FINAL ENVIRONMENTAL IMPACT STATEMENT

Final Environmental Impact Statement (FEIS) to Analyze Impacts of NOAA's National Marine Fisheries Service Proposed Approval of the Continued Operation of 10 Hatchery Facilities for Trout, Salmon, and Steelhead Along the Oregon Coast, as Described in Oregon Department of Fish and Wildlife Hatchery and Genetic Management Plans Pursuant to Section 4(d) of the Endangered Species Act

Prepared by the
National Marine Fisheries Service, West Coast Region

October 2017

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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
1201 NE Lloyd Boulevard, Suite 1100
PORTLAND, OREGON 97232-1274

May 26, 2017

Dear Reviewer:

In accordance with provisions of the National Environmental Policy Act (NEPA), we enclose for your review the *Final Environmental Impact Statement to Analyze Impacts of NOAA's National Marine Fisheries Service Proposed Approval of the Continued Operation of 10 Hatchery Facilities for Trout, Salmon, and Steelhead along the Oregon Coast, as Described in Oregon Department of Fish and Wildlife Hatchery and Genetic Management Plans Pursuant to Section 4(d) of the Endangered Species Act*. This final Environmental Impact Statement (FEIS) assesses environmental impacts associated with the National Marine Fisheries Service's (NMFS) review and approval of hatchery and genetic management plans submitted by the Oregon Department of Fish and Wildlife for hatchery programs along the Oregon Coast.

Additional copies of the FEIS may be obtained by submitting a request by U.S. mail or e-mail (see contact information below). The document is also accessible electronically through the NMFS West Coast Region website at:
http://www.westcoast.fisheries.noaa.gov/hatcheries/orcoast/orcoast_feis.html

NOAA's NEPA implementing procedures do not require responses to comments received on the FEIS (NOAA Administrative Order 216-6). However, comments received by July 3, 2017, will be reviewed and considered for their impact on issuance of a record of decision. Please send comments to me at the contact mailing address or e-mail listed below. The record of decision will be made publicly available following final Agency action after July 3, 2017.

Contact Information:
Barry A. Thom, Regional Administrator
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Sincerely,

Barry A. Thom
Regional Administrator

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Cover Sheet
Final Environmental Impact Statement (FEIS)

Title of Environmental Review: Final Environmental Impact Statement to Analyze Impacts of NOAA's National Marine Fisheries Service Proposed Approval of the Continued Operation of 10 Hatchery Facilities for Trout, Salmon, and Steelhead along the Oregon Coast, as Described in Oregon Department of Fish and Wildlife Hatchery and Genetic Management Plans, Pursuant to Section 4(d) of the Endangered Species Act

Responsible Agency and Official: Barry Thom, Regional Administrator
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Location of Proposed Activities: Oregon Coast

Proposed Action: NMFS would review and evaluate the continued operation of 10 hatchery facilities and associated hatchery programs under Limit 5 of 4(d) rules for listed coho salmon.

Abstract: The Oregon Department of Fish and Wildlife submitted hatchery and genetic management plans for hatchery programs along the Oregon Coast. These plans describe each hatchery program in detail, including fish life stages produced and potential measures to minimize risks of negative impacts that may affect listed coho salmon. The analysis within the final environmental impact statement (FEIS) informs NMFS, hatchery operators, and the public about the current and anticipated direct, indirect, and cumulative environmental effects of operating the hatchery programs under the full range of alternatives.

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SUMMARY

Background

The Oregon Department of Fish and Wildlife (ODFW) has submitted Hatchery and Genetic Management Plans (HGMPs) for all hatchery programs along the Oregon Coast to the National Marine Fisheries Service (NMFS), pursuant to Limit 5 of the 4(d) Rule for salmon and steelhead promulgated under the Endangered Species Act (ESA) (65 FR 42422, July 10, 2000). Before a decision is made by NMFS on these HGMPs under the ESA, the National Environmental Policy Act (NEPA) requires Federal agencies to conduct environmental analyses of proposed actions to fully consider their effects on the human environment. NMFS's action of issuing ODFW's HGMPs under Limit 5 of the 4(d) Rule is a major Federal action subject to environmental review under NEPA. A DEIS was prepared and underwent public review and comment in 2016. This FEIS provides NMFS' responses to public comments received during that review.

Proposed Action

ODFW has submitted 42 HGMPs for the continued operation of hatchery programs associated with the 10 hatchery facilities (and associated ancillary facilities) for approval by NMFS under the ESA Limit 5 of the 4(d) Rule for ESA-listed coho salmon along the Oregon Coast. Under the Proposed Action, NMFS would make a determination that ODFW's submitted HGMPs meet the requirements of Limit 5 under the 4(d) Rule of the ESA. The HGMPs for Oregon Coast hatcheries would be approved under the ESA and continue to be implemented by ODFW.

Purpose and Need

The purpose and need of the Proposed Action is two-fold: (1) for NMFS to ensure the HGMPs and associated hatchery facilities comply with requirements of the ESA, and (2) for ODFW to provide hatchery-origin fish for recreational and commercial fisheries in Oregon coastal streams and near-shore marine waters.

Project Area and Analysis Area

The project area is the geographic area where the Proposed Action would take place. In this case, it is the geographical area for hatchery salmon, steelhead, and trout and associated hatchery facilities used to collect, propagate, rear, and release hatchery-origin fish in specified rivers, streams, and lakes in the Oregon Coast Region (inclusive of all watersheds that drain directly into the Pacific Ocean along the Oregon Coast, with the exception of the Columbia River). The hatchery facilities are Cole Rivers Hatchery, Indian Hatchery, Elk Hatchery, Bandon Hatchery, Rock Hatchery, Alsea Hatchery, Salmon Hatchery, Cedar Hatchery, Trask Hatchery, Nehalem Hatchery, and associated satellite facilities. Hatchery fish are released into the following waterbodies: Chetco, Rogue, Elk, Coquille, Coos Umpqua, Siuslaw, Alsea, Yaquina, Siletz, Salmon, Nestucca, Trask, Wilson, and Nehalem Rivers, Tenmile Creek, and various coastal lakes.

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 project area, since some of the effects of the alternatives may occur outside the project area. For example, some socioeconomic effects of the hatchery

programs are evaluated at the project area level (the streams and rivers where hatchery fish are released), but others are evaluated within a larger geographic scope (fisheries occurring in the ocean off the Oregon Coast where hatchery fish are also caught). The analysis area for each resource is described in Chapter 3, Affected Environment. Direct and indirect effects on various resources within the project and analysis areas are analyzed in Chapter 4, Environmental Consequences.

In addition, a larger analysis area was defined to consider actions with effects that are potentially cumulative with the Proposed Action and, thus, require evaluation of effects outside the Oregon Coast watersheds. The evaluation of this larger analysis area for cumulative effects is described in Chapter 5, Cumulative Effects.

Relationship between the ESA and NEPA

The relationship between the ESA and NEPA is complex, in part because both laws address environmental values related to the impacts of a Proposed Action. However, each law has a distinct purpose, and the scope of review and standards of review under each statute are different.

The purpose of an EIS under NEPA is to promote disclosure, analysis, and consideration of the broad range of environmental issues surrounding a proposed major Federal action by considering a full range of reasonable alternatives, including a No-action Alternative. Public involvement promotes this purpose.

The purpose of the ESA is to conserve listed species and the ecosystems upon which they depend. Determinations about whether hatchery programs along the Oregon Coast meet ESA requirements are made under section 4(d) or section 7 of the ESA. Each of these ESA sections has its own substantive requirements, and the documents that reflect the analyses and decisions are different than those related to a NEPA analysis.

It is not the purpose of this EIS to suggest to the reader any conclusions relative to the ESA analysis for this action.

Alternatives Including the Proposed Action

This FEIS analyzes five alternatives in detail:

Alternative 1 (No-action)

Under this alternative, NMFS would not approve the HGMPs under 4(d) Rule, limit 5, and the hatchery programs would not be exempted from ESA section 9 take prohibitions. For purposes of this analysis, NMFS has defined the No-action Alternative as the choice by ODFW to continue to operate the existing hatchery programs without ESA authorization. All of the activities associated with the proposed salmon hatchery programs would continue: hatchery salmon and steelhead would be released, broodstock would be collected at proposed locations, the hatchery facilities would use water for operation, and the hatcheries would discharge hatchery water effluent. NMFS's No-action Alternative represents NMFS's best estimate of what would happen in the absence of the proposed Federal action.

Alternative 2 (Proposed Action/Preferred Alternative)

Under this alternative, NMFS would approve the existing hatchery programs (described in the submitted HGMPs) by issuing an approval letter to ODFW under Limit 5 of the 4(d) Rule. All of the hatchery reforms that have been enacted since the ESA listing of coho salmon along the Oregon Coast would continue to be implemented. ODFW has recently completed their Coastal Multi-Species Conservation

and Management Plan for the Oregon Coast Region. This entailed an elaborate review of the management of the hatchery programs considering a range of conservation and societal issues and included substantial stakeholder involvement. The current hatchery programs reflect the decisions under this management plan. The Best Management Practices (BMPs) used by ODFW for hatchery management would also continue as described in the submitted HGMPs.

Alternative 3 (Terminate Hatchery Programs on the Oregon Coast)

Under this alternative, NMFS would determine that the hatchery programs in the Oregon Coast Region do not meet the criteria under Limit 5 of the 4(d) rule, and, therefore, would not receive ESA approval. Because the hatchery plans would not be approved, the hatchery actions proposed by ODFW would not be exempt from section 9 take prohibitions. With this lack of approval, the hatchery actions proposed by ODFW would not be implemented, and the programs would be terminated. All of the activities associated with the hatchery programs would be terminated: no hatchery salmon would be released, no broodstock would be collected at trapping locations, trapping facilities would be removed, no returning hatchery fish would be removed from various locations, the hatchery facilities would not use water for operation, and the hatcheries would not discharge hatchery water effluent.

This alternative would not be expected to meet the purpose and need for action because termination of the proposed hatchery actions would not produce juvenile hatchery fish of each species that would return as adult fish to meet commercial and recreational fishery needs. However, NMFS supports its analysis to assist with a full understanding of potential effects on the human environment under various management scenarios.

Alternative 4 (Reduced Hatchery Production)

Under this alternative, ODFW would reduce the number of fish released from each of the proposed hatchery programs by 50 percent. All of the hatchery facilities would rear 50 percent less hatchery fish. This alternative represents a mid-point between the Proposed Action (Alternative 2) and Alternative 3 (Terminate Hatchery Programs on the Oregon Coast). Revised HGMPs would be submitted by ODFW reflecting these 50 percent reduced production levels, and NMFS would make a determination that the revised HGMPs meet the requirements of the 4(d) Rule.

NMFS's 4(d) regulations do not provide NMFS with the authority to order changes of this magnitude as a condition of approval of the HGMPs. NMFS's 4(d) regulations require NMFS to make a determination that the HGMPs, as submitted by the operator, 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 hatchery management scenarios.

Alternative 5 (Terminate Highest Risk Hatchery Programs and Implement Hatchery Program Reforms)

This is a new alternative included in the FEIS in response to public comments. This alternative specifically evaluates terminating the hatchery programs that are highest risk to natural-origin salmon and steelhead populations according to ODFW's Coastal Multi-Species Conservation and Management Plan (ODFW 2014a). These particular hatchery programs have hatchery fish spawning in the wild in excess of specified goals. In addition, this alternative also evaluates implementation of the hatchery reforms identified in section 1.16 of the HGMPs for the remaining hatchery programs. In total, this alternative

provides another scenario of effects within the range of Alternative 1 (No-action) and Alternative 3 (Terminate Hatchery Programs on the Oregon Coast).

Affected Environment

Along the Oregon Coast, seven resources are described in the affected environment of the Oregon Coast by the implementation of the four alternatives:

- Water quantity
- Water quality
- Salmon and Steelhead and Their Habitats
- Other Fish and Their Habitats
- Wildlife
- Socioeconomics
- Environmental justice

No other resources were identified during internal scoping that would potentially be impacted by the Proposed Action or alternatives. Current conditions include effects of the past operation of Oregon Coast hatchery programs.

Environmental Consequences

This FEIS is a comprehensive evaluation of all hatchery programs along the entire Oregon Coast. The genetic, ecological, and social effects of hatchery fish are evaluated at multiple local and regional scales for the Oregon Coast. The four alternatives evaluate a wide range of impacts associated with the identified resources for the four alternatives. The relative magnitude and direction 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 or greatly beneficial.

Table S-1 below provides a summary of the predicted resource effects under each of the four alternatives. The summary reflects the detailed resource discussions in Chapter 4, Environmental Consequences.

Table S-1. Summary of environmental consequences for FEIS alternatives for each resource.

Resource	Alternative 1 (No-action)	Alternative 2 (Proposed Action/Preferred Alternative)	Alternative 3 (Terminate Hatchery Programs on the Oregon Coast)	Alternative 4 (Reduced Hatchery Production)	Alternative 5 (Terminate Highest Risk Hatchery Programs and Implement Hatchery Reforms)
Water Quantity	Low to medium impacts at the hatchery facilities from water diversion and effluent discharge in affected reaches. Low overall on a watershed scale. Most populations no effect because no hatchery facilities exist in population area.	Overall same as Alternative 1.	Low to medium benefits at the hatchery facilities from water diversion and effluent discharge in affected reaches. Low overall on a watershed scale. Most populations no effect.	Low impacts at the hatchery facilities from water diversion and effluent discharge. Expected impact is 50 percent less compared to the No-action Alternative.	Hatchery facility impacts eliminated from North Fork Nehalem River due to closure of hatchery. Low impacts at the other facilities from water diversion and effluent discharge.
Water Quality	Negligible impacts from the hatchery facilities downstream. Most populations no effect because no facilities exist in population area.	Overall, same as Alternative 1.	Negligible benefits from the hatchery facilities downstream. Most populations no effect.	Negligible impacts from the hatchery facilities downstream compared to the No-action alternative.	Improved water quality in North Fork Nehalem River due to closure of hatchery and associated elimination of hatchery discharge effluent. Negligible impacts from the other hatchery facilities compared to No-action alternative.

Resource	Alternative 1 (No-action)	Alternative 2 (Proposed Action/Preferred Alternative)	Alternative 3 (Terminate Hatchery Programs on the Oregon Coast)	Alternative 4 (Reduced Hatchery Production)	Alternative 5 (Terminate Highest Risk Hatchery Programs and Implement Hatchery Reforms)
Salmon and Steelhead and Their Habitats	Depending upon the specific population and species, low to medium impacts related to hatchery genetic and ecological risks. However, many salmon and steelhead populations not affected at all by hatchery programs. Greatest genetic impacts occur for winter steelhead. Greatest ecological impacts occur in the mainstem rivers and estuaries where hatchery fish are released and the greatest overlap with natural-origin salmon and steelhead. Benefits to carcass nutrient enhancement and recreational and commercial fisheries in ocean and freshwater.	Overall, same as Alternative 1.	Depending upon the specific population and species, benefits range from low to medium related to the elimination of hatchery genetic and ecological effects. Low impact from elimination on hatchery nutrient enhancement. Possibility of increased harvest of natural-origin salmon and steelhead in fisheries from absence of hatchery fish.	Depending upon the specific population and species, impacts range from negligible to low related to hatchery genetic and ecological risks. Reduced benefits to hatchery carcass nutrient enhancement. Low impacts on recreational and commercial fisheries in the ocean and freshwater.	Genetic and ecological impacts of the hatchery programs range from negligible to low due to the termination of the highest risk programs on natural-origin salmon and steelhead populations. Reduced impacts from operation of hatchery facilities and programs compared to No-action alternative. Reduced benefits to hatchery carcass nutrient enhancement in some populations. Low impacts on recreational and commercial fisheries in the ocean and freshwater.

Resource	Alternative 1 (No-action)	Alternative 2 (Proposed Action/Preferred Alternative)	Alternative 3 (Terminate Hatchery Programs on the Oregon Coast)	Alternative 4 (Reduced Hatchery Production)	Alternative 5 (Terminate Highest Risk Hatchery Programs and Implement Hatchery Reforms)
Other Fish and Their Habitats	Mix of risks and benefits from the hatchery programs. Salmon, steelhead, and trout can compete and prey upon these fish species. Hatchery carcasses provide valuable ecosystem nutrients. Overall low impact.	Overall, same as Alternative 1.	Mix of risks and benefits from termination of the hatchery programs. Low impact from loss of hatchery nutrient enhancement. Predation and competition by hatchery fish on native fishes would decrease. Hatchery fish as a prey source will be eliminated for many species.	Mix of risks and benefits from the hatchery programs depending upon the species. Reduced levels of competition and predation expected between natural and hatchery fish compared to the No-action alternative. Reduced level of nutrient enhancement from hatchery fish.	Mix of risks and benefits from the hatchery programs depending upon the species. Reduced levels of competition and predation expected between natural and hatchery fish compared to the No-action alternative. Reduced level of nutrient enhancement from hatchery fish.
Wildlife	Mix of risks and benefits from the hatchery programs. Salmon, steelhead, and trout can compete and prey upon these fish species. Hatchery carcasses provide valuable ecosystem nutrients. Overall low impact.	Overall, same as Alternative 1.	Mix of risks and benefits from the termination of the hatchery programs. Hatchery fish as a prey source for many species would be eliminated. Hatchery nutrient enhancement would be eliminated.	Mix of risks and benefits from the reduced hatchery production. Hatchery fish as a prey source for certain species will be reduced compared to the No-action Alternative.	Mix of risks and benefits from the reduced hatchery production. Hatchery fish as a prey source for certain species will be reduced compared to the No-action Alternative.

Resource	Alternative 1 (No-action)	Alternative 2 (Proposed Action/Preferred Alternative)	Alternative 3 (Terminate Hatchery Programs on the Oregon Coast)	Alternative 4 (Reduced Hatchery Production)	Alternative 5 (Terminate Highest Risk Hatchery Programs and Implement Hatchery Reforms)
Socio-economics	Depending upon the specific fishery, low to medium economic benefits of the hatchery programs and facilities from employment, goods and services, fisheries, and tourism. The hatchery programs that have the highest harvest rates on hatchery fish typically exhibit the greatest economic contributions.	Overall, same as Alternative 1.	Depending upon the specific fishery, low to medium impact on socioeconomics from termination of the hatchery programs compared to the No-action Alternative.	Depending upon the specific fishery, a 50 percent decrease in economic benefits compared to the No-action Alternative.	Depending upon the specific fishery, a 50 percent decrease in economic benefits compared to the No-action Alternative.
Environmental Justice	Undetectable to negligible impacts on low income and minority groups in the local communities.	Overall, same as Alternative 1.	Undetectable to negligible impacts on low income and minority groups in the local communities compared to the No-action Alternative.	Undetectable to negligible impacts on low income and minority groups in the local communities compared to the No-action Alternative.	Undetectable to negligible impacts on low income and minority groups in the local communities compared to the No-action Alternative.

Summary of Major Changes Made in Response to Public Comments on the Draft EIS

Below is a summary of the major changes made to the draft EIS. Editorial revisions were also made, and these are not listed below. The location of text modification is denoted by chapter.

Summary:

1. An additional alternative is included in FEIS. Added summary of this Alternative 5 in Table S-1.

Chapter 1:

1. Edits made to update chapter on status of this document from DEIS to FEIS. Updates on coho salmon recovery plans.

Chapter 2:

1. Included description of the additional alternative new to the FEIS (Alternative 5: Terminate Highest Risk Hatchery Programs and Implement Hatchery Program Reforms). Alternative 5 was included in the FEIS in response to public review and comment to eliminate the highest risk hatchery programs. The specific programs terminated in this alternative and the hatchery program reform actions are also specifically described.
2. Edits made to text of other sections in response to including additional Alternative 5 in the FEIS.

Chapter 3:

1. Included description and summary of the pHOS goals for each hatchery program (see Figure 6). This helps inform the hatchery effects analysis in Chapter 4.
2. Included recent estimates of pNOB, pHOS, and PNI for each hatchery program (see Table 7). This helps inform the hatchery effects analysis in Chapter 4.
3. Included new metrics on the density of hatchery fish in freshwater and estuarine habitats of each population area along the Oregon Coast where hatchery fish are released (see Table 8). This information provides the basis for the analysis of ecological effects of hatchery fish on the environment in Chapter 4.
4. Edits to appropriate sections for salmon and steelhead regarding the new information included above.

Chapter 4:

1. Included analysis of effects of new Alternative 5: Terminate Highest Risk Hatchery Programs and Implement Hatchery Program Reforms throughout entire chapter.
2. Included information on the use of water for the hatchery facilities included in Alternative 5 (see table 13).
3. Included new information on the ecological effects of hatchery fish in freshwater and estuarine habitats in response to new metrics included in Chapter 3. This information provides the basis

for the effect levels (low, medium, high) included in Chapter 4.

4. Included assessment of effects of pHOS, pNOB, and PNI for salmon and steelhead populations in response to new information included in Chapter 3. This analysis helps inform the genetic effects of hatchery fish on natural-origin salmon and steelhead populations.

Chapter 5:

1. No substantive changes.

Appendices:

1. Appendix A - no substantive changes.
2. Included Appendix B- NMFS' responses to public comments on the DEIS.

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ACRONYMS AND ABBREVIATIONS

BMP	Best Management Practice
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CFS	Cubic feet per second
DPS	Distinct population segment
EA	Environmental assessment
EFH	Essential Fish Habitat
EIS	Environmental impact statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FONSI	Finding of No Significant Impact
FTE	Full-time equivalent
HGMP	Hatchery and genetic management plan
HSRG	Hatchery Scientific Review Group
IHOT	Integrated Hatchery Operations Team
MMPA	Marine Mammal Protection Act
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NEPA	National Environmental Policy Act
NFCP	Native Fish Conservation Policy
NMFS	National Marine Fisheries Service (also called NOAA Fisheries Service)
NPDES	National Pollutant Discharge Elimination System
ODFW	Oregon Department of Fish and Wildlife
pHOS	Proportion of hatchery-origin spawners on spawning grounds
PNI	Proportionate Natural Influence (pNOB/(pNOB+pHOS))
pNOB	Proportion of natural-origin fish in the broodstock
RM	River mile
ROD	Record of Decision
SONCC	Southern Oregon/Northern California Coast
TRT	Technical Recovery Team
USC	U.S. Code
USFWS	U.S. Fish and Wildlife Service

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GLOSSARY OF KEY TERMS

Abundance: Generally, the number of fish in a defined area or unit. It is also one of four parameters used to describe the viability of natural-origin fish populations (McElhany et al. 2000).

Adaptive management: A deliberate process of using research, monitoring, and scientific evaluation in making decisions in the face of uncertainty.

Acclimation pond: A concrete or earthen pond or a temporary structure used for rearing and imprinting juvenile fish in the water of a particular stream before their release into that stream.

Adipose fin: A small fleshy fin with no rays, located between the dorsal and caudal fins of salmon and steelhead. The adipose fin is often "clipped" on hatchery-origin fish so they can be differentiated from natural-origin fish.

