extreme adverse conditions for Elwha River fish stocks, due to large volumes of sediment that would be discharged from the former reservoir sites. Today, the agencies' predictions are bearing out—substantial volumes of sediment have been released, causing lethal or potentially lethal conditions for all life stages of fish in the river, with even more sediment to be released over the course of the next several years. Releases of hatchery smolts have to be timed as carefully as possible, and even then an unanticipated high water event can quickly mobilize enough sediment to have lethal consequences, as occurred with the loss of a substantial number of yearling Chinook released from the WDFW Elwha rearing channel in early April, 2013. It is important that the DSEA describe what the actual conditions have been and will continue to be in the Elwha River over the next several years, so that the public can appreciate the significance of the extirpation threat and the need to rear native fish stocks within the relatively safe hatchery environment, thereby providing much-needed protection during their early life stages. The Tribe commends NMFS for its efforts to make this information available and understandable to the public in the supplemental draft EA.

Lower Elwha hatchery programs have evolved significantly over the past 15 years, based on detailed consultation among tribal resource managers and scientists from a number of federal agencies, state agencies, and select scientific panels over the years has proven invaluable during the planning and implementation phases of recovery in the Elwha River following dam removal. In particular, guidance from the Hatchery Scientific Review Group (HSRG), has been critical.[1] As a result of this guidance, Elwha River resource managers distilled the various hatchery production and release strategies that had been under consideration to the single strategy employed today– the production of fully smolted fish to be released directly from the two hatcheries on the Elwha River. The HSRG's key guidance was that the greatest need during the initial years of fish recovery would be to get large numbers of adult fish back to the spawning grounds, and that this goal would be best achieved through the release of smolts ready to emigrate to salt water from the hatcheries that would return as adults ready to recolonize and spawn in newly opened areas of the Elwha River. HSRG 2012, *Review of the Elwha River Fish Restoration Plan and Accompanying HGMPs*, 150 pages plus appendices.

With the foregoing as background, the Tribe supports Alternative 2, the Proposed Action, as the only alternative that will: 1) prevent extirpation of native Elwha fish; 2) ensure sufficient genetic diversity; 3) ensure sufficient natural spawners to move between restoration phases in a timely manner; and 4) ensure that the Tribe's treaty rights can be

[1] Congress established the HSRG in 2000 because it recognized that hatcheries play a critical role in meeting conservation and harvest goals for Pacific Northwest salmon and steelhead and that existing hatchery practices needed a comprehensive review to ensure that stated goals could be achieved.

meaningfully exercised within a reasonable period of time. Achievement of the first three purposes is mandated by the Endangered Species Act (ESA), the Elwha River Ecosystem and Fisheries Restoration Act (the 1992 Elwha Act in which Congress mandated restoration of the fishery and established the authority for dam removal), and NMFS's own general mission. The Tribe does not support any of the other alternatives because none of these would achieve the four above purposes.

In the supplemental EA, NMFS considered a new alternative: Alternative 5, Reduced Hatchery Releases. This alternative should be rejected because it would reduce genetic diversity (and increase the risks associated with reduced diversity), significantly decrease the number of natural spawners, and increase the risk of extirpation during and immediately following dam removal. It would also entail substantial delay in restoring habitat and the ecosystem of the upper watershed in that gravel beds will not be cleaned as quickly due to fewer adult spawning fish and fewer associated marine nutrients reintroduced into the system. *See* DSEA at pages 77-79 for Chinook; at pages 85-86 for steelhead; and pages 107-08 for coho. Moreover, NMFS correctly recognizes that under Alternative 5, the hatchery programs would be required longer, and as a result, any risks associated with the programs in general could persist longer.

In addition, and of special importance to the Tribe, Alternative 5 simply does not fulfill the federal government's trust responsibility to the Tribe. The Lower Elwha Tribe has voluntarily closed any commercial or subsistence fishing on the Elwha River for 5 years in order to facilitate the early years of the restoration project. Because *all* Lower Elwha tribal members (not just the fishers or fishing families) are intimately connected to the Elwha River, this 5-year moratorium has seriously affected the economic, cultural, and spiritual well-being of the Tribe and its members. Nevertheless, our tribal leadership, and even our fishers themselves, concluded that this moratorium was paramount to the long-term recovery of the River and has willingly embraced it. But the reduced hatchery production reflected in Alternative 5 is not appropriate or acceptable in that it would not sufficiently recover the anadromous fishery resource in order to have any meaningful river fisheries in the foreseeable future.