Anadromous: A term used to describe fish that hatch and rear in fresh water, migrate to the ocean to grow and mature, and return to freshwater to spawn.

Analysis area: Within this Environmental Impact Statement (EIS), the analysis area is the geographic extent that is being evaluated for each resource. For some resources (e.g., socioeconomics and environmental justice), the analysis area is larger than the project area. See also **Project area**.

Best management practice (BMP): A policy, practice, procedure, or structure implemented to mitigate adverse environmental effects.

Broodstock: A group of sexually mature individuals of a species that is used for breeding purposes as the source for a subsequent generation.

Co-managers: Oregon Department of Fish and Wildlife. U.S. Corps of Engineers for the Rogue River hatchery programs. These agencies responsible for managing hatchery programs along the Oregon Coast.

Commercial harvest: The activity of catching fish for commercial profit.

Conservation: Used generally in the EIS as the act or instance of conserving or keeping fish resources from change, loss, or injury, and leading to their protection and preservation. This contrasts with the definition under the United States Endangered Species Act (ESA), which refers to use and the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to the ESA are no longer necessary.

Critical habitat: A specific term and designation within the ESA, referring to habitat area essential to the conservation of a listed species, though the area need not actually be occupied by the species at the time it is designated.

Dewatering: Typically, the immediate downstream habitat effects associated with a water withdrawal action that diverts the entire flow of a stream or river to another location

Distinct Population Segment (DPS): Under the ESA, the term "species" includes any subspecies of fish or wildlife or plants, and any "Distinct Population Segment" of any species or vertebrate fish or wildlife that interbreeds when mature. The ESA thus considers a DPS of vertebrates to be a "species." The ESA does not however establish how distinctness should be determined. Under NMFS policy for Pacific salmon, a population or group of populations will be considered a DPS if it represents an Evolutionarily Significant Unit (ESU) of the biological species. In contrast to salmon, NMFS lists steelhead runs under the joint NMFS-U.S. Fish and Wildlife Service (USFWS) Policy for recognizing DPSs (DPS Policy: 61 Fed. Reg. 4722, February 7, 1996). This policy adopts criteria similar to those in the ESU policy, but applies to a broader range of animals to include all vertebrates.

Diversity: Variation at the level of individual genes (polymorphism); provides a mechanism for populations to adapt to their ever-changing environment. It is also one of the four parameters used to describe the viability of natural-origin fish populations (McElhany et al. 2000).
Domestication: See **Hatchery-influenced selection**.
Emigration: The downstream migration of salmon and steelhead toward the ocean.
Endangered species: As defined in the ESA, any species that is in danger of extinction throughout all or a significant portion of its range.
Endangered Species Act (ESA): A United States law that provides for the conservation of endangered and threatened species of fish, wildlife, and plants.
Environmental justice: The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.
Escapement: Adult salmon and steelhead that survive fisheries and natural mortality, and return to spawn.
Estuary: The area where fresh water of a river meets and mixes with the salt water of the ocean.
Evolutionarily Significant Unit (ESU): A concept NMFS uses to identify Distinct Population Segments of Pacific salmon (but not steelhead) under the ESA. An ESU is a population or group of populations of Pacific salmon that 1) is substantially reproductively isolated from other populations, and 2) contributes substantially to the evolutionary legacy of the biological species. See also **Distinct Population Segment** (pertaining to steelhead).
Federal Register: The United States government's daily publication of Federal agency regulations and documents, including executive orders and documents that must be published per acts of Congress.
Fingerling: A juvenile fish.
Fishery: Harvest by a specific gear type in a specific geographical area during a specific period of time.
Fitness: As used in this EIS, the propensity of a group of fish (e.g., populations) to survive and reproduce.
Forage fish: Small fish that breed prolifically and serve as food for predatory fish.
Fry: Juvenile salmon and steelhead that are usually less than one year old and have absorbed their egg sac.
Habitat: The physical, biological, and chemical characteristics of a specific unit of the environment occupied by a specific plant or animal; the place where an organism naturally lives.
Hatchery and genetic management plan (HGMP): Technical documents that describe the composition and operation of individual hatchery programs. Under Limit 5 of the 4(d) rule, NMFS uses information in HGMPs to evaluate impacts on salmon and steelhead listed under the ESA.
Hatchery facility: A facility (e.g., hatchery, rearing pond, net pen) that supports one or more hatchery programs.
Hatchery-influenced selection: The process whereby genetic characteristics of hatchery populations become different from their source populations as a result of selection in hatchery environments (also referred to as domestication).
Hatchery operator: A Federal agency, state agency, or Native American tribe that operates a hatchery program.
Hatchery-origin fish: A fish that originated from a hatchery facility.

Hatchery-origin spawner: A hatchery-origin fish that spawns naturally.
Hatchery program: A program that artificially propagates fish. Most hatchery programs for salmon and steelhead spawn adults in captivity, raise the resulting progeny for a few months or longer, and then release the fish into the natural environment where they will mature.
Incidental: Unintentional, but not unexpected.
Incidental fishing effects: Fish, marine birds, or mammals unintentionally captured during fisheries using any of a variety of gear types.
Integrated hatchery program: A hatchery program that intends for the natural environment to drive the adaptation and fitness of a composite population of fish that spawns both in a hatchery and in the natural environment. Differences between hatchery-origin and natural-origin fish are minimized, and hatchery-origin fish are integrated with the local populations included in an ESU or DPS.
Isolated hatchery program: A hatchery program that intends for the hatchery-origin population to be reproductively segregated from the natural-origin population. These programs produce fish that are different from local populations. They do not contribute to conservation or recovery of populations included in an ESU or DPS.
Limit 5: Under section 4(d) of the ESA (see **Section 4(d) Rule**), a limit on "take" prohibitions that applies to Hatchery and Genetics Management Plans developed by a state and/or federal agency.
Limiting factor: A physical, chemical, or biological feature that impedes species and their independent populations from reaching a viable status.
National Environmental Policy Act (NEPA): A United States environmental law that established national policy promoting the enhancement of the environment and established the President's Council on Environmental Quality (CEQ).
National Marine Fisheries Service (NMFS): A United States agency within the National Oceanic and Atmospheric Administration and under the Department of Commerce charged with the stewardship of living marine resources through science-based conservation and management, and the promotion of healthy ecosystems.
National Pollutant Discharge Elimination System (NPDES): A provision of the Clean Water Act that prohibits discharge of pollutants into waters of the United States unless a special permit is issued by the Environmental Protection Agency, a state, or, where delegated, a tribal government on an Indian reservation.
Native fish: Fish that are endemic to or limited to a specific region.
Natural-origin: A term used to describe fish that are offspring of parents that spawned in the natural environment rather than the hatchery environment, unless specifically explained otherwise in the text. "Naturally spawning" and similar terms refer to fish spawning in the natural environment.
Oregon Coast: the entire geographic area from which streams and rivers drain directly into the Pacific Ocean between the California/Oregon border north to the Washington/Oregon border.
Oregon Coast Region: See Oregon Coast.
Pathogen: An infectious microorganism that can cause disease (e.g., virus, bacteria, fungus) in its host.
Population: A group of fish of the same species that spawns in a particular locality at a particular season and does not interbreed substantially with fish from any other group.

Preferred alternative: The alternative selected or developed from an evaluation of alternatives. Under NEPA, the preferred alternative is the alternative an agency believes would fulfill its statutory mission and responsibilities, giving consideration to economic, environmental, technical, and other factors.
Productivity: The rate at which a population is able to produce reproductive offspring. It is one of the four parameters used to describe the viability of natural-origin fish populations (McElhany et al. 2000).
Project area: Geographic area where the Proposed Action will take place. See also **Proposed Action**.
Proportion of hatchery-origin spawners (pHOS): The proportion of naturally spawning salmon or steelhead that are hatchery-origin fish.
Proposed Action: NMFS's review and approval under Limit 5 of the 4(d) rules of the hatchery and genetic management plans (and operation of the hatchery facilities) submitted by the Oregon Department of Fish and Wildlife for the Oregon Coast Region.
Record of Decision (ROD): The formal NEPA decision document that is recorded for the public. It is announced in a Notice of Availability in the Federal Register.
Recovery: Defined in the ESA as the process by which the decline of an endangered or threatened species is stopped or reversed, or threats to its survival neutralized so that its long-term survival in the wild can be ensured, and it can be removed from the list of threatened and endangered species.
Recovery plan: Under the ESA, a formal plan from NMFS (for listed salmon and steelhead) outlining the goals and objectives, management actions, likely costs, and estimated timeline to recover the listed species.
Recreational harvest: The activity of catching fish for non-commercial reasons (e.g., sport or recreation).
Redd: The spawning site or "nest" in stream and river gravels in which salmon and steelhead lay their eggs.
Residuals: Hatchery-origin fish that out-migrate slowly, if at all, after they are released. Residualism occurs when such fish residualize rather than out-migrate as most of their counterparts do.
Run: The migration of salmon or steelhead from the ocean to fresh water to spawn. Defined by the season they return as adults to the mouths of their home rivers.
Run size: The number of adult salmon or steelhead (i.e., harvest plus escapement) returning to their natal areas.
Salmonid: A fish of the taxonomic family Salmonidae, which includes salmon, steelhead, and trout.
Scoping: In NEPA, an early and open process for determining the extent and variety of issues to be addressed and for identifying the significant issues related to a proposed action (40 CFR 1501.7).
Section 4(d) Rule: A special regulation developed by NMFS under authority of section 4(d) of the ESA, modifying the normal protective regulations for a particular threatened species when it is determined that such a rule is necessary and advisable to provide for the conservation of that species.
Section 7 consultation: Federal agency consultation with NMFS or USFWS (dependent on agency jurisdiction) on any actions that may affect listed species, as required under section 7 of the ESA.
Section 10 permit: A permit for direct take of listed species for scientific purposes or to enhance the propagation or survival of listed species, or for incidental take of listed species during otherwise lawful activities. Issued by NMFS or USFWS (dependent on agency jurisdiction) as authorized under section 10(a)(1) of the ESA.

Smolts: Juvenile salmon and steelhead that have left their natal streams, are out-migrating downstream, and are physiologically adapting to live in salt water.

Spatial structure: The spatial structure of a population refers both to the spatial distributions of individuals in the population and the processes that generate that distribution. It is one of the four parameters used to describe the viability of natural-origin fish populations (McElhany et al. 2000).

Stock: A group of fish of the same species that spawns in a particular lake or stream (or portion thereof) at a particular season and which, to a substantial degree, does not interbreed with fish from any other group spawning in a different place or in the same place in a different season.

Straying (of hatchery-origin fish): A term used to describe when hatchery-origin fish return to and/or spawn in areas where they are not intended to return/spawn.

Supplementation: Release of fish into the natural environment to increase the abundance of naturally reproducing fish populations.

Take: Under the ESA, the term "take" means to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." Take for hatchery activities includes, for example, the collection of listed fish (adults and juveniles) for hatchery broodstock, the collection of listed hatchery-origin fish to prevent them from spawning naturally, and the collection of listed fish (juvenile and adult fish) for scientific purposes.

Threat: A human action or natural event that causes or contributes to limiting factors; threats may be caused by past, present, or future actions or events.

Threatened species: As defined by section 4 of the ESA, any species that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

Tributary: A stream or river that flows into a larger stream or river.

Viability: As used in this EIS, a measure of the status of listed salmon and steelhead that uses four criteria: abundance, productivity, spatial distribution, and diversity.

Viable salmonid population (VSP): An independent population of salmon or steelhead that has a negligible risk of extinction over a 100-year timeframe (McElhany et al. 2000).

Water intake screen: A screen used to prevent entrainment of salmonids into a water diversion or intake. See also **Diversion screen**.

Watershed: An area of land where all of the water that is under it or drains off of it goes into the same place, e.g. Rogue River watershed or Umpqua River watershed.

Weir: An adjustable dam placed across a river to regulate the flow of water downstream; a fence placed across a river to catch fish.

Yearling: Juvenile salmon or steelhead that has reared at least one year in the hatchery.

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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, steelhead, green sturgeon, and eulachon. In the project area for this proposed action (see Subsection 1.4 Project Area), two species of coho salmon are listed as threatened under the ESA (see Subsection 3.4)(70 FR 37160, June 28, 2005; 76 FR 35755, June 20, 2011). Green sturgeon and eulachon are also listed as threatened and may occur in the estuaries and some freshwater habitats along the Oregon Coast (76 FR 65324, October 20, 2011; 74 FR 52300, October 9, 2009). Because the Oregon Department of Fish and Wildlife (ODFW) is proposing to operate hatchery programs in areas containing ESA-listed species (see Subsection 3.4, Salmon and Steelhead and Their Habitats), NMFS is reviewing this action.

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 5 of the 4(d) Rule that section 9 take prohibitions would not apply to activities carried out under an HGMP when NMFS approves the HGMP, after having determined that the HGMP meets the requirements of limit 5 (50 CFR 223.203(b)(5)).

On November 14, 2012, NMFS determined the HGMPs submitted by the ODFW for the Oregon Coast Region (from California to Washington borders) were sufficient to proceed with evaluation under limit 5 of the 4(d) Rule. The ODFW provided updated plans after their completion of the Coastal Multi-Species Conservation and Management Plan in June 2014. There were some hatchery program changes in these updated plans. All of the 10 hatchery facilities within the Oregon Coast Region are still being used in the updated plans. The updates were related to production numbers of hatchery salmon and steelhead in the various populations along the Oregon Coast. NMFS has a responsibility to consider, through National Environmental Policy Act (NEPA) analysis, how its pending actions may affect the natural and physical environment and the relationship of people with that environment. The NEPA analysis provides an opportunity to consider, for example, how the action may affect conservation of non-listed species and

socioeconomic objectives that seek to balance conservation with wise use of affected resources and other legal and policy mandates.

NMFS will evaluated the HGMPs associated with the 10 hatchery facilities collectively here in one final environmental impact statement (FEIS) because the facilities all occur along the Oregon Coast, all of the HGMPs propagate fish in the same manner, and all of the HGMPs are implemented by the ODFW.

1.2. Description of the Proposed Action

ODFW has submitted HGMPs for all hatchery programs associated with the 10 hatchery facilities (and satellite facilities) for approval under the ESA limit 5 of the 4(d) Rule for ESA-listed coho salmon along the Oregon Coast. Table 1 of Appendix A lists of the HGMPs associated with the hatchery facilities within the Oregon Coast Region. All of the hatchery facilities are currently in operation. No new facilities or changes to current management would occur in the recently submitted HGMPs. The existing hatchery facilities are considered part of current conditions existing in the environment at this point in time because the hatchery facilities have been operating for many decades (Table 1). Under the Proposed Action, NMFS would issue a letter to ODFW approving the implementation of the submitted HGMPs under limit 5 of the 4(d) Rule. NMFS approval of the HGMPs would authorize the following programs and activities at the hatchery facilities along the Oregon Coast:

- Collection of spring and fall Chinook salmon, coho salmon, and summer and winter steelhead for broodstock at the specific hatchery collection facilities
- Holding of adult broodstock fish at the specific hatchery facilities if appropriate
- Spawning, incubation, and juvenile rearing at the specific 10 hatchery facilities
- Release of approximately seven million juvenile hatchery fish from the various hatchery release facilities along the Oregon Coast
- Research, monitoring, and evaluation activities associated with the hatchery programs

All of the HGMPs are funded, operated, and managed by ODFW for fishery enhancement. Funding is provided almost entirely by the state of Oregon (no Federal funding). The one exception is in the Rogue River, where four programs are partially funded by the U.S. Army Corps of Engineers to mitigate for the impacts of two Federal dams projects in the Rogue River Basin (Lost Creek and Applegate Dams).

All recreational and commercial fisheries that may harvest hatchery fish in the ocean and freshwater have current ESA authorizations (section 7 consultations, 4(d) limit 4 authorizations) in effect (NMFS 1999; NMFS 2003; NMFS 2009).

Table 1. Operations of the 10 hatchery facilities (and associated HGMP activities) along the Oregon Coast.

Activity	Facility	Location	Does Facility Exist under Current Conditions?	Is Facility Operated under Current Conditions?
Broodstock collection, spawning, incubation, and rearing	Cole Rivers Hatchery	RM 157 Rogue River	Yes	Yes
	Indian Hatchery	RM 1 Rogue River	Yes	Yes
	Elk Hatchery	RM 14 Elk River	Yes	Yes
	Bandon Hatchery	RM 1 Ferry Creek, Coquille	Yes	Yes
	Rock Hatchery	RM 36 NF Umpqua River	Yes	Yes
	Alsea Hatchery	RM 48.5 NF Alsea River	Yes	Yes
	Salmon Hatchery	RM 5.1 Salmon River	Yes	Yes
	Cedar Hatchery	RM 2.25 Three Rivers, Nestucca	Yes	Yes
	Trask Hatchery	RM 10 Trask River	Yes	Yes
	Nehalem Hatchery	RM 10.3 NF Nehalem River	Yes	Yes
	Other opportunistic trapping sites to fulfill broodstock needs	Chetco, Rogue, Coos, Tenmile, Umpqua, Siuslaw, Siletz	Yes	Yes
Juvenile release	Cole Rivers Hatchery	RM 157 Rogue River	Yes	Yes
	Indian Hatchery	RM 1 Rogue River	Yes	Yes
	Elk Hatchery	RM 14 Elk River	Yes	Yes
	Bandon Hatchery	RM 1 Ferry Creek, Coquille	Yes	Yes
	Rock Hatchery	RM 36 NF Umpqua River	Yes	Yes
	Alsea Hatchery	RM 48.5 NF Alsea River	Yes	Yes
	Salmon Hatchery	RM 5.1 Salmon River	Yes	Yes

Activity	Facility	Location	Does Facility Exist under Current Conditions?	Is Facility Operated under Current Conditions?
	Cedar Hatchery	RM 2.25 Three Rivers, Nestucca	Yes	Yes
	Trask Hatchery	RM 10 Trask River	Yes	Yes
	Nehalem Hatchery	RM 10.3 NF Nehalem River	Yes	Yes
	Other direct release and short term acclimation locations where no hatchery facility exists	Chetco, Rogue, Coos, Tenmile, Umpqua, Siuslaw, Siletz	Yes	Yes
Research, Monitoring, and Evaluation	Oregon Hatchery Research Center	RM 3 Fall Creek, Alsea	Yes	Yes
	RME specified in HGMPs	varies	Yes	Yes
	Watershed areas accessible to natural salmon and steelhead migration, spawning, and rearing		N/A	N/A

1.3. Purpose of and Need for the Action

The purpose and need of the Proposed Action is two-fold: (1) for NMFS to ensure the HGMPs and associated hatchery facilities comply with requirements of the ESA, and (2) for ODFW to provide hatchery-origin fish for recreational and commercial fisheries in Oregon coastal streams and near-shore marine waters.

1.4. Project Area and Analysis Area

The project area is the geographic area where the Proposed Action would take place. The project area consists of the geographic areas where the hatchery facilities are located and the stream and river reaches downstream of the facilities where hatchery fish are present as they emigrate to the ocean. The project area specifically includes hatchery areas where fish are spawned, incubated, reared, acclimated, released, or harvested. Within the project area, 10 hatcheries are used to propagate the hatchery fish: Nehalem Trask, Salmon, Cedar Creek, Alsea, Rock Creek, Bandon, Cole Rivers, Indian, and Elk Hatcheries (Table 1; Figure 1). Additional traps are used to collect broodstock in the Chetco, Rogue, Elk, Coos, Umpqua, Siletz, and Siuslaw Basins. Some programs have additional juvenile fish rearing and acclimation satellite facilities at the location where hatchery fish are released. Only one hatchery program collects ESA-listed fish (Umpqua River coho salmon program). All of the other programs use entirely non-listed fish.

Coho salmon and eulachon are the only federally-listed fish species occupying the Oregon Coast Region under NMFS' jurisdiction (see Subsection 3.5, Other Fish and Their Habitats). For coho salmon, two Evolutionarily Significant Units (ESUs) occur within the Oregon Coast Region. The boundary between the Oregon Coast Coho Salmon ESU and the Southern Oregon Northern California Coast (SONCC) Coho Salmon ESU is Cape Blanco (near Elk River Hatchery in Figure 3). Other ESA-listed fish species, particularly green sturgeon, may inhabit the coastal estuaries during periods of their life, but spawn in other distinct population areas such as the Sacramento River. No other ESA-listed fish species occur in the project area. Other listed terrestrial animal species found within the Oregon Coast Region include marbled murrelet, northern spotted owl, and snowy plover. In the ocean, ESA-listed marine mammals may be present within the Oregon Coast Region, including Steller sea lion, humpback whale, killer whale, sei whale, and right whale (Table 10).

Figure 1. Location of the 10 hatchery facilities along the Oregon Coast.

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 project area, since some of the effects of the alternatives may occur outside the project area. For example, some socioeconomic effects of the hatchery programs are evaluated at the project area level (the streams and rivers where hatchery fish are released), but others are evaluated within a larger geographic scope (fisheries occurring in the ocean off the Oregon Coast where hatchery fish are also caught). The analysis area for each resource is described in Chapter 3,

Affected Environment. Direct and indirect effects on various resources within the project and analysis areas are analyzed in Chapter 4, Environmental Consequences.

In addition, a larger analysis area was defined to consider actions with effects that are potentially cumulative with the Proposed Action and thus, require evaluation of effects throughout the entire Oregon Coast Region (including areas where no hatchery facilities exist and no hatchery fish are released). The evaluation of this larger analysis area for cumulative effects is described in Chapter 5, Cumulative Effects.

1.5. Decisions to be Made

NMFS must decide on the following before the Proposed Action can be implemented:

- The preferred alternative following an analysis of all alternatives in this FEIS and review of public comment on the FEIS
- Whether the Proposed Action complies with ESA criteria under the section 4(d) Rule

1.5.1. Record of Decision

This NEPA process will culminate in a Record of Decision (ROD) that will record the selected alternative. The ROD will identify the environmentally preferred alternative; describe the preferred alternative and the selected alternative; and summarize the impacts expected to result from implementation of the selected alternative. As for the preferred alternative in this FEIS, the selected alternative in the ROD could be the preferred alternative or could comprise components of alternatives evaluated in the FEIS. The ROD will also consider comments on this FEIS. The ROD will be completed after public review and comment on the FEIS, and after the ESA determinations and associated public review processes are completed.

1.5.2. NMFS's Determination as to Compliance with the 4(d) Rule

Discussions between the co-managers and NMFS during development of the HGMPs are conducted with the knowledge and understanding that the specific criteria under Limit 5 of the 4(d) Rule must be met before take coverage under the ESA can be issued. HGMPs submitted under Limit 5 (Artificial Propagation) must meet the following criteria:

1. Specify the goals and objectives for the hatchery program.

2. Specify the donor population's critical and viable threshold levels.
3. Prioritize broodstock collection programs to benefit listed fish.
4. Specify the protocols that will be used for spawning and raising the hatchery-origin fish.
5. Determine the genetic and ecological effects arising from the hatchery program.
6. Describe how the hatchery operation relates to fishery management.
7. Ensure that the hatchery facility can adequately accommodate listed fish if collected for the program.
8. Monitor and evaluate the management plan to ensure that it accomplishes its objective.
9. Be consistent with tribal trust obligations (65 Fed. Reg. 42422, July 10, 2000).

NMFS has a limited role (i.e., approve or deny) under Limit 5 of the 4(d) Rule. The decision as to whether the ESA 4(d) Rule Limit 5 have been met will be documented in NMFS's ESA decision documents at the end of the ESA evaluation process. Included with the ESA decision documents will be responses to comments on the HGMPs received during public review as required by the 4(d) Rule.

1.5.3. Biological Opinion on NMFS's Determination as to Compliance with the 4(d) Rule

ESA section 7(a)(2) provides that any action authorized, funded, or carried out by a Federal agency shall not jeopardize the continued existence of any endangered or threatened species or result in the adverse modification or destruction of designated critical habitat. NMFS's actions under section 4(d) are Federal actions, and NMFS must comply with section 7(a)(2). NMFS's consultations under section 7 on those actions may be informed by this NEPA analysis. The results of these consultations are documented in the Biological Opinion developed by NMFS for the species under their jurisdiction. Biological Opinions are produced near the end of the ESA evaluation and determination process, providing the NMFS conclusions regarding the likelihood that the proposed hatchery actions will jeopardize the continued existence of any listed species or adversely modify designated critical habitat for any listed species.

1.6. Scoping and Relevant Issues

The first step in preparing an EIS is to conduct scoping of the issues that may be associated with the Proposed Action. This occurs through internal agency and public scoping processes. The purpose of that scoping is to identify the relevant human environmental issues, to eliminate insignificant issues from

detailed study, and to identify the alternatives to be analyzed in the EIS. Scoping can also help determine the level of analysis and the types of data required for analysis.

1.6.1. Scoping Process

This FEIS is a culmination of activities that included both internal, Tribal, and public scoping that are described in the following paragraphs.

1.6.2. Internal Scoping

NMFS initially conducted internal project scoping on hatchery programs within the Oregon Coast Region in 2014, and convened later, internal-only, meetings for the process of developing this EIS. Internal scoping for this EIS was informed by public comments on previous NEPA analyses throughout Oregon and Washington (e.g., Sandy River EA, Puget Sound Hatcheries DEIS (NMFS 2014a) and the Puget Sound Early Winter Steelhead Hatcheries DEA (NMFS 2015a)).

1.6.3. Tribal Government Scoping

In March, 2013, NMFS sent letters to the following Tribal Governments located along the Oregon Coast:

- Coquille Indian Tribe
- The Confederated Tribes of Coos, Lower Umpqua, and Siuslaw Indians
- Cow Creek Band of Umpqua Tribe of Indians
- The Confederated Tribes of Grand Ronde
- Confederated Tribes of Siletz Indians

The purpose of the letters was to inform the Tribes of NMFS' review of the HGMPs under the ESA and NEPA and to identify any specific interests and/or issues from the Tribe's perspectives. A conference call with a few Tribal representatives occurred on April 4, 2013 to further describe NMFS' anticipated actions with this project. No specific issues were identified by the Tribes pertaining to this NEPA analyses.

1.6.4. Notices of Public Scoping and Public Review and Comment

Public scoping for this EIS commenced with publication of a Notice of Intent in the Federal Register on January 15, 2016 (81 FR 2197). The comment period was open for 60 days to gather information on the scope of the issues and the range of alternatives to be analyzed in the DEIS (81 FR 8685, February 22, 2016).

At the same time, all of the HGMPs were available for public review and comment for 60 days (Table 2). The HGMPs provided information to help inform the public of the upcoming EIS. Public review of the HGMPs is also required under limit 5 of the ESA 4(d) Rule.

On August 26, 2016, the DEIS was released and made available for public review and comment for 60 days (81 FR 58924, August 26, 2016).

NMFS developed a website for the EIS at: http://www.westcoast.fisheries.noaa.gov/hatcheries/salmon_and_steelhead_hatcheries.html.

The website was available during the scoping period, DEIS public review and comment, FEIS public review, and will be updated and available throughout the project duration.

1.6.5. Written Comments

Written comments received on the DEIS during the public scoping process included:

- 1 from a governmental agency
- 4 from non-governmental organizations
- 3 from individual citizens

Written comments received on the DEIS during public review included:

- 2 from government agencies
- 5 from non-governmental organizations
- 4 from individual citizens

1.6.6. Issues Identified During Scoping

Based on all input received during the scoping process, public review of the DEIS, and the purpose and need for the Proposed Action, input relevant to development of FEIS alternatives include:

- Modify hatchery programs to reduce hatchery impacts on natural salmon and steelhead.
- Assess and report the impacts of hatchery programs on salmon and steelhead.
- Maintain existing fishing opportunities on salmon and steelhead that are important to anglers and local economies.

Comments from public scoping and DEIS review were also received on resources to be analyzed, the importance of evaluating the genetic and ecological effects on coho salmon, and new information.

Scoping identified water quantity, salmon and steelhead, Southern Resident killer whales, socioeconomics, and environmental justice as the resources to be analyzed, along with cumulative effects.

1.6.7. Future Public Review and Comment

Under NEPA, this FEIS will be issued for a 30-day public review period via notification in the Federal Register. Following this public review period, responses to public comments will be considered and included in the consideration of the ROD (Table 2). The ROD (Subsection 1.5.2, Record of Decision) will be signed and made publicly available.

To the extent that HGMPs reviewed in this FEIS substantively change over time in response to new information or proposed actions, additional NEPA and ESA compliance may be warranted. The nature and extent of changes to plans or new information will determine the type of additional NEPA and ESA compliance that may be needed. Subsequent public review opportunities may be warranted as part of these additional NEPA and ESA reviews.

Table 2. NMFS documents and decisions required under the ESA and NEPA regarding Oregon Coast HGMPs, public notices, and comment opportunities.

Determination	Public Review, Scoping, and Comment	Public Review and Comment EIS	Availability and Public Access/Review	Decision Document
ESA				
Limit 5 of the NMFS 4(d) Rule	Public review and comment on all HGMPs for 60 days (81 FR 2197 and 81 FR 8685)			Evaluation and Recommendation Determination[1]
NMFS BiOp[2]				Signed BiOp
NEPA				
EIS[3]	60 day public scoping on Notice of Intent to prepare EIS (81 FR 2197 and 81 FR 8685)	Draft EIS (60-day comment period)	Final EIS (30-day "cooling off" period)	Record of Decision
Progression of Steps for Each Determination	Start →			End

[1] Notification of decision published in Federal Register.

[2] BiOp = Biological Opinion under section 7 of the ESA.

3 FEIS = Final Environmental Impact Statement

1.7. Relationship to Other Plans and Policies

In addition to NEPA and ESA, other plans and policies also affect hatchery management along the Oregon Coast. They are summarized below to provide additional context for Oregon Coast hatchery programs.

1.7.1. Oregon Plan for Salmon and Watersheds

The Oregon Plan for Salmon and Watersheds began in the mid-1990s to address the conservation crisis of Oregon Coast coho salmon (OCSRI 1997). This state-initiated conservation plan specified the new management strategies for hatchery programs and fishery harvest affecting coho salmon. Substantial reform actions for hatcheries and fishery harvest were enacted and implemented over the last 15 years to help recover coho salmon. The HGMPs under evaluation reflect the management direction established in the Oregon Plan for Salmon and Watersheds. Most of the hatchery coho programs were terminated along the Oregon Coast during this period to help recover wild coho salmon.

1.7.2. Native Fish Conservation Policy

Oregon's Native Fish Conservation Policy helps guide the management of hatcheries and fishery harvest as it relates to conserving and recovering wild fish species (ODFW 2002). This policy was enacted in 2002 and replaced the former Wild Fish Policy. One of the requirements of this policy is to develop and implement conservation plans for fish species. In areas where ESA listed salmon and steelhead occur, a federal recovery plan meets this need. For other non-listed salmonids, Oregon develops the state conservation plan (see below). The HGMPs under evaluation reflect decisions made by ODFW under this policy.

1.7.2.1. Coastal Multi-Species Conservation and Management Plan

In June of 2014, ODFW finalized a new conservation and management plan for spring and fall Chinook salmon, summer and winter steelhead, chum salmon, and cutthroat along most of the Oregon Coast Region (Elk River north to Necanicum River)(ODFW 2014a) under Oregon's Native Fish Conservation Policy. This plan resulted in many changes to hatchery management along the Oregon Coast that: (1) reduce or minimize impacts on natural-origin populations, and (2) provide greater fishery opportunities on hatchery-origin salmon and steelhead. Some hatchery programs were eliminated entirely. Other hatchery programs increased in production. The hatchery programs (and associated HGMPs) included here in this evaluation are the result of these new hatchery management changes adopted under this new Coastal Multi-Species Conservation and Management Plan.

1.7.3. Recovery Plans for Oregon Coast Salmon

Federal recovery plans are required for the ESA-listed Oregon Coast coho salmon and SONCC coho salmon. The SONCC coho salmon recovery plan was finalized in 2014 (NMFS 2014). The Oregon Coast coho salmon recovery plan was finalized in December, 2016 (NMFS 2016a). These recovery plans include the actions needed to achieve the conservation and recovery goals for each watershed within the geographic boundaries of the two listed ESUs. The recovery plans do not assure that the recommended actions will occur; implementation is left to resource managers and other interested parties.

In the SONCC coho salmon recovery plan (NMFS 2014), hatcheries were determined to be a low threat in the Chetco River and a medium threat for the Elk River and all of the Rogue River populations (no other coho salmon populations in the Oregon portion of the SONCC have hatchery fish released). The risks are related to genetic interbreeding between hatchery and natural coho salmon in the Upper Rogue population, and competition/predation/disease impacts on coho salmon from releases of hatchery Chinook salmon and steelhead in the Elk, Rogue, and Chetco Rivers. The only specific action identified in the recovery plan for Oregon populations related to hatcheries was to develop HGMPs that address the concerns specified above (genetic and ecological impacts of hatchery fish). All HGMPs have been developed and submitted to NMFS. This FEIS describes and evaluates the impacts of the hatchery programs on the identified resources.

In the final Oregon Coast coho salmon recovery plan (NMFS 2016a), two recovery actions were specified for hatchery management: 1) maintain current low levels of hatchery production in order to minimize genetic risks of hatchery fish interbreeding with natural-origin coho salmon, and 2) maintain current low levels of hatchery production in order to minimize competition and predation risks with wild fish in tributaries and estuaries. The HGMPs submitted by ODFW within the Oregon Coast coho salmon ESU reflect the management reforms that have been implemented since ESA listing of coho salmon. Coho salmon hatchery production continues to be at very low levels ESU-wide, with only three coho salmon production programs (Umpqua, Trask, Nehalem) and one STEP program (Siuslaw)(recovery action 1). For the other HGMPs that propagate other species besides coho salmon, total production of these programs has not increased over the last decade (recovery action 2). Due to the reforms implemented to date, hatchery program impacts have not been identified as a primary or secondary limiting factor/threat for any coho salmon population along the Oregon Coast. Therefore, other factors and threats are currently impeding the recovery of coho salmon along the Oregon Coast.

1.7.4. 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 approving and reviewing National Pollutant Discharge Elimination System (NPDES) applications, and establishing 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 Oregon Department of Environmental Quality is the agency responsible for carrying out the provisions of the Federal Clean Water Act within Oregon. The agency is responsible for establishing water quality standards, making and enforcing water quality rules, and operating waste discharge permit programs. Hatchery operations are required to comply with the Clean Water Act and governed by NPDES permits.

1.7.5. 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 of 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).

1.7.6. 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 key 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).

1.7.7. 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.

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

1.7.9. **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).

2. ALTERNATIVES INCLUDING THE PROPOSED ACTION

Five alternatives are evaluated in this environmental impact statement: (1) NMFS would not approve the HGMPs under limit 5 of the 4(d) Rule, (2) NMFS would approve the HGMPs under limit 5 of the 4(d) Rule, (3) all of the salmon and steelhead hatchery programs described in the HGMPs would be terminated along the Oregon Coast, (4) hatchery production would be reduced by approximately 50 percent from Alternative 1, and (5) the highest risk hatchery programs would be terminated and hatchery program reforms identified in the HGMPs would be implemented for the remaining programs. No other alternatives that would meet the purpose and need were identified that would be appreciably different from the five alternatives described below (see Subsection 2.5, Alternatives Considered But Not Analyzed in Detail, for further description of alternatives considered but not analyzed in detail).

2.1. Alternative 1 (No-action): Do Not Approve ODFW's HGMPs for Operation of Hatchery Programs on the Oregon Coast

Under this alternative, NMFS would not approve the HGMPs under 4(d) Rule, limit 5, and the hatchery programs would not be exempted from ESA section 9 take prohibitions. If the programs are not authorized under the No-action Alternative, several possible outcomes could occur:

- ODFW could pursue obtaining an ESA section 10(a)(1)(B) incidental take permit to exempt the hatchery programs from take prohibitions.
- ODFW could choose to continue to operate the existing hatchery programs without ESA authorization and be liable for ESA take violations.
- ODFW could choose to terminate all of the hatchery programs because they would not have ESA authorization.

For purposes of this analysis, NMFS has defined the No-action Alternative as the choice by ODFW to continue to operate the existing hatchery programs without ESA authorization. All of the activities associated with the proposed salmon hatchery programs would continue: hatchery salmon and steelhead would be released, broodstock would be collected at proposed locations, the hatchery facilities would use water for operation, and the hatcheries would discharge hatchery water effluent.

NMFS's No-action Alternative represents NMFS's best estimate of what would happen in the absence of the proposed Federal action. While it is far from certain that the hatcheries would continue if NMFS

declined to conduct its review, the fact that each of the programs under review has been in existence in some form and their importance to ODFW's management goals suggests they would not be terminated immediately, if at all, in this scenario. Moreover, Alternative 3 considers the scenario where hatchery programs are terminated, so NMFS is not deprived of that analysis by choosing a status quo scenario for the No-action alternative.

2.2. Alternative 2 (Proposed Action/Preferred Alternative): Approve ODFW's HGMPs for Operation of Hatchery Programs on the Oregon Coast

Under this alternative, NMFS would approve the existing hatchery programs (described in the submitted HGMPs) by issuing an approval letter to ODFW under limit 5 of the 4(d) Rule. All of the hatchery reforms that have been enacted since the ESA listing of coho salmon along the Oregon Coast would continue to be implemented. ODFW has recently completed their Coastal Multi-Species Conservation and Management Plan for the Oregon Coast Region. This entailed an elaborate review of the management of the hatchery programs considering a range of conservation and societal issues and included substantial stakeholder involvement. The current hatchery programs reflect the decisions under this management plan. The Best Management Practices (BMPs) used by ODFW for hatchery management would also continue as described in the submitted HGMPs.

BMPs are protocols for the operation of hatchery facilities and hatchery programs to appropriately meet the objectives of the hatchery program, including minimizing impacts on ESA-listed fish (IHOT 1995; HSRG 2004; Mobrand et al. 2005; Jones and Stokes 2009). The BMPs in these HGMPs include:

(1) providing specific-pathogen free water source for adult and juvenile fish holding
(2) ensuring adequate alarm systems are in operation to protect rearing fish from flow disruptions
(3) ensuring that water supplies have back-up power generation in case of an electrical outage to protect rearing fish
(4) requiring appropriate disinfection procedures to prevent pathogen transmission between stocks of fish onsite
(5) providing the correct amount and type of food to achieve desired growth rates
(6) adequately screening hatchery intake water supplies to prevent fish loss
(7) ensuring that the hatchery is operated in compliance with its NPDES permit
(8) documenting the survival and production of hatchery fish at each life stage while in the hatchery.

(9) outplanting surplus carcasses from the hatchery for nutrient enhancement in the ecosystem, if appropriate according to pathology guidelines.

For the purpose of this analysis, NMFS treats the Proposed Action Alternative as implementing the hatchery production of salmon and steelhead as proposed in the HGMPs provided in 2014. All of the following activities would occur: broodstock collection; spawning, rearing, and release of hatchery fish; and facility operation including water intake and discharge.

2.3. Alternative 3: Terminate Hatchery Programs on the Oregon Coast

Under this alternative, NMFS would determine that the hatchery programs in the Oregon Coast Region do not meet the criteria under limit 5 of the 4(d) rule, and, therefore, would not receive ESA approval. Because the hatchery plans would not be approved, the hatchery actions proposed by ODFW would not be exempt from section 9 take prohibitions. With this lack of approval, the hatchery actions proposed by ODFW would not be implemented, and in NMFS' best estimate the programs would likely be terminated. All of the activities associated with the hatchery programs would be terminated: no hatchery salmon would be released, no broodstock would be collected at trapping locations, trapping facilities would be removed, no returning hatchery fish would be removed from various locations, the hatchery facilities would not use water for operation, and the hatcheries would not discharge hatchery water effluent. All salmon and steelhead currently being raised in hatchery facilities would be released or killed, and no additional broodstock would be collected.

This alternative would not be expected to meet the purpose and need for action because termination of the proposed hatchery actions would not produce juvenile hatchery fish of each species that would return as adult fish to meet commercial and recreational fishery needs. However, NMFS supports its analysis to assist with a full understanding of potential effects on the human environment under various management scenarios.

2.4. Alternative 4: Reduced Hatchery Production

Under this alternative, ODFW would reduce the number of fish released from each of the proposed hatchery programs by 50 percent. All of the hatchery facilities would rear 50 percent less hatchery fish. This alternative represents a mid-point between the Proposed Action (Alternative 2) and Alternative 3 (Terminate Hatchery Programs on the Oregon Coast). Revised HGMPs would be submitted by ODFW

reflecting these 50 percent reduced production levels, and NMFS would make a determination that the revised HGMPs meet the requirements of the 4(d) Rule.

NMFS's 4(d) regulations do not provide NMFS with the authority to order changes of this magnitude as a condition of approval of the HGMPs. NMFS's 4(d) regulations require NMFS to make a determination that the HGMPs, as submitted by the operator, either meet or do not meet the standards prescribed in the rule. Nonetheless, ODFW could choose to make this change in consultation with NMFS, and NMFS supports analysis of this alternative to assist with a full understanding of potential effects on the human environment under various hatchery management scenarios.

2.5. Alternative 5: Terminate Highest Risk Hatchery Programs and Implement Hatchery Program Reforms

This is a new alternative included in the FEIS in response to public comments which suggested that another alternative focused on reducing risks to natural-origin fish populations was needed. This alternative specifically evaluates terminating the hatchery programs that are highest risk to natural-origin salmon and steelhead populations according to ODFW's Coastal Multi-Species Conservation and Management Plan (ODFW 2014a) and/or recent data on the proportionate of natural influence (PNI) for the hatchery program. See Table 7 in Subsection 3.4, Salmon and Steelhead and Their Habitats, for recent metrics. Hatchery programs with PNI metrics less than 0.50 were judged to be highest risk to natural-origin salmon and steelhead populations because hatchery selective forces would dominate natural selective forces in the wild (Mobrand et al. 2005). The following hatchery programs met the specified criteria and were terminated for this alternative 5:

- Elk River hatchery fall Chinook salmon program
- South Umpqua River hatchery coho salmon program
- Siletz River hatchery summer steelhead program
- Nestucca River hatchery spring Chinook salmon program
- Trask River hatchery coho salmon program
- Trask River hatchery spring Chinook salmon program
- Wilson River hatchery spring Chinook salmon program
- Nehalem River hatchery coho salmon program
- Nehalem River hatchery winter steelhead program
- Necanicum River hatchery winter steelhead program

Termination of the above hatchery programs results in a reduction of approximately 1.16 million hatchery fish being released annually along the Oregon Coast Region compared to the No-action Alternative. Production of these hatchery fish currently occurs at Elk, Rock, Salmon, Cedar, Trask, and Nehalem hatcheries (Figure 5). Under this alternative, Nehalem hatchery would be the only facility that is closed in entirety because all of the hatchery production would be terminated at the hatchery (Nehalem coho salmon, Nehalem winter steelhead, Necanicum fall Chinook salmon, and Necanicum winter steelhead). For the remaining hatchery facilities, hatchery production would still occur. However, the use of water for hatchery rearing and effluent discharge from the hatchery would be reduced. Operation and maintenance costs would be similar to Alternative 1 because most of the hatchery production is still being produced at the remaining facilities.

In addition, this alternative also evaluates implementation of the hatchery reforms identified in section 1.16 of the HGMPs for the remaining hatchery programs. The actions identified were feasible, but not being implemented due to lack of funding, lack of planning, or some other factor. Alternative 5 specifically evaluates the effects of the hatchery programs with implementation of the following reform actions in section 1.16 of the HGMPs. It is important to note section 1.16 of the HGMPs identified more actions than included in the list, but all of those actions were included as part of another alternative (e.g. terminate the hatchery program, reduce hatchery production).

- Alsea winter steelhead – initiate new wild steelhead broodstock
- Applegate winter steelhead – develop offsite acclimation sites to increase harvest
- Cedar Creek Hatchery – improve hatchery ladder and weir on Three Rivers to aid collection of hatchery fish and allow to spawn naturally if desirable.
- Cedar Creek Hatchery – screen hatchery water intake to minimize impacts on fish species.
- Nestucca winter steelhead – improve acclimation and release sites to increase harvest.
- Nestucca summer steelhead – improve acclimation and release sites to increase harvest
- Chetco fall Chinook salmon – increase broodstock collection efficiency by having more equipment available.
- Chetco fall Chinook salmon – develop acclimation sites to reduce pHOS.
- Chetco winter steelhead – develop broodstock holding facility at the Chetco River.
- Coos fall Chinook salmon – increase broodstock collection capacity so that run/spawn timing can be better represented
- Coos fall Chinook salmon – develop acclimation sites in Coos Bay so hatchery fish can be more susceptible to the fishery.