As stated in the DSEA at Section 3.8, Cultural Resources, page 54, the Tribe's reliance on fishing and fish is fundamental to and pervasive in its culture, economy, ceremonies, daily life, and very identity. For these reasons, it is virtually impossible to overstate the importance of fisheries restoration to the Tribe or of the federal government's (including NMFS's) solemn obligation to aid in that restoration and protection of treaty rights, by among other things, selecting and implementing Alternative 2. Accordingly, the Tribe appreciates and generally concurs in the DSEA's various statements regarding treaty rights, cultural usages of the fisheries, the federal trust

responsibility to protect those rights and usages, and associated environmental justice considerations. *See* Sections 1.5.9 through 1.5.13, at pages 12-14, *and* Section 3.8 at page 54.

In addition, the Tribe generally concurs in the analysis and conclusions found at pages: 6 n.2 (the Tribe's modest proposed steelhead harvest plan, if approved, would not be sufficient to satisfy treaty rights); 57-58 (Clallam County and Lower Elwha tribal lands and usual and accustomed fishing locations are a legitimate focus of environmental justice concerns with respect to the alternatives under consideration); 86, lines 20-26 (because Alternative 5 will not result in 300 native Elwha steelhead spawners by 2018, it will indefinitely delay initiation of even a de minimis tribal ceremonial and subsistence steelhead fishery); and 120-134 (effects of each alternative on tribal socioeconomic conditions, cultural resources, and environmental justice considerations). Regarding environmental justice considerations discussed at both pages 57-58 as well as at various points in the impact analysis at pages 120-134, the DSEA should more clearly state that only Alternative 2 will prevent a denial of environmental justice to the Lower Elwha Reservation community.

In addition, we propose the inclusion of additional statements regarding treaty rights that are more specific to Lower Elwha, along the lines of the following:

> The 1855 Treaty of Point No Point, 12 Stat. 933, is the foundation for the Lower Elwha Tribe's rights in the Elwha River fishery. The Tribe is the modern-day successor to several traditional Klallam villages on the Elwha River (including the village of Elwha at the mouth of the River, where the Tribe's Reservation is located today) that signed the Treaty. In that treaty the Tribe reserved its right to harvest fish at all of its usual and accustomed grounds and stations, which have been determined by Judge Boldt to include the entire Elwha River and Strait of Juan de Fuca. *U.S. v Washington*, 626 F. Supp. 1405, 1443 (W.D. Wash. 1985), and 459 F. Supp. 1020, 1049, 1066 (W.D. Wash. 1978). By blocking most of the still-pristine habitat in the river and thereby decimating the fish runs, the two Elwha River dams largely thwarted fulfillment of that treaty promise for most of the twentieth century. Dam removal and the associated restoration project can now finally make the treaty promise meaningful at the beginning of the twenty-first century. In addition, not only do the two Elwha River hatcheries play a critical role in fisheries and ecosystem restoration, but tribal harvest access to hatchery production has also been specifically recognized by the federal court as an element of the treaty right. *U.S. v. Washington*, 759 F.2d 1353, 1360 (9th Cir. 1985)(en banc).

The Lower Elwha Klallam Tribe appreciates the opportunity to provide these comments. If you have any questions, please contact the Tribe's Natural Resources Director and Fisheries Manager Doug Morrill at 360-457-4012, ext. 7485 or at doug.morrill@elwha.org.

Sincerely,

Frances G. Charles

Frances G. Charles, Chairperson
Lower Elwha Klallam Tribal Council
Lower Elwha Klallam Tribe

cc: Robert Turner, NMFS
Tim Tynan, NMFS
Doug Morrill, Lower Elwha Natural Resources Director
Larry Ward, Lower Elwha Hatchery Manager
Steve Suagee, Lower Elwha General Counsel

Responses to Comments Submitted by the Lower Elwha Klallam Tribe

NMFS hereby notes all comments submitted by the Lower Elwha Klallam Tribe. Please see Subsection 3.3, Water Quality for a summary of actual water quality conditions in the Elwha River. Please see Subsection 4.10, Environmental Justice, for additional text clarifying that the Lower Elwha Klallam Tribe believes that Alternative 2 is the only alternative that will prevent denial of environmental justice to the Lower Elwha Reservation community. Please see Subsection, 1.5.10, Treaties of Point Elliot, Medicine Creek, and Point No Point, for additional information related to the Lower Elwha Klallam Tribe's specific treaty rights.