- Coos winter steelhead – increase acclimation sites to increase harvest of hatchery fish.
- Coos winter steelhead – increase broodstock collection capacity so that run/spawn timing can be better represented.
- Coquille fall Chinook salmon – increase acclimation sites to increase harvest of hatchery fish.
- Coquille fall Chinook salmon – improve broodstock collection facilities to allow better collection.
- Coquille winter steelhead – increase acclimation sites to increase harvest of hatchery fish.
- Coquille winter steelhead – improve broodstock collection facilities to allow better collection.
- Indian Creek fall Chinook – increase broodstock collection efficiency by having more equipment available.
- North Umpqua summer steelhead – improve water quantity and quality at Rock Creek hatchery to rear production.
- North Umpqua summer steelhead – develop acclimation site to increase harvest.
- Rogue spring Chinook salmon – increase acclimation sites to increase harvest of hatchery fish.
- Rogue summer steelhead – increase acclimation sites to increase harvest of hatchery fish.
- Rogue winter steelhead – increase acclimation sites to increase harvest of hatchery fish.
- Salmon fall Chinook salmon – build a new weir and adult collection facility at the hatchery.
- Siuslaw winter steelhead – upgrade hatchery facilities to allow raising of 2 year old smolts for release.
- Tenmile winter steelhead - increase acclimation sites to increase harvest of hatchery fish.
- Tenmile winter steelhead – improve broodstock collection facilities to allow better collection.
- Trask Hatchery – screen water intakes for hatchery.
- Trask winter steelhead – improve adult trapping facility at Tuffy Creek.
- North Umpqua spring Chinook salmon – increase acclimation sites to increase harvest of hatchery fish.
- North Umpqua spring Chinook salmon – improve water quantity and quality at Rock Creek Hatchery to rear production.

In total, this alternative provides another scenario of effects within the range of Alternative 1 (No-action) and Alternative 3 (Terminate Hatchery Programs on the Oregon Coast).

2.6. Alternatives Considered But Not Analyzed in Detail

In the EIS, there were several hatchery scenarios that were not evaluated in detail because they were infeasible (absent a new application by ODFW) and because they were not substantially different than the

range of Alternatives 1 through 4. However, based upon public comment NMFS chose to analyze an additional hatchery scenario alternative (Alternative 5), which was previous considered but not fully evaluated in the EIS.

After incorporating this additional alternative in the FEIS, the following alternatives were not evaluated in detail. These alternatives are eliminated because (1) they do not meet the purpose and need for the action, and/or (2) they are not meaningfully different from the Proposed Action or No-action Alternatives described above and would not supply additional information that would inform the decision-making process.

2.6.1. Eliminate all hatchery coho salmon programs and the largest hatchery Chinook salmon program

Under this alternative, consideration was given to eliminating the four hatchery coho salmon programs (Rogue, Umpqua, Trask, and Nehalem) and the largest hatchery program in the project area (fall Chinook salmon in Coos Bay). This was considered in the DEIS, but the FEIS includes an additional alternative (Alternative 5) that fully evaluates terminating the highest risk hatchery programs, which includes the Trask, Nehalem and Umpqua programs and which considers applying reforms to the Coos Bay fall Chinook program.

These hatchery program changes were considered because they could possibly represent the largest genetic and ecological impacts on the only ESA-listed fish species, coho salmon, and, therefore, their elimination would provide the largest reductions in those impacts. These changes would reduce production levels by approximately 35 percent from the Proposed Action Alternative, reductions accruing to coho and fall Chinook salmon.

If these five hatchery programs were eliminated, none of the hatchery facilities would be closed because other hatchery fish are raised at these facilities. All of the hatchery facilities would still use water for operations. Water intakes would still require compliance with ESA standards, and hatchery effluent would require compliance with the Clean Water Act. The effects of the remaining programs would be the same as evaluated under the Proposed Action Alternative and Reduced Hatchery Production Alternative. This alternative would result in reductions in socioeconomics, in that harvest capability would be reduced and the income generated by that harvest would be reduced; the likely effects on both harvest and financial benefits would likely be similar to the effects of Alternative 4, Reduced Hatchery Production.

Alternative 4, Reduced Hatchery Production, is analyzed in the FEIS and represents a 50 percent reduction in hatchery production for all of the hatchery facilities. This Alternative 4 was deemed to be adequate in addressing a mid-point range of impacts between the Proposed Action (Alternative 1) and terminating all hatchery programs on the Oregon Coast (Alternative 3). Therefore, consideration of the elimination of the hatchery coho salmon and the largest hatchery salmon programs does not provide additional insight on impacts compared to Alternative 4, and was eliminated from further analysis.

2.6.2. Terminate operation of Cole Rivers Hatchery and all associated hatchery programs for coho salmon, spring Chinook salmon, fall Chinook salmon, winter steelhead, and summer steelhead

Under this possible alternative, consideration was given to closing down the operation of Cole Rivers Hatchery in the Rogue River. Within the Oregon Coast Region, this facility produces the most hatchery fish and uses the most water for hatchery operations. A total of 2.86 million hatchery fish would be eliminated under this potential alternative, which equates to a reduction of 40 percent of the total releases within the Oregon Coast Region compared to the Proposed Action Alternative. No hatchery fish would be released in the Rogue River and the fall Chinook salmon programs in the Coquille and Coos Rivers would be substantially decreased. Cole Rivers Hatchery would not operate the trap, collect hatchery fish, use water for hatchery purposes, or discharge any effluent into the Rogue River.

This alternative was eliminated from further analysis because it did not meet the purpose and need of the action for the following reasons. However, it is important to note that NMFS included an additional alternative (Alternative 5) in the FEIS that analyses a similar hatchery scenario. This is a change from the DEIS to FEIS.

- The elimination of 2.86 million hatchery fish releases would have little to no beneficial effect on ESA-listed salmon species, and this effect has already been evaluated in Alternative 3. The only ESA-listed salmon species in the Rogue River is coho salmon. NMFS approved the HGMP for the hatchery coho salmon program in 1999, and there are no new issues that need to be evaluated with this program. Therefore, this potential alternative would not address any further ESA issues compared to the Proposed Action Alternative, and is not a necessary step to achieve the conservation portion of the Purpose and Need.
- The elimination of 2.86 million hatchery fish releases would result in a keen reduction in harvest opportunity, and therefore would not meet that portion of the Purpose and Need.

- Cole Rivers Hatchery was instituted and is currently operated to provide fish for harvest purposes due to the construction and operation of Lost Creek and Applegate dams; funding is obligated for this Federal hatchery mitigation.
- At the local scale of the Rogue River Basin, this possible alternative is the same as analyzed under Alternative 3 (terminate hatchery programs along the Oregon Coast), and therefore does not provide any new information already considered under Alternative 3.

2.6.3. Approve Greater Levels of Hatchery Production than those Proposed

Under this alternative, NMFS would make a determination that revised HGMPs with increased production levels meet the requirements of limit 5 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 propagate the hatchery fish in the specified HGMPs.

2.6.4. Change Locations of the Hatchery Programs and/or Releases

Under this alternative, changes to the locations where hatchery fish are currently being released would be implemented. Such a modification might be considered in an attempt to focus harvest opportunities in fewer areas with similar overall fishery effort, possibly to create more areas of little or no hatchery influence. Overall hatchery production levels would remain similar to the Proposed Action using the existing hatchery facilities at full capacity. However, release locations would be changed throughout the Oregon Coast Region, while maintaining a similar number of hatchery and wild fish management areas. Since hatchery production under this possible alternative would still occur using the existing facilities at full capacity, with only the specific release locations changing within the Oregon Coast Region, for NEPA evaluations this possible alternative is not substantially different from the Proposed Action.

The proposed release locations were defined considering many other policy directives, like Oregon's Native Fish Conservation Policy (NFCP) and the Oregon Plan for Salmon and Watersheds. In 2014, ODFW adopted the Coastal Multi-Species Conservation and Management Plan under the NFCP. This management plan assessed a wide range of potential changes to the hatchery programs and included stakeholder involvement. This plan sets forth the locations of releases into the foreseeable future. Changes to release locations as developed through the prior planning process would not be an

improvement in achieving the conservation portion of the Purpose and Need, and would potentially reduce the effectiveness of the harvest opportunity component of the Purpose and Need, and, therefore, this alternative is not further analyzed.

2.6.5. Attaining Hatchery Program Goals by Alternative Actions and Reforms

In the DEIS, this alternative action was considered but not evaluated. However, in response to public comment NMFS has incorporated these actions in Alternative 5 (Terminate Highest Risk Hatchery Programs and Implement Hatchery Program Reforms) as part of the reforms included in that alternative.

2.6.6. Reinstate Hatchery Production that Existed Prior to the ESA Listing of Coho Salmon Along the Oregon Coast

Under this alternative, the previous hatchery production levels that occurred prior to the ESA listing of coho salmon along the Oregon Coast would be reinstated. Since the current hatchery production levels are substantially different from pre-ESA listing of coho salmon, many hatchery facilities (private and government) would have to be funded, repaired, and put back into operation for this alternative to be implemented. Hatchery production would be increased 100 percent to 500 percent above proposed levels. Because hatchery production was reduced on the Oregon Coast in the 1990s to reduce impacts on ESA-listed coho salmon, increasing hatchery production to pre-reform levels would exceed impact levels consistent with the ESA, and so would not meet the purpose and need for action. Specifically, this possible alternative would not comply with the requirements of the ESA and the mandates established in the Oregon Plan for Salmon and Watersheds and the Native Fish Conservation Policy's Coho Conservation Plan (OCSRI 1997; ODFW 2007).

2.6.7. Evaluate the HGMPs under Section 10(a)(1)(b) of the ESA, instead of Limit 5 of the 4(d) Rule

Under this alternative, NMFS would determine that the hatchery programs, as described in the HGMPs, meet the requirements for a section 10(a)(1)(B) incidental take permit. Under this possible alternative, beyond the elimination from consideration of two programs[1], the only change from the Proposed Action

[1] The Umpqua River coho salmon program, as proposed, would incorporate natural-origin ESA-listed fish into its broodstock and would, therefore, be a direct-take program, which would not qualify for an incidental take permit. Individual projects at the Oregon Hatchery Research Center might include deliberate handling or monitoring of natural-origin ESA-listed fish, and potentially would not qualify for an incidental take permit for the same reason.

would be a difference in which process mechanism would be used to address ESA compliance for these hatchery programs. Consequently, this potential alternative would not be meaningfully different from the Proposed Action and will not be analyzed in detail.

Both of these programs would need to be evaluated under separate processes, with likely the same consideration and effect as under the Proposed Action, but potentially losing some specificity in the cumulative nature of the analysis.

3. AFFECTED ENVIRONMENT

3.1. Introduction

Chapter 3, Affected Environment, describes current conditions for seven resources that may be affected by implementation of the alternatives:

- Water quantity (Subsection 3.2)
- Water quality (Subsection 3.3)
- Salmon and Steelhead and Their Habitats (Subsection 3.4)
- Other Fish and Their Habitats (Subsection 3.5)
- Wildlife (Subsection 3.6)
- Socioeconomics (Subsection 3.7)
- Environmental justice (Subsection 3.8)

No other resources were identified during internal scoping that would potentially be impacted by the Proposed Action or alternatives. Current conditions include effects of the past operation of Oregon Coast hatchery programs.

The project area is the geographic area where the Proposed Action would take place. It includes the watersheds where fish would be spawned, incubated, reared, acclimated, released, or harvested under the proposed hatchery programs (Subsection 1.4, Project Area). Each resource's analysis area includes the project area as a minimum area, but may include locations beyond the project area if effects would be expected to occur outside the project area (Subsection 1.4, Project 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 from which the water was appropriated after it circulates through the hatchery facility (non-consumptive use) (Table 3). 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 reduced habitat areas and/or 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 for the hatchery facility.

A water right permit is required for all groundwater withdrawal except those supporting single-family homes. All hatchery wells used by hatchery facilities supporting Oregon Coast hatchery programs are permitted by the Oregon Department of Water Resources (OWRD 2013). No Oregon Coast hatchery facilities are located in areas designated by Oregon as Critical Groundwater Areas (OWRD 2013). For surface water use, each hatchery facility has a designated water right (Table 2) issued by the State of Oregon.

Streamflows within the watersheds where the hatchery facilities are located is driven predominantly by rain (Lawson et al. 2007). Most of the Oregon Coast Region drains the westslope of the Coast Range and has little snowpack because of the relatively low elevation. The two exceptions within the region are the Upper Umpqua and Upper Rogue Basins, which drain the west side of the Cascade Mountain Range (which is higher in elevation and provides more streamflow from snow-melt (Lawson et al. 2007)). The quantity of water within the streams and rivers along the Oregon Coast is typically greatest in December and January and tapers off to the lowest streamflow conditions in August through October. The streams and rivers of the Oregon Coast Region are not flow-limited, with respect to fishery resources, because the vast majority of available water stays within the stream (OCCCP 2007). Water diversions for agricultural and municipal purposes are not prominent throughout this region. The exceptions are the Middle Umpqua and South Umpqua Basins, where reduced water quantity during the summer was identified as limiting salmon production (OCCCP 2007). The tributary streams of the Upper Rogue Basin (not the mainstem Rogue River) also have a substantial amount of consumptive use that may affect salmon production within those reaches. Streamflow in the mainstem Rogue River is not appreciably affected because of flow augmentation from Lost Creek reservoir.

Ten hatchery facilities are currently used to support the hatchery programs along the Oregon Coast (Subsection 1.4, Project Area). All of the hatchery facilities use surface water as their primary water source (Table 3). Three hatchery facilities (Elk, Nehalem, Indian) may also use groundwater only during specific time periods for incubating the eggs in the hatchery. Otherwise, surface water is used for hatchery operations. The length of stream affected by the hatchery's water withdrawal (from inlet to outlet) ranges from 100 to 5,943 feet in length for the 10 hatchery facilities (Table 2). Cole Rivers Hatchery has the longest diversion (5,943 feet). However, this diversion to the hatchery does not affect the adjacent Rogue River because water is piped directly from within the reservoir to the hatchery facility

located at the tailrace of the dam. No change in the discharge of the Rogue River occurs from the hatchery's water diversion. A similar situation occurs at Bandon Hatchery, where the hatchery is located at the tailrace of Ferry and Geiger reservoirs. Discharge from these reservoirs literally flows through some hatchery raceways, which is located immediately downstream of the reservoirs. The water from the hatchery then continues to flow downstream as Ferry Creek. The remaining eight hatchery facilities divert water from the adjacent stream and affect the length of stream estimated in Table 2. The percent of stream miles affected by all of the hatchery facility water withdrawal within the watershed (as indexed by critical habitat designated for coho salmon (see Oregon Coastal Coho Salmon discussion in Subection 3.4, Salmon and Steelhead and Their Habitats) ranges from zero to 0.23 percent (Table 2).

The maximum allowable water use permitted by the hatchery's surface water right ranges from three to 224 cubic feet per second (cfs) (Table 2). However, most of the hatchery facilities do not use their full water right throughout the entire year. Water use depends upon fish production levels and the capacity of the hatchery facility. During the lowest streamflow periods throughout the year (typically August through October), each hatchery facility uses only a small fraction of their full water right (Table 2).

Table 3. Water source and use by hatchery facility. See Appendix 1 for HGMP citations.

Hatchery Facility	Maximum Surface Water Use Permitted by Water Right (cfs)[1]	Maximum Ground-water Use Permitted by Water Right (cfs)	Surface Water Source	Minimum Mean Monthly Surface Water Flows during Facility Operation (cfs, month)	Actual Surface Water Use (cfs) by Hatchery Facility[3] During Minimum Mean Monthly Surface Flows (previous column)	Maximum length of stream affected by hatchery water withdrawal (feet)[2]	Discharge Location
Cole Rivers Hatchery	224	0	Lost Creek Dam and Reservoir	1000 (October)	119.54	5,943[6]	Rogue River
Indian Hatchery	1.75	0.06	Indian Creek	Unknown	Not in Operation	100	Indian Creek
Elk Hatchery	20	0.7	Elk River	57 (August)	20	1,364	Elk River
Bandon Hatchery	3	0	Ferry and Geiger Reservoirs	2.5 (September)	2.7[5]	1,380	Ferry Creek
Rock Hatchery	55	0	Rock Creek and North Umpqua River	975 (September)	37	1,230	Rock Creek
Alsea Hatchery	47	0	North Fork Alsea River	25 (August)	9.67	1,056	North Fork Alsea River
Salmon Hatchery	30	0	Salmon River	48.5 (August)	11.77	692	Salmon River
Cedar Hatchery	116	0	Cedar Creek and Three Rivers	Unknown	8.5 (August)	770	Cedar Creek
Trask Hatchery	19	0	Gold Creek and Marys Creek	111 (August)	6.34	2,204	Gold Creek
Nehalem Hatchery	21	2.2	North Nehalem River	Unknown	15.9 (August)	262	North Nehalem River
Oregon Hatchery Research Center [1]	20[3]	0	Fall Creek	16 (August)	Varies depending upon research.	1,831	Fall Creek

Source: HGMPs (see Appendix 1 for citations), United States Geological Survey data sets (http://waterdata.usgs.gov), http://streamflow.engr.oregonstate.edu/links/gages_mainx.htm, Oregon Water Resources Department (http://apps.wrd.state.or.us/apps/sw/hydro_report/default.aspx).

[1] The Oregon Hatchery Research Center only uses water when needed for research purposes. If no research is being conducted, then water is not used.

[2] Reported values are the maximum distance from intake of water supply to discharge point at the outfall of the hatchery facility. Some hatchery facilities have two water intake sources and the farthest intake from the facility is reported here to represent the maximum stream reach affected. Lengths were estimated visually using Google Earth..

[3] Monthly hatchery facility water use data reported by ODFW for Water Year 2012-13.

[5] Bandon Hatchery does not dewater any of the stream reaches. All of the water released from the dam flows entirely through the hatchery facility located immediately downstream from the dam.

[6] Cole Rivers Hatchery does not dewater any portion of the Rogue River. The hatchery water is piped from within the reservoir directly to the hatchery facility. The Rogue River is not affected until the water is discharged into the Rogue River below the hatchery facility (additional water to Rogue River).

3.3. Water Quality

Hatchery programs can affect the water quality of the adjacent stream or river from the discharge of effluent from the hatchery facility. There are potentially 11 rivers or streams within the Oregon Coast Region affected by the operation of the hatchery facilities. The areas are shown in Table 3. Each of the hatchery facilities (with the exception of Indian Creek Hatchery) is required to have a National Pollutant Discharge Elimination System (NPDES) permit administered by the Environmental Protection Agency under the Clean Water Act. Monitoring and compliance with the permits is verified on a regular basis by testing the water quality below the hatchery to determine if discharge is within the specified limits. The most common substances found in the effluent of Oregon Coast hatcheries are ammonia, nitrogen, phosphorus, and antibiotics. Bacteria, parasites, and viruses can also be transmitted from the hatchery fish to the effluent. These substances and organisms are a byproduct of hatchery fish rearing and treating the fish to ensure high survival while being grown at very high densities.

The affected environment from the discharge of effluent from the hatchery facilities occurs from the point of discharge downstream until thorough mixing occurs in the adjacent stream or river. Even though the discharges are within the criteria of the hatchery facilities NPDES permit administered by the Oregon Department of Environmental Quality, the effluent may affect water quality, and disease and pathogen load below the hatchery facility. Bartholomew (2013) showed the effluent discharge effects to be short-lived and extending downstream for less than 200 meters before it became undetectable. Each of the hatchery facilities are required by their NPDES to circulate the effluent through an abatement pond to settle out uneaten food, fish waste, and any other substances not in solution. After this, the effluent is then discharged into the adjacent stream or river to help reduce the effects on the adjacent stream or river near the hatchery facility.

The release of hatchery fish from the facilities are exposed to the broader range of water quality conditions throughout the watershed as the smolts, jacks, and adults migrate to and from the ocean. Hatchery fish can contribute marine-derived nutrients to the watershed if they spawn naturally or die before being collected at the hatchery facility. The current condition of most streams and rivers within the Oregon Coast Region are in violation of one or more of the Federal Clean Water Act 303(d) standards (Figure 2). Water temperature, fecal coliform, sedimentation, dissolved oxygen are the current 303(d) listings for the Oregon Coast Region (Table 4). Lack of riparian shade, poor agricultural and forestry practices are some of the causes for the 303(d) listings. The hatchery facilities are not identified as a cause for any of the current 303(d) listings within the Oregon Coast Region. Most of the streams and rivers have 303(d) listings and are not affected in any way by the operation of the hatchery programs.

Table 4. Water source and use by hatchery facility and applicable 303(d) listings.

Hatchery Facility	Stream or River Adjacent to Hatchery Facility	Compliant with NPDES Permit	Discharges Effluent into a 303(d) Listed Water Body	Impaired Parameters	Cause of Impairment
Cole Rivers Hatchery	Rogue River	Yes	No	None	None
Indian Hatchery	Indian Creek	N/A	Yes	Temperature	Timber harvest – loss of riparian
Elk Hatchery	Elk River	Yes	Yes	Temperature	Timber harvest – loss of riparian habitat
Bandon Hatchery	Ferry Creek	Yes	Yes	Fecal coliform	Livestock, residential development
Rock Hatchery	Rock Creek,	Yes	Yes	Temperature, sedimentation	Timber harvest – loss of riparian, roads
Alsea Hatchery	North Fork Alsea River	Yes	Yes	Temperature	Timber harvest – loss of riparian habitat, stream widening
Salmon Hatchery	Salmon River	Yes	Yes	Temperature, dissolved oxygen, fecal coliform	Timber harvest, livestock
Cedar Hatchery	Cedar Creek	Yes	Yes	Biological criteria	Anthropogenic impacts on aquatic communities (primarily macroinvertebrates)
Trask Hatchery	Gold Creek	Yes	Yes	Temperature	Timber harvest – loss of riparian, stream widening
Nehalem Hatchery	North Fork Nehalem River	Yes	Yes	Temperature	Timber harvest – loss of riparian, stream widening
Oregon Hatchery Research Center	Fall Creek	Yes	Yes	Temperature	Timber harvest– loss of riparian, stream widening

Source: ODEQ (2013).

N/A = Not applicable because the facility is not required to have an NPDES permit 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.

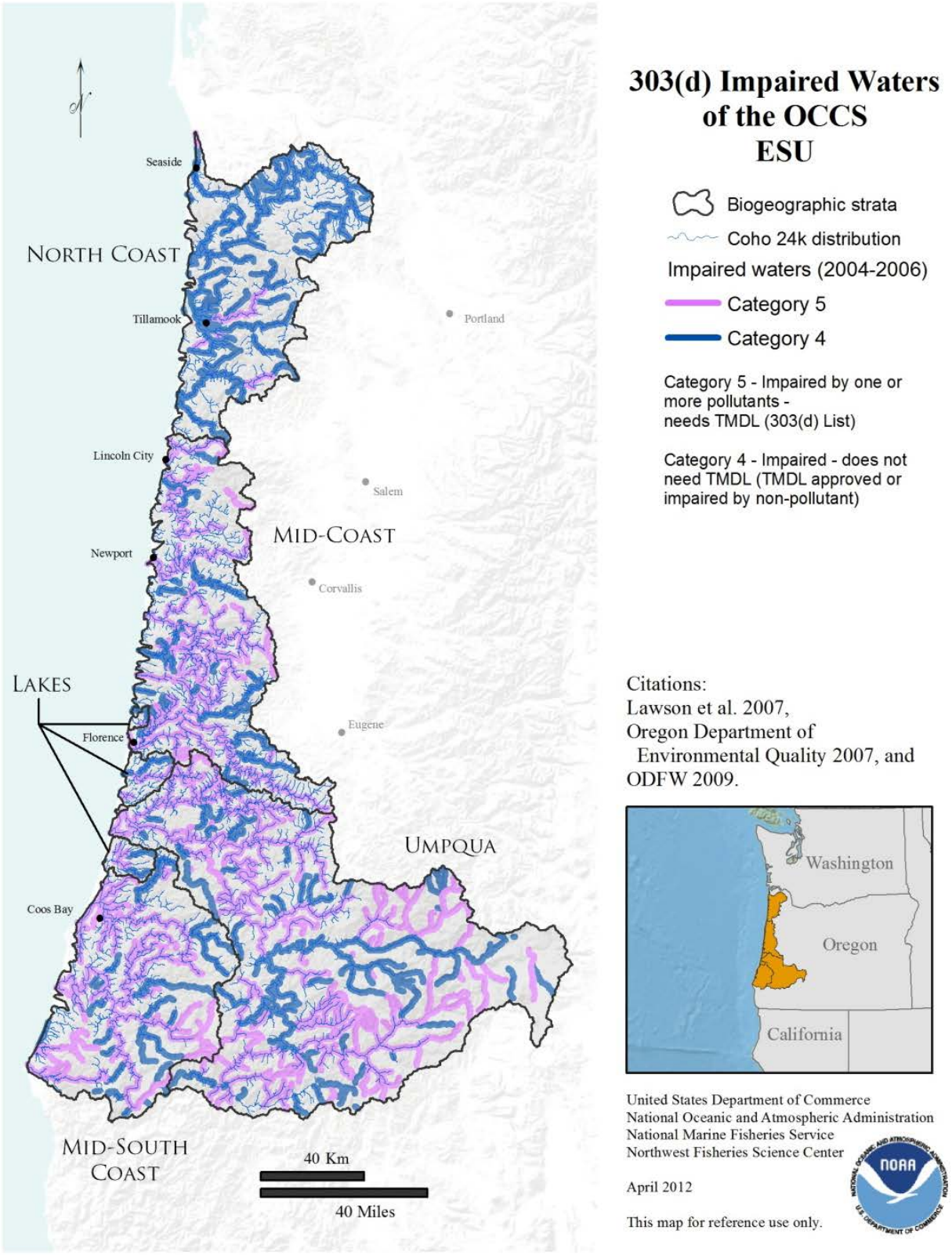


Figure 2. EPA 303(d) water-quality-impaired waters for Oregon Coast Coho Salmon ESU. Figure taken from Stout et al. (2012).

3.4. Salmon and Steelhead and Their Habitats

This section describes the current status of salmon and steelhead populations throughout the Oregon Coast Region, past and present hatchery fish releases, current effects of these hatchery programs on salmon and steelhead, and species-specific information. This information informs the comparison of alternatives in Chapter 4, Environmental Consequences.

Within the Oregon Coast Region, natural populations of coho salmon, Chinook salmon, chum salmon, and steelhead are present. Coho salmon are the only species listed under the ESA (76 FR 35755, June 20, 2011); and therefore critical habitat is designated only for this species. Chinook salmon, chum salmon, and steelhead are not protected by the ESA. The specific spatial distribution, abundance and productivity, diversity, and habitat of each species (VSP parameters; McElhany et al. 2000) are further described below.

Past and Present Hatchery Fish Releases

The past and present releases of hatchery fish from Oregon Coast hatcheries is shown in Figure 3. The trend in hatchery releases over time varies according to the specific species. Releases of coho salmon, winter steelhead, and summer steelhead are currently at the lowest release levels over the last four decades. Fall and spring Chinook salmon hatchery releases are at the highest levels over the last four decades (Figure 3). The location of hatchery fish releases have varied over time. Most of the hatchery fish releases occur at the hatchery facilities (Figure 1). The current release locations in the Oregon Coast ESU are shown in Figure 4. All of the current hatchery facilities (Figure 1) have been in operation for at least the last 20 years. Many salmon and steelhead populations do not have any hatchery programs present (Figure 5).

The period when hatchery fish are released into the wild varies by species and hatchery program (Table 2, Appendix A). For the Oregon Coast hatchery programs, presently hatchery steelhead are released in March through April at a size of 4 to 6 fish per pound (7.5 – 8.5 inches in length). Hatchery coho salmon are released April through June at a size of 10 to 15 fish per pound (5 – 6 inches in length). Hatchery Chinook salmon are released in later summer through early fall ranging from 100 to 6 fish per pound (3 – 8 inches in length).

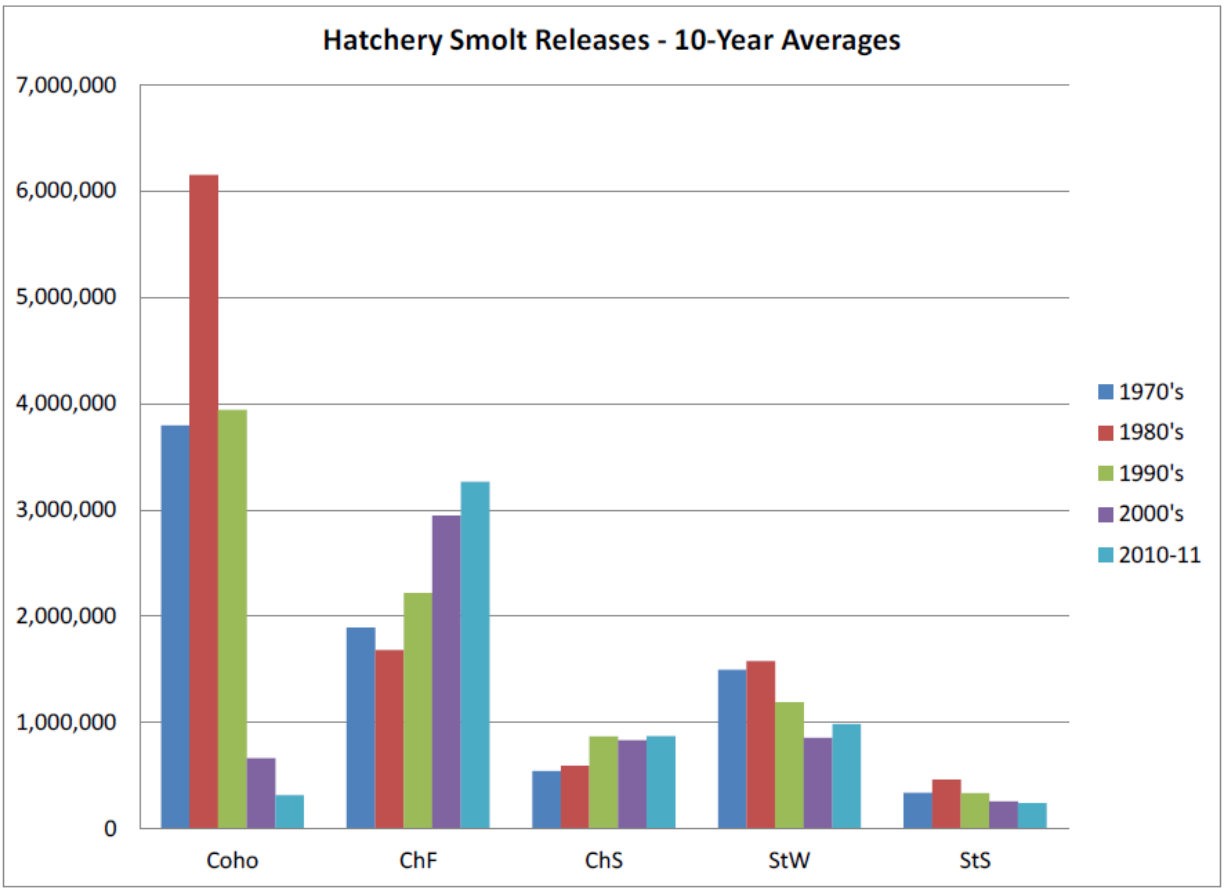


Figure 3. Smolt releases over the most recent five decades by ODFW from the Elk River to Necanicum River (ODFW 2014a). Hatchery fish releases in the Rogue and Chetco Rivers are not included. The numbers do not include releases of hatchery coho by private organizations prior to 1993 or unfed fry and fingerling life stages.

Table 5. Comparative individual sizes and freshwater occurrence timings for rearing and/or emigrating natural-origin salmon and steelhead juveniles by species and life stage, and hatchery-origin fish released from Oregon Coast hatchery programs.

Species/Origin	Life Stage	Individual Size (average fork length (mm) and range)	Occurrence or Release Timing
Chinook salmon (wild)	Fry	40 (35-67)	Mid-February - April
Chinook salmon (wild)	Parr-Subyrlg.	64 (39-95)	May - June
Chinook salmon (wild)	Yearling	103 (78-179)	Mid-March – mid-May
Chinook salmon (hatchery)	Sub-yearling	120 (60 -200)	May - November
Steelhead (wild)	Fry	60 (23-100)	June - Oct.
Steelhead (wild)	Parr	96 (65-131)	Oct.- mid-May
Steelhead (wild)	Smolt	165 (109-215)	Late-April - June
Steelhead (hatchery)	Smolt	195 (180-220)	March - April
Rainbow trout (hatchery)	Fingerling	100 (50-150)	Spring, fall
Rainbow trout (hatchery)	Legal	>200 (200-400)	Spring, summer, fall
Coho (wild)	Fry	30 (29-36)	February - March
Coho (wild)	Parr	56 (37-70)	April - April
Coho (wild)	Yearling	95 (70-150)	May - June
Coho (hatchery)	Yearling	140 (131-156)	May-June
Chum (wild)	Fry	38 (33-50)	March - May

Notes and sources:

- Wild Chinook salmon data from Beamer et al. 2005 (yearling data) and Tulalip Tribes juvenile out-migrant trapping reports for the Skykomish River (average individual fish size, size range, and emigration timing data from Nelson et al. 2003; Nelson and Kelder 2005a; Nelson and Kelder 2005b).
- Wild steelhead individual size data and occurrence estimates from Shapovalov and Taft (1954) and WDFW juvenile out-migrant trapping reports (Volkhardt et al., 2006a, 2006b; Kinsel et al., 2007).
- Wild coho data for Skykomish River from Nelson and Kelder 2005b (smolts); Beachum and Murray 1990 and Sandecock (1991) (fry); parr size range extrapolated from smolt and fry data considering year-round residence.
- Wild chum data from Volkhardt et al. 2006a (Green River fall-run), and Tynan 2007 (Hood Canal summer-run).
- Hatchery-origin fish release size and timing data are average individual fish size and standard release timing targets as cited in ODFW's Hatchery Operation Plans for 2012 and submitted HGMPs. See Table 2 in Appendix A for specific details.

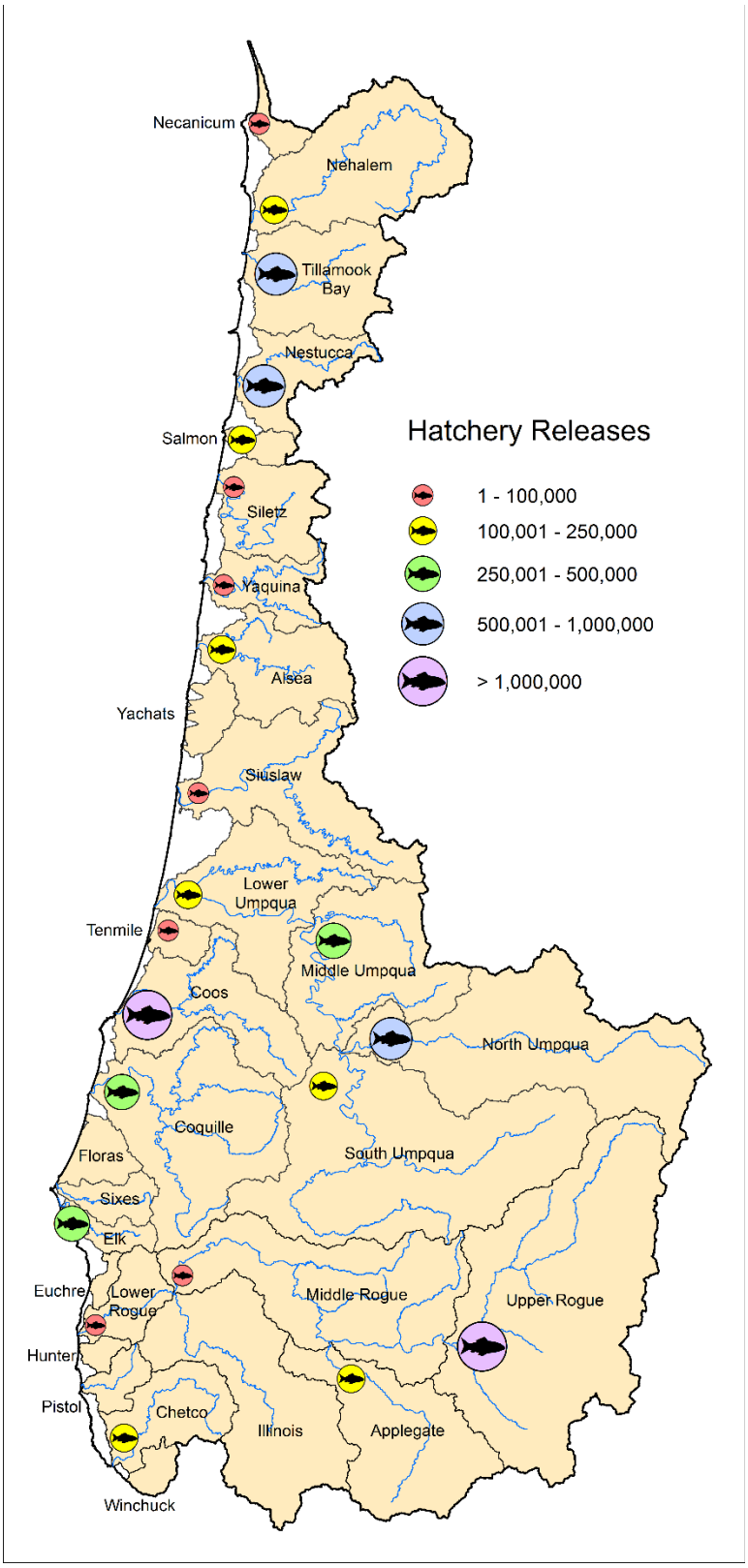


Figure 4. Location and size of hatchery programs within the Oregon Coast Region. Taken from ODFW (2014a).

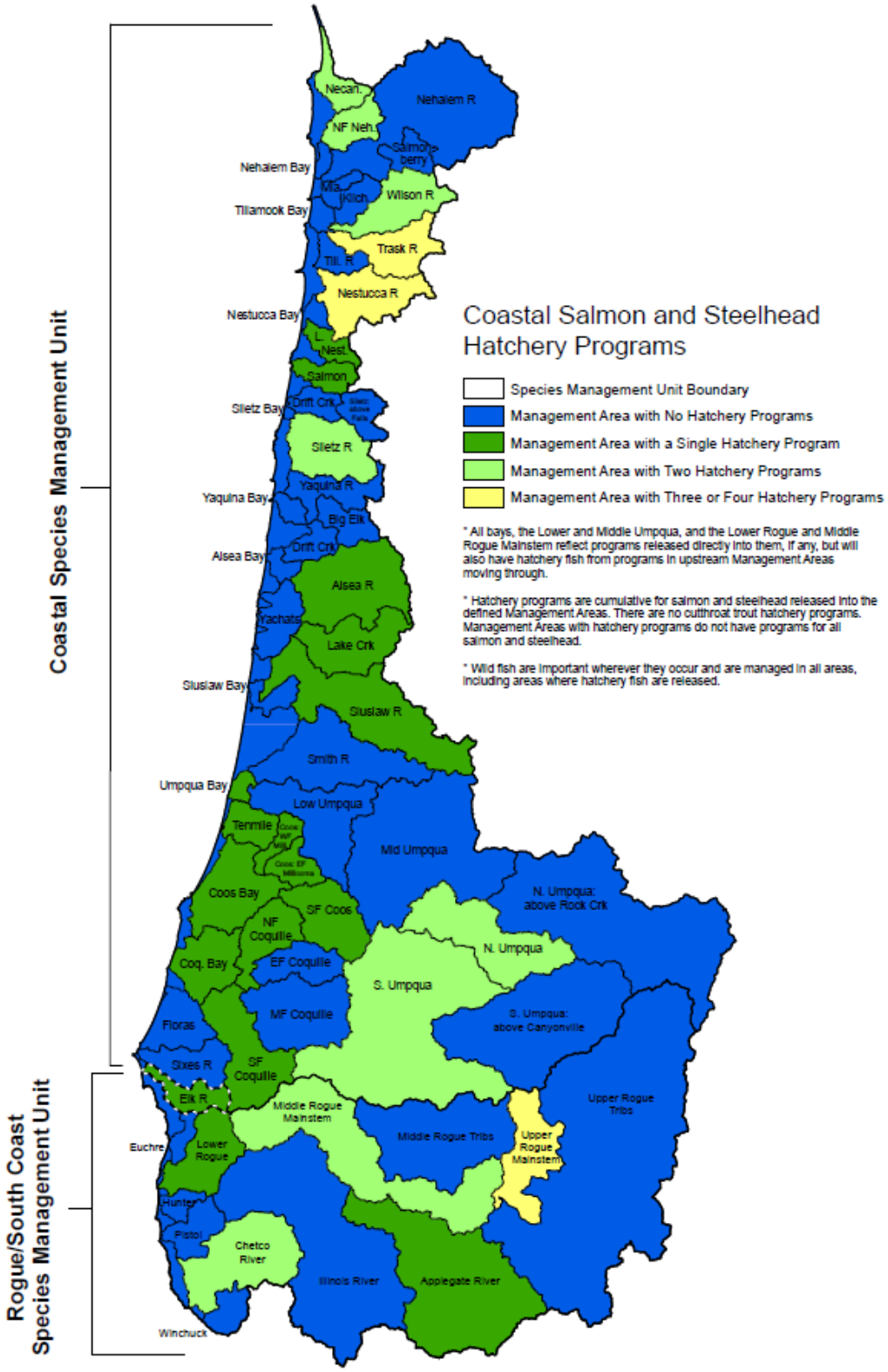


Figure 5. Map showing salmon and steelhead population areas with and without hatchery programs within the Oregon Coast Region. Taken from ODFW (2014a), with updates reflecting hatchery programs in 2016.

Effects of the Hatchery Programs

The existing hatchery programs along the Oregon Coast affect natural-origin salmon and steelhead and their habitat. The general mechanisms through which hatchery programs can affect natural-origin salmon and steelhead populations is described in Table 6. Below is a further explanation of these effects in general and for each species of salmon and steelhead along the Oregon Coast.

ODFW's Multi-Species Conservation and Management Plan (ODFW 2014a) approved in 2014 currently defines the management goals for naturally-spawning hatchery fish in the population areas of the Oregon Coast Region (Figure 6). These goals define the desired levels of pHOS for each hatchery program in each population area. Some hatchery programs have pHOS above identified goals, and others are in compliance with stated goals (Table 7). In areas where pHOS is above goals, reform actions have been identified by ODFW (2014a) to reduce pHOS. For more information on current pHOS levels, see the species-specific information below.

Table 6. General mechanisms through which hatchery programs can affect natural-origin salmon and steelhead populations.

Effect Category	Description of Effect
Genetics	• Hatchery-origin salmon and steelhead interbreeding with natural-origin fish in the wild can change the genetics of the affected natural population(s). • Hatchery-origin fish can alter the genetic integrity and/or genetic diversity of the affected natural population(s) depending upon the magnitude of interaction.
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.
Pathogen transfer	• Hatchery fish can have elevated levels of pathogens and bacteria from rearing in the hatchery which can be transferred to the natural-origin population from hatchery fish and/or release of hatchery effluent.

Hatchery facilities	• Hatchery facilities can reduce water quantity or quality in adjacent streams through water withdrawal and discharge of effluent.
	• Hatchery facilities at weirs and dams to collect broodstock and/or control hatchery 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, increase predation, and/or alter spawn timing and distribution
	  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
	• Impingement of downstream migrating fish

Natural population masking	o Hatchery-origin fish spawning naturally can mask the true status of the natural-origin population from hatchery supplementation.

Effect Category	Description of Effect
Fishing	• Fisheries targeting hatchery-origin fish can have incidental impacts on co-occurring natural-origin fish.
Population viability benefits	Depending upon the objective of the specific hatchery program, hatchery fish can potentially: • Increase the abundance of natural-origin fish from additional natural spawning in the wild. • Increase the productivity of the natural population from hatchery fish spawning and nutrient enhancement, particularly if abundance of natural-origin fish is low. • Preserve and/or increase the genetic and phenotypic diversity of the affected natural population, particularly for severely depressed populations.
Nutrient cycling benefits	• Returning hatchery-origin adults can increase the amount of marine-derived nutrients in freshwater systems from natural spawning and/or outplanting of carcasses from the hatchery.

Operation of the hatchery facilities and release of hatchery fish into the natural environment has affected natural-origin salmon and steelhead through genetic introgression of hatchery fish into the natural population, increased competition and predation from hatchery fish, transfer of pathogens from hatchery fish and/or the hatchery facility to the adjacent river or stream, operation of the hatchery facility using water and discharging effluent, masking of natural population status from having hatchery fish spawning in the wild, incidental fishing effects, and nutrient input from carcasses. The extent of adverse effects depends on how the hatchery program is managed, the current status of the natural-origin populations and how affected by the hatchery program, and the condition of the habitat; among other factors. Hatchery programs can also provide benefits to the natural-origin populations by increasing the amount of marine-derived nutrients to the freshwater environment from having hatchery fish spawn naturally and from the outplanting of carcasses from the hatchery facility. Hatchery programs can also potentially benefit the abundance, productivity, spatial structure, and diversity of natural populations (McElhany et al. 2000). None of the current hatchery programs within the Oregon Coast Region are managed for the supplementation or restoration of natural-origin populations. All of the hatchery programs are managed solely for fishery harvest opportunities.

Stratum	Basin/Population Area	Chinook	Spring Chinook	Chum	Winter Steelhead	Summer Steelhead	Cutthroat
North Coast	Necanicum	≤30 (<60/<90)	---	*N/A*	≤30	---	*N/A*
	Nehalem	<10	<10	*N/A*	≤10 (<30/<60)	---	*N/A*
	Tillamook	≤10 (<30/<60)	≤10 (<30/<60)	*N/A*	≤10 (<30/<60)	---	*N/A*
	Nestucca	≤10 (<30/<60)	≤30 (<60/<90)	*N/A*	≤30	---	*N/A*
Mid Coast	Salmon	≤30 (<60/<90)	---	*N/A*	<10	---	*N/A*
	Siletz	<10	<10	*N/A*	≤10 (<30/<60)	<5	*N/A*
	Yaquina	<10 [a]	---	*N/A*	<10	---	*N/A*
	Alsea	<10	<10	*N/A*	≤10 (<30/<60)	---	*N/A*
	Yachats Aggregate	<10	---	---	<10	---	*N/A*
	Siuslaw	<10	---	*N/A*	≤10 (<30/<60)	---	*N/A*
Umpqua	Lower Umpqua	≤10 (<30/<60)	---	*N/A*	<10	---	*N/A*
	Middle Umpqua	≤10 (<30/<60)	---	---	<10	---	*N/A*
	North Umpqua	---	≤10 (<30/<60)	---	<10	≤10 (<30/<60)	*N/A*
	South Umpqua	<10	<10	---	≤10 (<30/<60)	---	*N/A*
Mid-South Coast	Tenmile	---	---	*N/A*	≤30 (<60/<90)	---	*N/A*
	Coos	≤10 (<30/<60) [a]	---	*N/A*	≤10 (<30/<60)	---	*N/A*
	Coquille	≤10 (<30/<60)	<10	*N/A*	≤10 (<30/<60)	---	*N/A*
	Floras	<10	---	---	<10	---	*N/A*
	Sixes	<10	---	---	<10	---	*N/A*
	Elk	≤30	---	---	*out-of-SMU*	---	*out-of-SMU*

Figure 6. ODFW's population goals for hatchery fish spawning in the wild (ODFW 2014a). The values in parentheses are pHOS goals for the area where hatchery fish are released; where spawning by returning adult hatchery fish may be higher than observed throughout the rest of the population area. The values outside of the parentheses are the population goals.

Hatchery fish that spawn in the wild can interbreed with natural-origin fish and affect the genetic integrity of the natural population. Depending upon how the hatchery broodstock has been managed, hatchery fish that interbreed with natural fish can reduce the fitness of the wild population to varying degrees from inbreeding and outbreeding depression. The hatchery environment during early rearing of hatchery fish before release undergo different selection pressures than fish in the wild. This hatchery-influenced selection (often referred to as domestication) occurs in hatchery fish which can alter the genetic make-up of the natural-origin population. Consequently, when hatchery fish interbreed in the wild, genetic changes can occur to the wild population from the hatchery program depending upon the level of straying and interbreeding.

Table 7. Recent estimates of pNOB, pHOS, and PNI (averages within the last five years) for all of the Oregon Coast hatchery programs. Blank cells denote no recent data was available. "NA" means not applicable to the hatchery program.

Hatchery Program	Recent pNOB	Recent pHOS	Recent PNI
Chetco River Fall Chinook	0.79	0.12	0.87
Chetco River Winter Steelhead	0.71	0.04	0.95
Rogue River Spring Chinook	0.20	0.10	0.67
Rogue River Summer Steelhead	0.46	0.10	0.82
Rogue River Winter Steelhead	0.41	0.10	0.80
Rogue/Applegate River Winter Steelhead	0.30	0.10	0.75
Indian Creek STEP Fall Chinook	0.39	0.03	0.93
Elk River Fall Chinook	0.10	0.51	0.16
Coquille River Winter Steelhead	0.40	0.15	0.73
Coquille River Fall Chinook	0.80	0.10	0.89
Coos River Fall Chinook	0.30	0.20	0.60
Coos River Winter Steelhead	0.30	0.15	0.67
Coos Bay Spring Chinook	na	na	na
Tenmile Lakes Winter Steelhead	0.50	0.15	0.77
Tenmile Lakes Rainbow Trout	na	na	na
North Umpqua River Spring Chinook	0.15	0.12	0.57
North Umpqua River Summer Steelhead	1.00	0.01	0.99
Lower Umpqua River Fall Chinook	0.25	0.11	0.69
South Umpqua River Coho	0.01	0.05	0.17
South Umpqua River Winter Steelhead	0.60	0.04	0.94
Munsel Creek Coho (STEP)	1.00	0.01	0.99
Siuslaw River Winter Steelhead	0.27	0.16	0.63
Alsea Hatchery/Lakes Rainbow Trout	na	na	na
Alsea River Winter Steelhead	0.30	0.22	0.58
Yaquina Bay Spring Chinook	na	na	na
Siletz River Winter Steelhead	1.00	0.16	0.86
Siletz River Summer Steelhead	0.01	0.16	0.06
Salmon River Fall Chinook	0.50	0.50	0.50
Nestucca River Summer Steelhead	0.00		
Nestucca River Spring Chinook	0.00	0.72	0.00
Little Nestucca River Spring Chinook	0.00	0.72	0.00
Nestucca River STEP Fall Chinook	0.30	0.05	0.86
Nestucca River Winter Steelhead	0.50	0.10	0.83
Wilson River Winter Steelhead (stock 121)	1.00	0.11	0.90
Wilson River Winter Steelhead (stock 47)	0.00	0.11	0.00
Trask River Coho	0.00	0.04	0.00
Trask River Fall Chinook	0.05	0.05	0.50
Necanicum River Fall Chinook	0.05	0.05	0.50
Trask River Spring Chinook	0.00	0.67	0.00
North Fork Nehalem Coho	0.00	0.02	0.00
Nehalem River Winter Steelhead	0.01	0.10	0.09
Necanicum River Winter Steelhead	0.01	0.10	0.09

Juvenile and adult hatchery fish can compete with and/or predate upon natural-origin salmon and steelhead. Hatchery fish can be much larger than co-occurring natural-origin fish (Table 5); making them vulnerable to predation during the period when the hatchery fish emigrate to the ocean. Hatchery fish can residualize in freshwater and not emigrate to the ocean, which promotes competition with co-occurring natural fish if resources are limited. The density of hatchery fish in freshwater and estuarine habitats of the population areas where hatchery programs exist is shown in Table 8. This metric provides a relative measure on the potential ecological interaction between hatchery and natural salmon and steelhead when they co-exist.

Hatchery programs can also introduce diseases and pathogens into natural fish populations. However, this is uncommon along the Oregon Coast because the hatchery programs all use salmon and steelhead from within the region that are naturally exposed to these diseases and pathogens. Hatchery facilities can result in elevated levels of disease and pathogen downstream of the hatchery facility effluent discharge. This is commonly caused by higher densities of fish rearing in the hatchery, which results in greater disease and pathogen levels in the hatchery than under natural conditions. Although poorly managed hatchery programs can increase disease and pathogen transfer risks, compliance with applicable protocols for fish health can effectively minimize this risk. The elevated levels of disease and pathogen are typically concentrated near the hatchery effluent and then are diluted by water as it discharges downstream. The higher concentration of disease and pathogens associated with hatcheries is typically localized and short-lived (Bartholomew et al. 2013).

Table 8. Relative density of hatchery fish released in salmon and steelhead population areas along the Oregon Coast. Values were calculated by dividing the total number of hatchery fish released (2016) in each population area by the number of acres in freshwater and in the estuary.

Population Area with Hatchery Fish Releases	Density of Hatchery Fish in Freshwater (per wateshed acre)	Density of Hatchery Fish in the Estuary (per estuary acre)
Necanicum	1.23	144
Nehalem	0.36	72
Tillamook	2.47	94
Nestucca	1.28	221
Salmon	3.17	342
Siletz	0.43	68
Alsea	0.48	58
Siuslaw	0.15	25
Umpqua	0.26	118
Tenmile	0.45	260
Coos	4.39	122
Coquille	0.47	293
Elk	4.32	879
Rogue	0.71	2670
Chetco	1.03	1363

The operation of hatchery facilities can affect salmon and steelhead by the withdrawal of water from adjacent streams and rivers, whereby decreasing the amount of habitat available for natural fish in the affected reach (Table 3). The discharge of effluent from the hatchery facility can expose natural fish to elevated levels of bacteria and viruses. Both of these potential effects are described above in Section 3.2, Water Quantity and Section 3.3, Water Quantity.

Hatchery fish can mask the true status of natural populations if straying and spawning by hatchery fish in the wild is substantial (Table 7). The continual supplementation of natural spawning by hatchery fish (intentional or unintentional) can increase production and thereby increase uncertainty of the status of the natural population to sustain itself without hatchery influence. Along the Oregon Coast, most natural populations currently have low percentage of hatchery fish on the spawning grounds (e.g., 0 to 10

percent). Therefore, managers are able to evaluate the true status of the natural population because hatchery influence is relatively minor. Two notable exceptions identified by ODFW (2014a) are fall Chinook salmon hatchery programs in the Salmon and Elk Rivers. Management actions have recently been taken to reduce hatchery Chinook salmon spawning in these natural populations.

Hatchery programs provide fish for fishery harvest opportunities in the ocean and freshwater. Natural-origin salmon and steelhead are affected by these fisheries to some degree. In most cases along the Oregon Coast, hatchery and natural-origin salmon can be harvested, so it is difficult to precisely estimate the effects of fishing on hatchery fish. For steelhead, many fisheries along the Oregon Coast allow only the retention of hatchery steelhead, with all natural-origin steelhead released unharmed. The incidental effects of these catch-and-release fisheries on steelhead along the Oregon Coast typically range from 0 to 10 percent mortality on natural-origin fish.

Hatchery programs may also maintain and/or increase salmonid abundance and productivity, spatial structure, and diversity. However, none of the hatchery programs within the Oregon Coast Region are managed to provide these benefits to natural populations. Still, natural spawning by hatchery fish occurs because collection efficiency at the hatchery facilities is not 100 percent and salmon and steelhead by nature can stray and spawn in the wild. The recent level of hatchery fish spawning in the wild depends upon the species, run type, and specific population. Further information is provided below for each species.

The current hatchery programs have benefitted natural-origin salmon and steelhead by providing additional hatchery fish returns to the freshwater ecosystem, thereby enhancing the amount of marine-derived nutrients available from the decomposed carcasses (Table 7). Marine-derived nutrients are important to the coastal temperate streams of the Project Area, because streams in those areas tend to be low in terrestrial nutrients; the return of anadromous fish from the ocean environment acts as a key mechanism for bringing nutrients into the freshwater ecosystems (Cederholm et al. 1999). The carcasses can provide food for aquatic and terrestrial species via direct consumption. The carcasses can also decompose with the primary nutrients available in the water and deposited in the sediments which are then available for primary production by plants and animals. Both of these pathways increase the productivity of the freshwater environment from salmon and steelhead carcasses.

The proposed action includes the benefit of marine-derived nutrients into the freshwater environment from hatchery fish returns. Hatchery fish that are not harvested or collected at hatchery facilities can

spawn in the wild and contribute marine derived nutrients to the environment. This occurs at low levels in the natural populations where the hatchery programs exist. In addition, hatchery fish collected at the facilities in excess of broodstock needs can be outplanted in streams for nutrient enhancement after routine fish health testing to ensure carcasses are not carrying non-endemic pathogens and diseases, to avoid elevating the level of risk of diseases and pathogens in the wild. In most years, tens of thousands of hatchery fish carcasses (spring Chinook, fall Chinook, and coho salmon, and winter and summer steelhead) are available for outplanting for nutrient enhancement within the Oregon Coast Region. In 2012, more than 16,336 hatchery fish carcasses were outplanted within the Oregon Coast Region (ODFW 2013d). The location of hatchery fish carcass outplantings occurs primarily in the watersheds where the hatcheries are located (Rogue, Elk, Coquille, Coos, Umpqua, Siuslaw, Alsea, Nestucca, Trask, Nehalem Rivers; Figure 1). Most of the hatchery carcass outplanting occurs in the smaller tributary areas where spawning and rearing of resident fish, salmon, and steelhead occurs (ODFW 2013d). Outplanting of hatchery fish is typically limited by the availability of hatchery staff to conduct the work (and funding) throughout the year and not limited by the number of hatchery fish carcasses. Based upon the abundance of hatchery-origin and natural-origin salmon and steelhead returns in the project area (see the specific species sections below for abundance information), far fewer than 20 percent of naturally spawning salmon and steelhead in the wild have been hatchery-origin fish (including outplants of hatchery fish carcasses; Figure 9; ODFW 2014a). More than 80 percent of the marine-derived nutrients available to the freshwater environment have come from natural-origin salmon and steelhead carcasses in the project area.

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) designated Essential Fish Habitat (EFH) for Pacific salmon, which includes Chinook and coho salmon along the Oregon Coast. The consultation requirement of section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. The MSA (section 3) defines EFH as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. Adverse effects include the direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects on EFH may result from actions occurring within EFH or outside EFH, and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH. Chapter 4, Environmental Consequences, evaluates the effects of the alternatives on EFH. In its evaluation of the HGMPs, NMFS will include analysis of the effects of the

proposed action on EFH. For the purposes of this NEPA analysis, effects on habitat – and, in particular, designated critical habitat – will include effects on EFH.

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 Mitchell Act Hatchery Programs (NMFS 2014).

3.4.1. Oregon Coastal Coho Salmon

In the project area, two ESUs for coho salmon exist: Oregon Coast ESU and Southern Oregon/Northern California Coast ESU (SONCC) (Figure 7). Both of these ESUs are listed as threatened under the ESA (70 FR 37160, June 28, 2005; 76 FR 35755, June 20, 2011). Cape Blanco (the most westerly point on the Oregon Coast) is the boundary line between these ESUs. A total of 70 independent and dependent populations of coho salmon have been identified within the Oregon Coast Region (56 populations for Oregon Coast ESU and 14 populations on the Oregon side of SONCC ESU; Williams et al. 2006; Stout et al. 2012). All of the hatchery facilities are located within the larger, independent coho salmon populations (Figure 1). The coho hatchery programs exist in the independent population areas of the Nehalem, Tillamook, South Umpqua, and Rogue watersheds.

VSP biological data (i.e. abundance, productivity, diversity, and distribution) is available for the Oregon Coast and SONCC coho salmon ESUs. Information is available for the status of the Oregon Coast ESU because of the long-term monitoring program by ODFW under the Oregon Plan for Salmon and Watersheds. Information for coho salmon in the SONCC ESU is much more limited. For the Oregon Coast ESU, spawner abundance estimates are available for all of the populations in this ESU since the 1990's. This data provides estimates of abundance, productivity, pHOS, and spawning distribution. In addition, there are seven long-term life-cycle monitoring sites for juvenile coho salmon that have been operating since 1997 throughout the Oregon Coast ESU. The juvenile coho salmon information provides an indicator of smolt production for the ESU because not every population is monitored (Suring et al. 2015). For the SONCC coho salmon ESU, data on juvenile and adult coho salmon abundance is much more limited. The long-term adult return dataset is only available from Huntley Park sampling on the lower Rogue River. There are no other long-term datasets (>10 years) for the Oregon portion of the SONCC ESU for adult or juvenile coho salmon.

For the Oregon Coast ESU, the abundance of coho salmon has decreased substantially over the last century (Figure 8; Figure 9; Stout et al. 2012). The lowest escapements on record occurred during the 1990s. Since this time, the abundance of coho salmon has been increasing with escapements ranging from 66,000 to 356,000 from 2000 to 2012 (ODFW 2013). The most abundant and productive coho populations occur in the Coquille, Coos, Tenmile, Tahkenitch, and Siltcoos populations (Stout et al. 2012). The most recent status review cited continued concerns regarding poor productivity, degraded freshwater habitat, and poor overwinter survival in the other populations (Stout et al. 2012). Since most of the coho salmon hatchery programs have been terminated since ESA listing, hatcheries are no longer a limiting factor for the ESU (Stout et al. 2012). The hatchery reforms due to ESA-listing in the late 1990s which substantially curtailed hatchery releases of coho salmon in the Oregon Coast ESU substantially reduced the impacts of hatchery fish on natural-origin coho salmon populations. Buhle et al. (2009) evaluated the reduction of hatchery coho salmon releases in the ESU and concluded there was an approximately 20 percent increase in productivity from the reductions in pHOS. Productivity increased by another seven percent from the reductions in ecological impacts associated with hatchery coho salmon smolt releases interacting with natural-origin coho salmon. Therefore, approximately 27 percent of the improvements to the status of coho salmon in the Oregon Coast ESU could be attributed to the hatchery reform actions taken since ESA listing (Buhle et al. 2009). The rest of the observed improvements to the status of natural-origin coho salmon in the ESU were attributed to freshwater habitat capacity and improved marine survival.

The recovery plan for Oregon Coast coho salmon states hatchery programs are currently a “low” cause of concern (NMFS 2016a). ODFW (2005) cited concerns over naturally spawning hatchery coho in the North Umpqua River and Salmon River populations, which resulted in the termination of the hatchery programs in 2008. Most of the natural populations have no hatchery coho salmon spawning in the wild (Stout et al. 2012). Hatchery coho salmon are found spawning naturally in the independent populations (pHOS) where the hatchery programs exist (i.e., Rogue, Cow Creek (South Umpqua), Trask, and Nehalem Rivers). In 2014, pHOS was less than two percent in the Nehalem and Trask Rivers and eight percent in the South Umpqua population (ODFW 2016a). The average pHOS from 2009 through 2014 was 1.3 percent for the Oregon Coast ESU (range of zero to five percent per population; ODFW 2016a). The Sixes River and Floras Creek populations (no hatchery coho salmon released) have poor productivity (ODFW 2005). All of the hatchery coho salmon programs are in compliance with ODFW’s pHOS goals for natural-origin coho salmon (<10% pHOS; ODFW 2007). However, proportionate natural influence (PNI) metrics are low for the South Umpqua, Trask, and Nehalem hatchery programs because no natural-origin coho salmon have been incorporated into hatchery broodstocks (pNOB), resulting in PNI values of

zero to 0.17 (Table 7). If the submitted HGMPs are approved under the ESA, natural-origin coho salmon will be incorporated into hatchery broodstocks according to the criteria specified in the HGMPs; resulting in PNI values greater than 0.90.

Designated critical habitat for Oregon Coast coho salmon includes all estuarine areas and river reaches presently occupied by coho salmon within the boundaries of this ESU (73 FR 7816, February 11, 2008). Essential features of these habitats include adequate substrate (especially spawning gravel), water quality, water quantity, water temperature, water velocity, cover/shelter, food, riparian vegetation, space, and suitable migration conditions.

For the SONCC ESU, the abundance of coho salmon has decreased substantially over the last century. Recent status information is scarce for the ESU, with the most data available for the Rogue River Basin (Williams et al. 2011). Recent abundances of coho salmon for populations on the Oregon side of the ESU have all exhibited downward trends from 2000 to present (NMFS 2011). Populations of coho salmon in the Rogue River Basin are the most abundant and productive. Only one hatchery coho salmon program exists in this ESU (Cole Rivers Hatchery on the Rogue River). The incidence of naturally spawning hatchery coho salmon is always greatest in the populations where the hatchery fish are released. Hatchery coho salmon spawning naturally in the Rogue River (where hatchery coho salmon are released) has been less than five percent in recent years (ODFW 2015). All other coho salmon populations in the Oregon portion of the SONCC ESU are at very low abundance of natural-origin coho salmon and no hatchery coho salmon have been observed in recent years. Over the last four years, the marine survival of returning SONCC coho salmon (as indexed by Cole Rivers hatchery stock) has been extremely low and, consequently, escapements poor (Williams et al. 2011). The most recent status review cited continued concerns regarding poor productivity and degraded freshwater habitat for all populations (NMFS 2011).

Designated critical habitat for SONCC coho salmon includes all estuarine areas and river reaches presently occupied by coho salmon within the boundaries of this ESU (64 FR 24049, May 5, 1999). Essential features of these habitats include adequate substrate (especially spawning gravel), water quality, water quantity, water temperature, water velocity, cover/shelter, food, riparian vegetation, space, and suitable migration conditions.

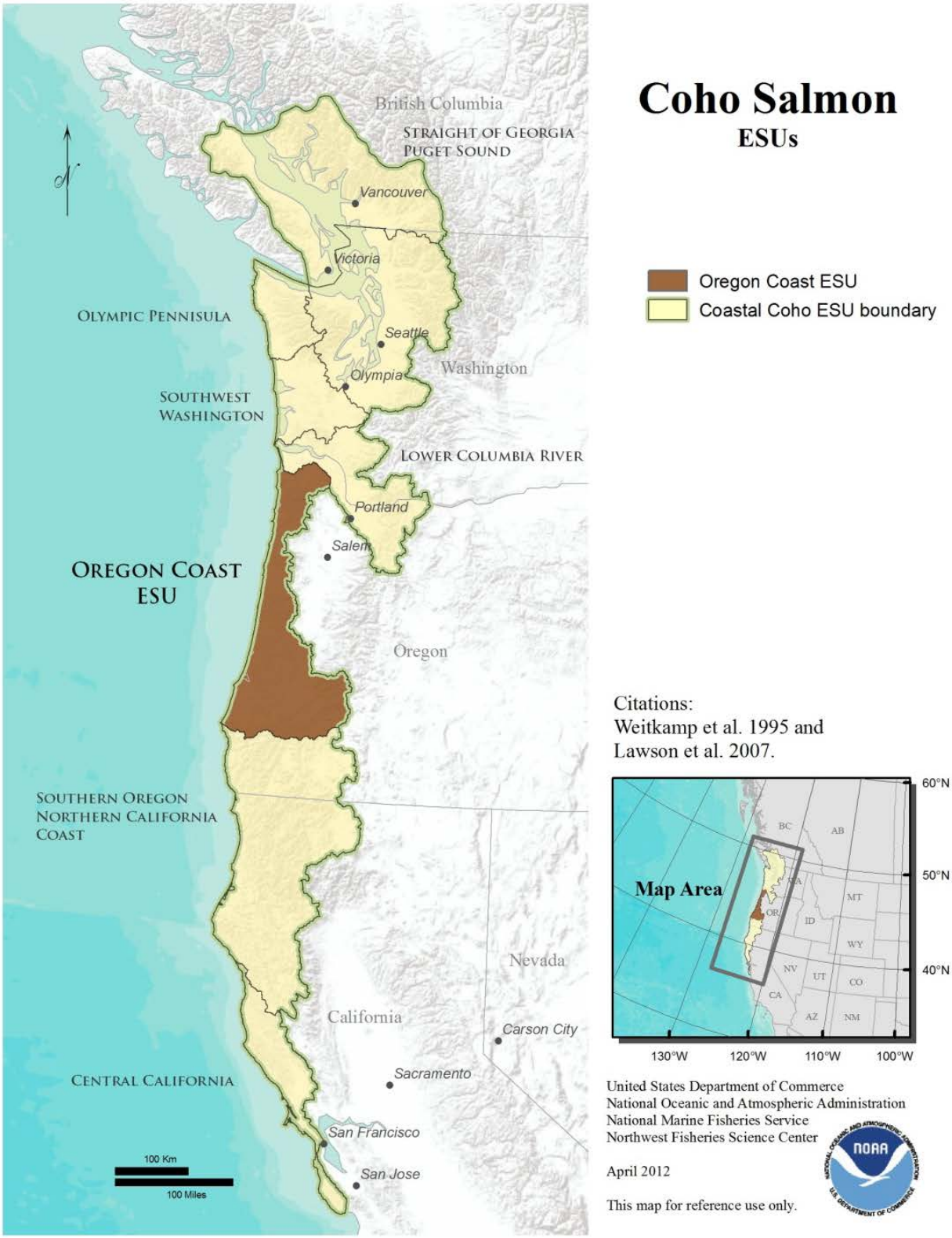


Figure 7. Map of West Coast coho salmon ESUs, including Oregon Coast and Southern Oregon Northern California Coast (SONCC). Taken from Stout et al. (2012).

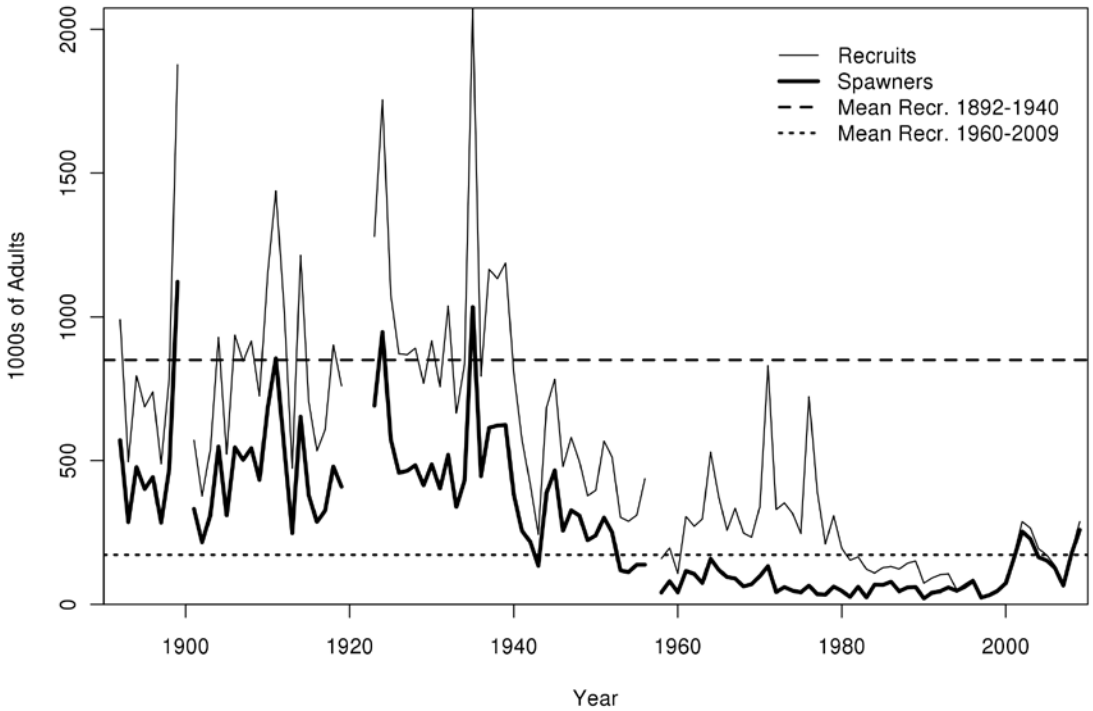


Figure 8. Comparison of historical (1892–1956) and recent (1958–2009) estimates of spawner abundance and preharvest recruits for the Oregon Coast Coho Salmon ESU. Horizontal lines are the geometric mean recruits for 1892–1940 and 1960–2009. Taken from Stout et al. (2012).

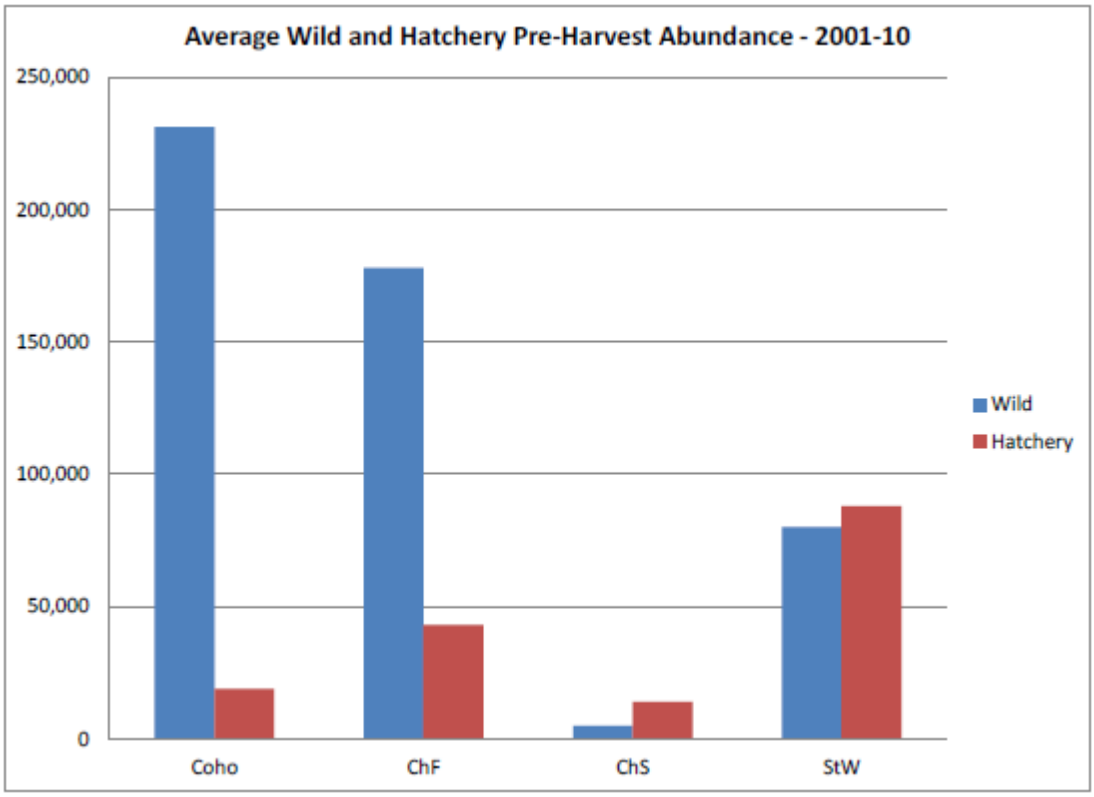


Figure 9. Estimated pre-harvest abundance of coho salmon, fall Chinook salmon, spring Chinook salmon, and winter steelhead from 2001 through 2010. Figure taken from ODFW (2014a). These numbers are only for populations in the Oregon Coast ESU (from Elk River to Necanicum River inclusive).

3.4.2. Oregon Coastal Chinook Salmon

Along the Oregon Coast, two ESUs for Chinook salmon are defined: the Oregon Coast ESU and the Southern Oregon California Coastal ESU (Myers et al. 1998). Neither of these ESUs is listed under the ESA (and no critical habitat has been designated under the ESA). Cape Blanco (in northern Curry County) is the boundary line between these ESUs. Within these ESUs, the fall Chinook salmon life history type is the most abundant and widespread (Myers et al. 1998). Fall Chinook salmon populations occur throughout the entire Oregon Coast Region (ODFW 2014a). Independent populations of spring Chinook salmon occur only in the Rogue and Umpqua Basins, which drain the Cascade Mountains. Smaller, remnant runs of spring Chinook salmon occur in the coast range basins of the Siletz, Tillamook, Nestucca, Coquille, and Alsea Rivers.

As described below, the overall status of Chinook salmon along the Oregon Coast has been determined to be viable, and did not warrant listing under the ESA. It is generally recognized fall Chinook populations throughout the Oregon Coast region are more abundant and productive based upon monitoring at a few

locations throughout the region and recreational and commercial fisheries information showing abundant catches. Periodic assessments of juvenile Chinook salmon have occurred in select locations, but there are no current long-term monitoring datasets in existence that NMFS is aware of. For the race of spring Chinook salmon, data is even more limited for most populations except the Rogue and North Umpqua populations. Adult population abundance estimates for the Siletz, Tillamook, Coquille, and Alsea rivers are sparse.

The most recent status assessments of Oregon Coastal Chinook salmon are found in ODFW (2005) and ODFW (2014a). These assessments evaluated the Viable Salmonid Population (VSP) parameters of abundance, productivity, spatial structure, and diversity (McElhany et al. 2000). ODFW (2014a) classified fall Chinook salmon as "strong" and spring Chinook salmon as "sensitive-vulnerable" in the Oregon Coast ESU. The abundance and productivity of fall Chinook salmon within the Oregon Coast Region has been relatively stable over the last several decades (ODFW 2014a). The average abundance of fall Chinook salmon in the Oregon Coast ESU has been more than 160,000 natural-origin fish over the last decade. An additional 50,000 to 100,000 natural-origin fall Chinook salmon are typically found in the populations of southern Oregon (Elk to Chetco).

Several populations of Chinook salmon along the Oregon Coast did not achieve ODFW's benchmark status criteria (ODFW 2005). Most of the fall Chinook salmon populations have zero hatchery-origin fall Chinook salmon on the spawning grounds. Recent information on the proportion of natural spawners that are of hatchery origin (pHOS) are shown in Table 7. The highest percentage of hatchery fall Chinook salmon spawning in the wild recently have been in the Elk and Salmon Rivers. In particular, genetic introgression of hatchery Chinook salmon was identified as a secondary limiting factor for fall Chinook salmon in the Elk and Salmon River populations (ODFW 2014a). The percentage of hatchery fall Chinook salmon on the spawning grounds in the Elk and Salmon Rivers ranges from 50 to 60 percent based upon anecdotal information (K. Goodson, ODFW, pers. comm., November 4, 2015). For other Chinook salmon populations where hatchery fall Chinook programs occur (e.g., Chetco, Coquille, Coos, Umpqua, Nestucca, Necanicum), pHOS is in the ranges from five to 20 percent (Table 7; K. Goodson, ODFW, pers. comm., November 4, 2015). For spring Chinook populations, the limited data shows pHOS is in the range of 50 to 87 percent for years 2005-2008 in the populations with poor natural production (i.e., Nestucca, Trask, Wilson; Stewart and Suring (2008)) and less than 10 percent long-term averages for the healthier natural spring Chinook populations (i.e., Rogue and North Umpqua; ODFW 2016b). Figure 6 shows ODFW's (2014a) goals for pHOS for natural-origin Chinook salmon populations along the Oregon Coast Region.

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) designated Essential Fish Habitat (EFH) for Pacific salmon, which includes Chinook salmon along the Oregon Coast. Chapter 4, Environmental Consequences, includes evaluation of the effects of the alternatives on EFH.

3.4.3. Oregon Coastal Chum Salmon

Along the Oregon Coast, chum salmon are currently only present along the northern Oregon coast (ODFW 2014a). These populations are included as part of the Pacific Coast ESU that occurs throughout the coastlines of Washington and Oregon (Johnson et al. 1997). This ESU is not listed under the ESA (and no critical habitat has been designated under the ESA). ODFW (2014a) stated chum salmon were "sensitive-critical". Poor productivity, low abundance, and reduced spatial distribution were the VSP parameters of most concern within the existing populations (ODFW 2014a). ODFW (2014a) also stated that the lack of specific information on the runs of chum salmon make status assessments difficult. No estimates are available on the recent abundance of chum salmon. The best available information is obtained through incidental catch of chum salmon while fishing for Chinook salmon. Even though this information is anecdotal and does not provide population estimates, it provides an indication of where chum salmon occur. The highest catch of chum salmon (all catch and release) occurs in the rivers entering Tillamook Bay. These rivers represent the highest abundances of chum salmon throughout the entire Oregon Coast. This is the extent of the best available information on chum salmon (ODFW 2014a). There are no hatchery chum salmon in these populations and pHOS is zero.

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) designated Essential Fish Habitat (EFH) for Pacific salmon, which includes chum salmon along the Oregon Coast. Chapter 4, Environmental Consequences, includes evaluation of the effects of the alternatives on EFH.

3.4.4. Oregon Coastal Steelhead

Along the Oregon Coast, two Distinct Population Segments (DPSs) of steelhead exist: Oregon Coast DPS and Klamath Mountains Province DPS (Busby et al. 1996). Neither of these DPSs is listed under the ESA (and no critical habitat has been designated under the ESA). Cape Blanco (in northern Curry County) is the boundary line between these DPSs. Both DPSs have winter-run and summer-run life history types. ODFW has listed steelhead in the Klamath Mountains Province as a sensitive species. For the Oregon Coast DPS, ODFW (2014a) described winter steelhead as "strong guarded" and summer

steelhead as "sensitive guarded." Essential Fish Habitat has not been defined under the MSA for steelhead.

Specific VSP biological data is summarized below for the Oregon Coast and Klamath Mountains Province steelhead DPSs. For the Oregon Coast DPS, long-term spawning trends are available for winter steelhead based upon redd expansions. This information is collected at a scale that represents several population areas throughout the DPS (Figure 11), and thus does not estimate population-specific abundances. Long-term adult monitoring (>10 years) is not available for Klamath Mountains Province steelhead. Previously, the best steelhead monitoring came from Gold Rey dam counts on the upper Rogue River; however this dam (and it's counting station) were removed. For juvenile steelhead, the best available information comes from the life-cycle monitoring stations throughout the Oregon Coast DPS (Suring et al. 2015). These stations provide the only measure of recent juvenile steelhead production along the Oregon Coast region.

The status of steelhead is measured by four VSP parameters: abundance, productivity, spatial structure, and diversity. Winter steelhead are most abundant and occur in every watershed along the Oregon Coast. The total abundance of winter steelhead along the Oregon Coast is not known annually, but likely exceeds an average of 100,000 natural origin fish (including southern Oregon populations; Figure 9; Figure 12; Figure 10). The overall abundance trends, as indexed by redd abundance, for winter steelhead have been stable over the last decade (Figure 10). In 2015, the estimated abundance of natural-origin winter steelhead in the Oregon Coast DPS was 106,435 fish (Jacobsen et al. 2015). There has been some variability in annual redd estimates within each monitoring area (Figure 11). For the southern Oregon Coast (border to Cape Blanco), in 2015 the estimated abundance was 2,863 winter steelhead (not including the Rogue River).

The percentage of hatchery winter steelhead on the spawning grounds in recent years ranges from approximately five percent in southern Oregon to a high of 22 percent in the mid-coast region of the Oregon Coast (Figure 10; Table 7; Jacobsen et al. 2015). Over a longer period of record, pHOS estimates for select winter steelhead populations are shown in Figure 12. Lindsay et al. (2001) also reported pHOS to be high for many winter steelhead populations in the 1990's when hatchery steelhead were being released from non-local broodstocks. It is important to note recent information for pHOS is not available at the individual steelhead population level due to statistical sampling methods employed by ODFW (see Jacobsen et al. 2015 for further sampling details). Recent spawning ground data and pHOS

is only available at a scale that represents several steelhead populations (Jacobsen et al. 2015). There are six geographic areas along the entire Oregon Coast region that have been sampled (Figure 11). Consequently, estimates of pHOS represents more of an average across populations for each management area, where hatchery programs occur in some populations and are not present in some steelhead populations. Consequently, it is likely the pHOS estimates are under-estimated in populations with hatchery programs and over-estimated in populations where hatchery programs do not exist because of averaging. It is important to note for the North Coast Management Area, hatchery steelhead are released in all of the population areas (i.e. the Necanicum, Nehalem, Tillamook, and Nestucca), and therefore, pHOS estimates likely reflect hatchery fish spawning in each population. This is not the case for the other Management Areas. Even with these limitations (that are typical of fisheries survey data), the recent estimates are still useful for evaluating the effects of hatchery programs on salmon and steelhead populations. Figure 6 shows ODFW's (2014a) goals for pHOS for natural-origin steelhead populations along the Oregon Coast Region.

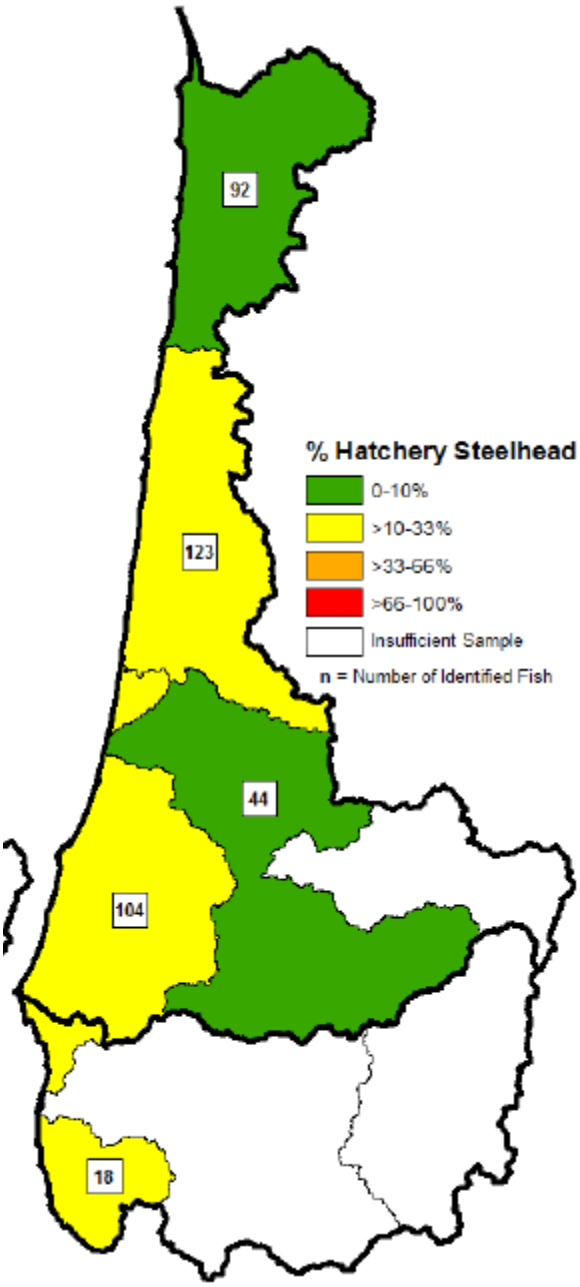


Figure 10. Percentage of hatchery steelhead (pHOS) found on spawning surveys in 2015. Figure taken from Jacobsen et al. (2015).

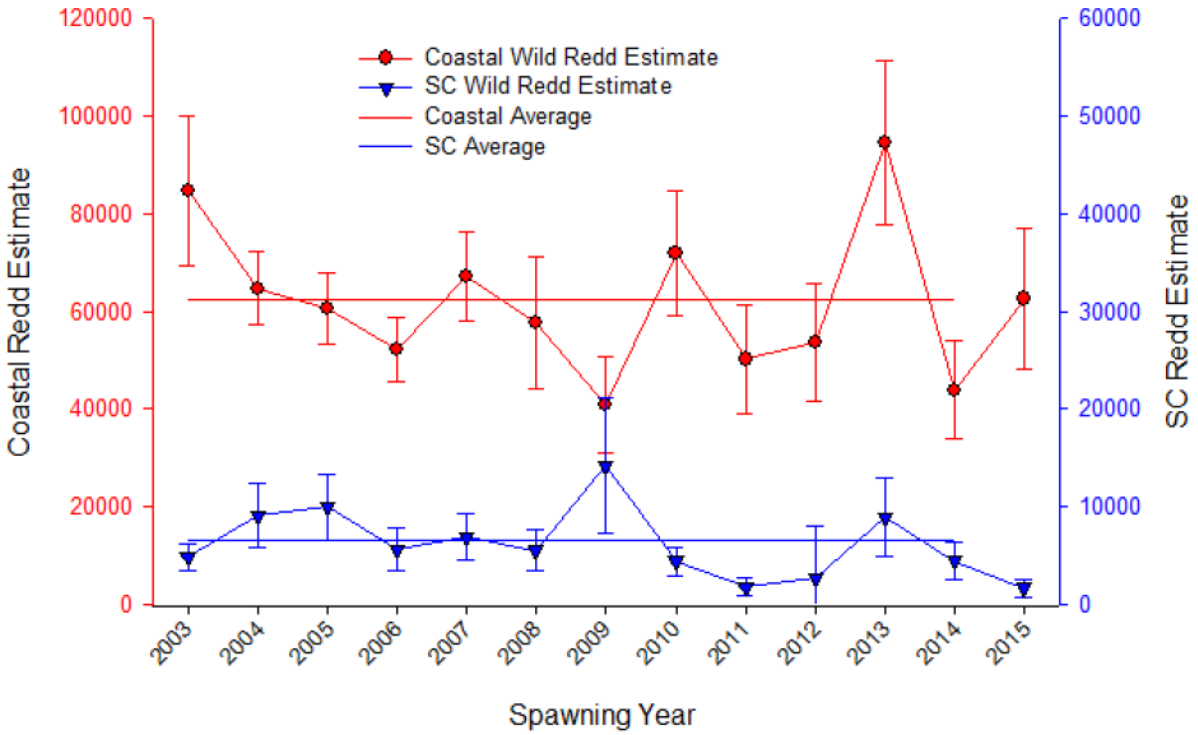


Figure 11. Estimated number of wild winter steelhead redds in the Oregon Coast DPS and South Coast MA, 2003 to 2015. Figure taken from Jacobsen et al. (2015).

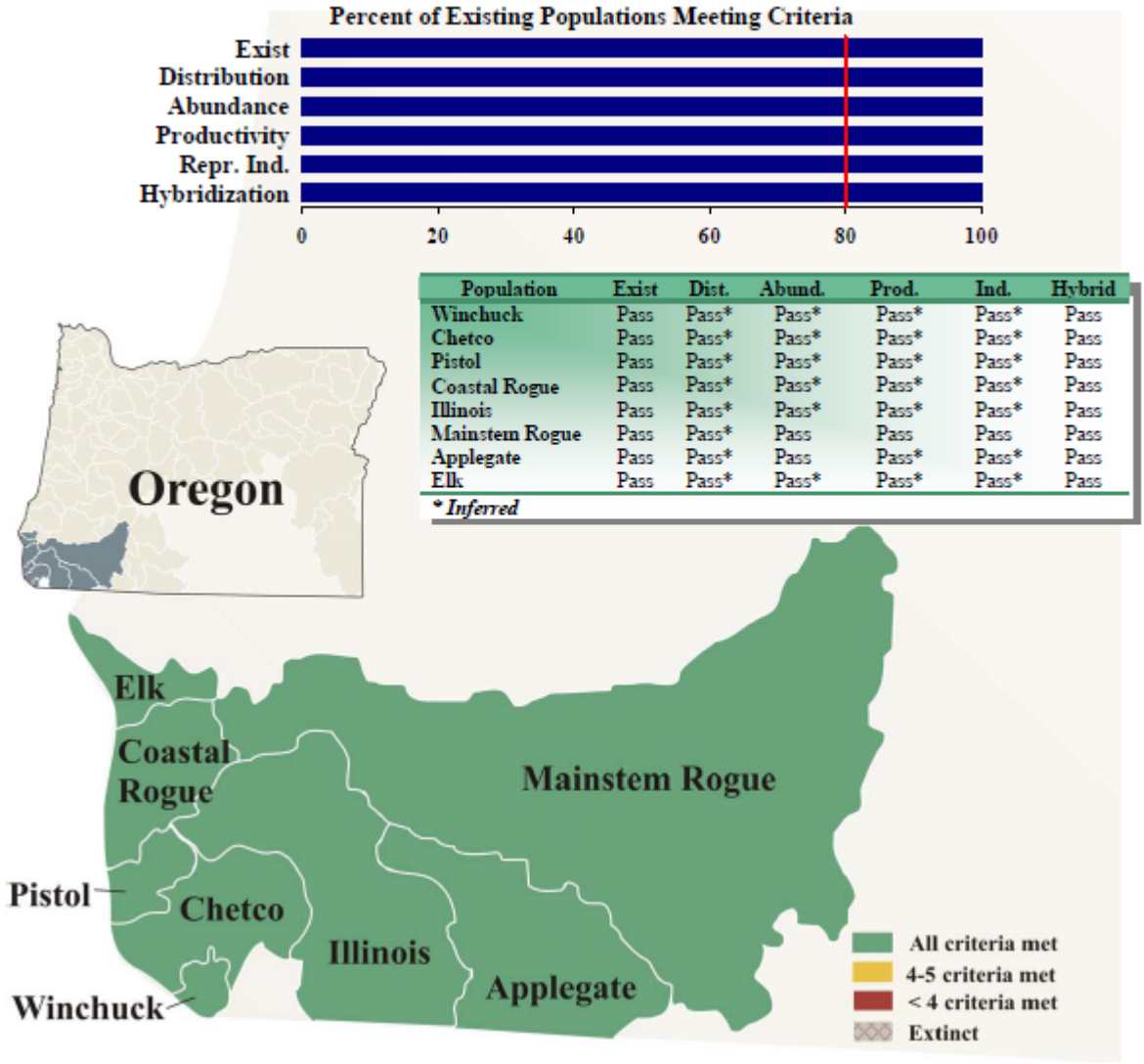
Year	Oregon Coast DPS				Klamath Mountains Province DPS	
	North Coast MA	Mid Coast MA	Mid-South Coast MA	Umpqua MA	South Coast MA	Rogue River MA
2003	28,726	18,092	11,853	26,044	4,852	7,105
2004	28,599	14,043	10,195	11,922	9,093	n.a.
2005	19,125	7,890	22,871	10,628	10,035	4,995
2006	21,065	13,496	19,550	8,786	5,667	7,372
2007	20,592	10,133	24,312	13,900	6,917	6,986
2008	11,859	12,628	18,806	15,556	5,520	5,822
2009	10,433	12,080	9,136	9,282	14,268	12,352
2010	18,928	16,684	19,927	16,266	4,430	n.a.
2011	9,961	19,347	9,504	11,394	1,808	n.a.
2012	15,864	19,074	7,414	11,416	2,738	n.a.
2013	29,371	27,927	15,423	21,895	8,961	n.a.
2014	14,185	9,012	10,877	9,791	4,449	n.a.
2015	24,641	15,443	11,548	10,975	1,682	n.a.

Figure 12. Annual redd estimates of natural origin winter steelhead by monitoring area. Figure taken from Jacobsen et al. (2015). Highlighted areas do not include estimates for areas above counting stations (i.e. Winchester Dam on the North Umpqua River and Gold Ray Dam (now gone) on the Rogue River).

Estimate area	Scale	Year(s)	pHOS	sample size
Necanicum	Population	2003-2012 combined	63%	30
		2013-2015 combined	11%	9
Nehalem	Combined Pops	2003-2012 combined	19%	196
		2013-2015 combined	3%	86
Nehalem Mainstem	Population	2003-2012 combined	2%	132
		2013-2015 combined	2%	51
NF Nehalem	Population	2003-2012 combined	56%	64
		2013-2015 combined	6%	35
Wilson	Population	2003-2012 combined	11%	151
		2013-2015 combined	4%	25
Tillamook Bay	Combined Pops	2003-2012 combined	8%	294
		2013-2015 combined	1%	69

Figure 13. Average pHOS estimates for select winter steelhead populations over many years (Bradley 2016).

The distribution of summer steelhead along the Oregon Coast is limited to the Siletz, North Umpqua, and Rogue Rivers (ODFW 2005; ODFW 2014a). Natural-origin summer steelhead are not present in other basins along the Oregon Coast. The average abundance of adult summer steelhead in the three populations where they occur (Rogue, North Umpqua, and Siletz) likely ranges from 10,000 to 20,000 natural-origin fish. For the Klamath Mountains Province ESU, the Oregon populations were last assessed in 2005 (Figure 12; Figure 13)(ODFW 2005). The most recent status assessments by ODFW (2005) and ODFW (2014a) for summer steelhead within the Oregon Coast Region show the populations exceeding their VSP benchmark criteria (Figure 13). However, due to the lack of recent monitoring, there is some uncertainty regarding the genetic and ecological effects of hatchery fish in the populations where they occur in the Oregon Coast ESU (ODFW 2014a).



Population	Exist	Dist.	Abund.	Prod.	Ind.	Hybrid
Winchuck	Pass	Pass*	Pass*	Pass*	Pass*	Pass
Chetco	Pass	Pass*	Pass*	Pass*	Pass*	Pass
Pistol	Pass	Pass*	Pass*	Pass*	Pass*	Pass
Coastal Rogue	Pass	Pass*	Pass*	Pass*	Pass*	Pass
Illinois	Pass	Pass*	Pass*	Pass*	Pass*	Pass
Mainstem Rogue	Pass	Pass*	Pass	Pass	Pass	Pass
Applegate	Pass	Pass*	Pass	Pass*	Pass*	Pass
Elk	Pass	Pass*	Pass*	Pass*	Pass*	Pass

** Inferred*

Figure 14. Southern Oregon Coast winter steelhead population status report. The criteria are existence, distribution, abundance, productivity, reproductive independence, and hybridization. Figure taken from ODFW (2005).

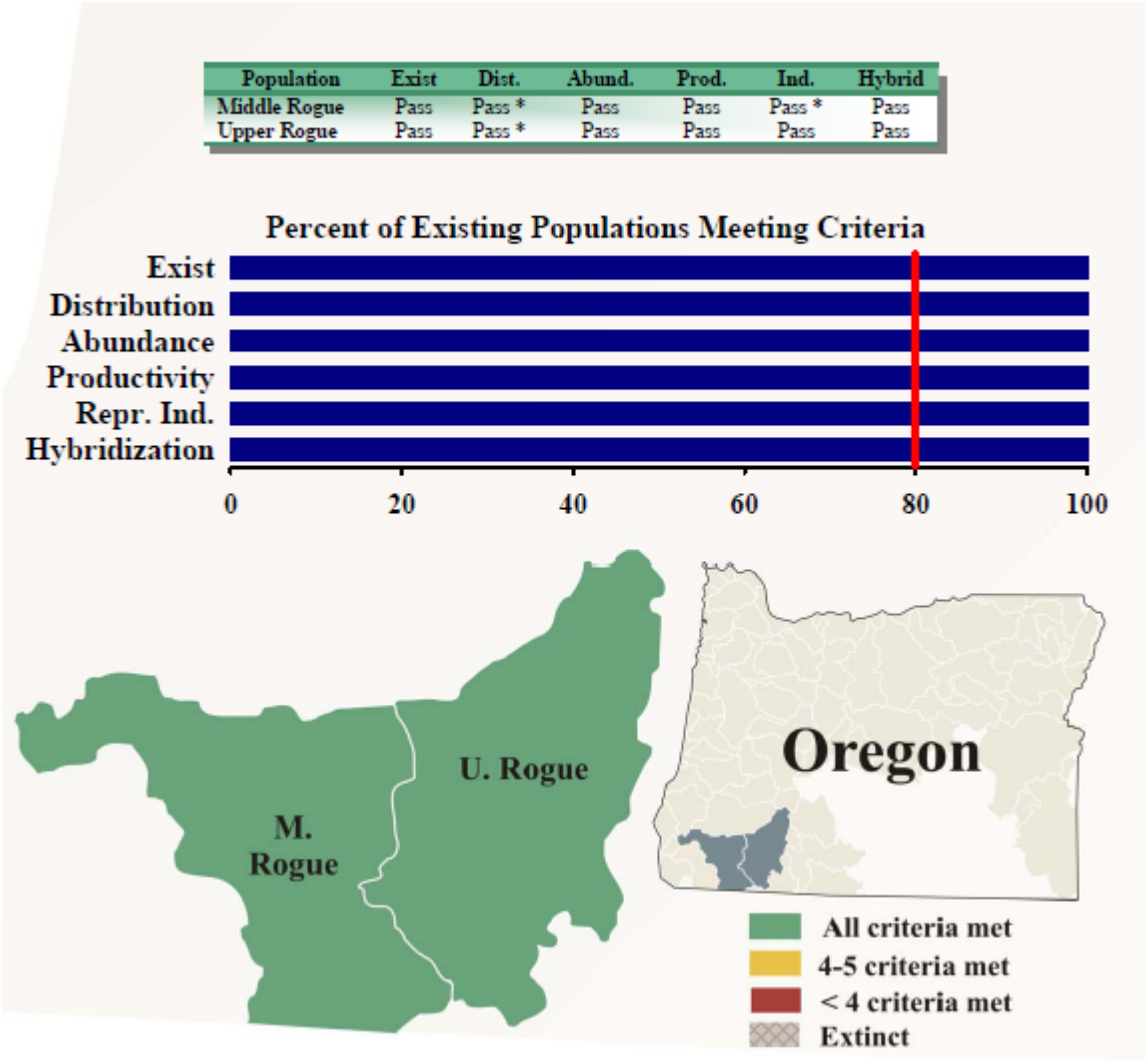


Figure 15. Rogue River summer steelhead population status report. The criteria are existence, distribution, abundance, productivity, reproductive independence, and hybridization. Figure taken from ODFW (2005).

3.5. Other Fish and Their Habitats

This section includes other fish species (not salmon and steelhead) along the Oregon Coast that have a relationship with hatchery fish either as prey, predators, or competitors (Table 9). Generally, impacts would occur (1) through competition for space or food used by hatchery fish, and other fish in the analysis area, or (2) if hatchery fish are prey for other fish species or vice-versa. In the freshwater habitat areas of the Oregon Coast Region, all resident fish species may compete with, be predators of, and/or serve as prey for hatchery fish depending upon the life stage and time of year (Table 9). In marine areas, juvenile salmon and steelhead are prey for most marine fish species. Sub-adult and adult salmon and steelhead may prey upon many forage fish such as anchovy, herring, sardine, and smelt.

Resident hatchery rainbow trout are stocked into many reservoirs, lakes, and ponds throughout the Oregon Coast Region. Hatchery trout are stocked as fingerlings and legal-sized fish (>8 inches in length). No hatchery trout are stocked into free-flowing rivers and streams where anadromous salmon and steelhead are currently present. The current stocking locations of hatchery trout along the Oregon Coast is described in ODFW (2014b).

In addition to coho salmon, there are two other fish species listed under the ESA within the Oregon Coast Region. The southern Eulachon DPS and the southern Green Sturgeon DPS are both listed as threatened under the ESA. Critical habitat has been designated for the southern DPS of Pacific eulachon (76 FR 65324, October 20, 2011). Along the Oregon Coast, only the Umpqua River estuary and lower Tenmile Creek are designated as eulachon critical habitat. The specific habitat features described are for migration and spawning of adult eulachon in the tidally influenced areas.

The southern Green Sturgeon DPS includes spawning populations south of the Eel River in California. The only known spawning area occurs in the Sacramento River (74 FR 52300, October 9, 2009). However, sub-adult and adult green sturgeon may migrate north and be found along the Oregon Coast. Critical habitat has been designated for the southern DPS of green sturgeon in the estuaries of the Rogue, Coos, Umpqua, Siuslaw, Alsea, Yaquina, Tillamook, and Nehalem Rivers (74 FR 52300, October 9, 2009). These areas may be used by sub-adult and adult green sturgeon for feeding.

Essential fish habitat (EFH) has been described under the MSA for most of the marine groundfish and pelagic species specified in Table 9. The MSA defines EFH as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” This includes aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include areas historically used by fish. The purpose of EFH is to conserve the habitat required to support a sustainable fishery and ensure the managed species’ contribute to a healthy ecosystem throughout the full life cycle of the species.

Pacific lamprey, river lamprey, Western Brook lamprey, coastal cutthroat trout, Millicoma dace, and Umpqua chub are Federal “species of concern” (Table 9). Lamprey and cutthroat trout are found throughout the Oregon Coast Region. Millicoma dace is found exclusively in the Coos Bay Basin. Umpqua chub inhabits the Umpqua River basin. All of these fish species may prey upon certain life stages of salmon and steelhead.

In the analysis area, all of the hatchery facilities may intercept and/or attract these fish species because water is used during operation. The inlet and outlet water discharge for the 10 hatchery facilities are screened to prevent fish from entering the facilities. During collection of returning hatchery salmon and steelhead, any other fish species that are incidentally collected are returned back to the river unharmed. For other broodstock collection and smolt release locations, the standard protocol is to release all other fish unharmed. Rainbow and cutthroat trout, pikeminnow, dace, sculpin, and sucker are the most common fish species incidentally captured and released within the Oregon Coast Region. The hatchery collection facilities are designed specifically to capture and collect adult salmon and steelhead. Most of the non-salmonid species commonly occurring in the Affected Environment are smaller-sized fish and thus freely pass through the facilities unimpeded and are not captured. Non-target species typically are less than five percent of the total catch.

Table 9. Range and status of other fish species that may interact with Oregon Coast salmon and steelhead. This is not an exhaustive list of fish species, but includes the fish most abundant and widespread in the analysis area.

Species	Range along the Oregon Coast	Federal/State Listing Status	Type of Interaction with Hatchery Fish in Analysis Area
Southern Eulachon	Lower Umpqua, lower Tenmile Creek	Federally listed threatened	• Potential prey item for adult salmon and steelhead • May benefit from additional marine-derived nutrients provided by hatchery-origin fish
Green sturgeon	Estuaries of the Rogue, Coos, Umpqua, Siuslaw, Alsea, Yaquina, Tillamook, and Nehalem Rivers	Southern DPS Federally listed threatened. Northern DPS Federal species of concern	• Predator of juvenile and adult salmon and steelhead. • May benefit from additional marine-derived nutrients provided by hatchery-origin fish
White sturgeon	Estuaries of Nehalem, Tillamook, Nestucca, Salmon, Siletz, Yaquina, Alsea, Siuslaw, Umpqua, Coos, Rogue, Chetco watersheds.	Not listed	• Predator of juvenile and adult salmon and steelhead. • May benefit from additional marine-derived nutrients provided by hatchery-origin fish
Pacific, river, and brook lamprey	All accessible reaches within watersheds of the Oregon Coast	Not listed. Pacific lamprey and river lamprey are Federal species of concern. Pacific lamprey are Oregon sensitive species	• Potential prey item for adult salmon and steelhead • May interact with salmon and steelhead for space on spawning grounds • May be a parasite on salmon and steelhead while in marine waters • May benefit from additional marine-derived nutrients provided by hatchery-origin fish
Rainbow trout	All accessible reaches within watersheds of the Oregon Coast	Not listed	• Predator of salmon and steelhead eggs and fry • Potential prey item for adult salmon and steelhead • May compete with salmon and steelhead for food and space • May interbreed with steelhead • May benefit from additional marine-derived nutrients provided by hatchery-origin fish

Species	Range along the Oregon Coast	Federal/State Listing Status	Type of Interaction with Hatchery Fish in Analysis Area
Coastal cutthroat trout	All accessible reaches within watersheds of the Oregon Coast	Not listed. Federal species of concern	• Predator of salmon and steelhead eggs and fry • Potential prey item for adult salmon and steelhead • May compete with salmon and steelhead for food • May benefit from additional marine-derived nutrients provided by hatchery-origin fish
Millicoma dace	All accessible reaches within watersheds of Coos Bay	Not listed. Federal species of concern	• Predator of salmon and steelhead eggs and fry • May compete with salmon and steelhead for food • May benefit from additional marine-derived nutrients provided by hatchery-origin fish
Umpqua, longnose, speckled dace	All accessible reaches within watersheds of the Oregon Coast	Not listed	• Predator of salmon and steelhead eggs and fry • May compete with salmon and steelhead for food • May benefit from additional marine-derived nutrients provided by hatchery-origin fish
Redside shiner	All accessible reaches within watersheds of the Oregon Coast	Not listed	• May compete with salmon and steelhead for food and space • May benefit from additional marine-derived nutrients provided by hatchery-origin fish
Sculpin (genus *Cottus* and *Leptocottus spp.*)	All accessible reaches within watersheds of the Oregon Coast	Not listed	• Predator of salmon and steelhead eggs and fry • May compete with salmon and steelhead for food • May benefit from additional marine-derived nutrients provided by hatchery-origin fish
Largescale sucker	All accessible reaches within watersheds of the Oregon Coast	Not listed	• Predator of salmon and steelhead eggs and fry • May compete with salmon and steelhead for food • May benefit from additional marine-derived nutrients provided by hatchery-origin fish

Species	Range along the Oregon Coast	Federal/State Listing Status	Type of Interaction with Hatchery Fish in Analysis Area
Northern pikeminnow	All accessible reaches within watersheds of the Oregon Coast	Not listed	• Freshwater predator on salmon and steelhead eggs and juveniles • May compete with salmon and steelhead for food • May benefit from additional marine-derived nutrients
Umpqua chub	Umpqua River Basin	Not listed. Federal species of concern	• May compete with salmon and steelhead for food • May benefit from additional marine-derived nutrients provided by hatchery-origin fish
Smallmouth bass	Mainstem Umpqua, South Umpqua, Coquille	Non-native species	• Freshwater predator of salmon and steelhead • May benefit from additional marine-derived nutrients provided by hatchery-origin fish
Largemouth bass	Coastal lakes	Non-native species	• Freshwater predator of salmon and steelhead • May benefit from additional marine-derived nutrients provided by hatchery-origin fish
Other centrarchids (bluegill, crappie, pumpkinseed)	Coastal lakes	Non-native species	• Freshwater predator of salmon and steelhead • May benefit from additional marine-derived nutrients provided by hatchery-origin fish
American shad	Nehalem, Tillamook, Siuslaw, Umpqua, Coquille, Coos, Rogue Rivers	Non-native species	• May compete with salmon and steelhead for food • May benefit from additional marine-derived nutrients provided by hatchery-origin fish
Rockfish (black, blue, lingcod, canary, vermillon, cabezon, yelloweye, greenling)	Rocky reef habitats in estuary and ocean	Not listed	• Predators of juvenile salmon and steelhead in saltwater • Limited interaction for food and space due to different habitat preferences
Flatfish (sole, flounder, skates, halibut)	Sand and gravel habitats in the estuary and ocean	Not listed	• Predators of juvenile salmon and steelhead • Limited interaction for food and space due to different habitat preferences
Forage fish (herring, anchovy, sardine)	Pelagic habitats in the estuary and ocean	Not listed	• Prey for juvenile and adult salmon and steelhead • May compete with salmon and steelhead for food during smolt stage

Species	Range along the Oregon Coast	Federal/State Listing Status	Type of Interaction with Hatchery Fish in Analysis Area
Sharks	Estuary and nearshore ocean waters	Great white shark under Federal status review for ESA listing.	• Predators of adult salmon and steelhead.

Sources: NMFS (2013), ODFW (2005), and USFWS (2013).

3.6. Wildlife

Within the analysis area, many species occur and potentially interact with hatchery salmon and steelhead in freshwater and marine environments within the Oregon Coast Region (Table 10). Many species are listed under the ESA including: southern resident killer whale, humpback whale, Steller sea lion, northern spotted owl, snowy plover, and marbled murrelet (Table 10). However, most of these ESA-listed species do not interact with hatchery salmon and steelhead because of their habitat preferences and distribution. No interaction is expected to occur between salmon and steelhead and northern spotted owl, gray wolf, snowy plover, sperm whale, and most sea turtles because they are not likely to be found in the analysis area or do not feed upon aquatic species (Table 10).

Steller sea lion, southern resident killer whale, and many birds, reptiles, and small mammals feed on adult salmon and steelhead or on decomposing carcasses of spawned adult salmon and steelhead (Table 10). Fish are not the only component of the diets of these species, though salmon and steelhead may represent a somewhat larger proportion of the diet during the relatively short period of the year that adult salmon return to the analysis area to spawn. Most of these species are opportunistic feeders responding to local prey abundance and exploit a wide range of prey species in their diet throughout the year.

Southern resident killer whales reside predominantly in the Strait of Juan de Fuca and Puget Sound regions during late spring through summer. During this period, these killer whales feed predominantly on returning Chinook salmon to the region, with selective preference given to consuming the older and largest Chinook salmon (Hanson et al. 2010). During the fall and winter periods, southern resident killer whales have been observed outside the Puget Sound Region, ranging from central California to northern Vancouver Island, Canada (Hilborn et al. 2012). While Chinook salmon still continues to be the preferred prey species of these killer whales, other marine species such as lingcod, greenling, sole, sablefish, and

squid have also been observed in their diet (NMFS 2014[2]). The limited data available suggest the highest likelihood of southern resident killer whales being found within the Oregon Coast Region is from late fall through early spring. The occurrence of killer whales along the Oregon Coast likely varies from year to year, but known southern resident killer whales have been observed off the Oregon Coast several times over the last decade. During the period when killer whales are most likely to be present along the Oregon Coast (late fall through early spring), a mixture of Chinook salmon stocks originating from California to southeast Alaska have been found off the Oregon Coast (Weitkamp 2010). Therefore, Chinook salmon potentially consumed by killer whales would not be solely from the Oregon Coast river basins, and only a small percentage of the total abundance of Chinook salmon would be from the proposed hatchery programs described herein, based on the abundance of hatchery-origin Chinook salmon relative to total Chinook salmon. In addition to Chinook salmon, a variety of other salmonids and marine species are also available for consumption by killer whales along the Oregon Coast.

Other marine species such as ESA-listed sea turtles and whales may be found along the Oregon Coast during certain time periods. However, depending upon the species, their occurrence within the nearshore area is rare. Most of these species, if present in the analysis area, would not consume salmon and steelhead directly, but feed upon prey items such as zooplankton and forage fish (Table 10).

There are several species of birds that feed on juvenile salmon including Caspian terns and cormorants. During the spring when salmon and steelhead juvenile outmigrate to the Pacific Ocean, they may be a major food source for these bird populations within the Oregon Coast Region. Hatchery-produced fish represent approximately 10 percent of the salmon and steelhead available as prey for these birds during the spring.

Finally, fishing in the analysis area has created fishery access points, roads, boat launches, and campsites that result in ongoing, but likely minor, habitat disruptions to terrestrial wildlife.

[2] Information available from: http://www.westcoast.fisheries.noaa.gov/protected_species/marine_mammals/killer_whale/index.html. Accessed February 13, 2014.

Table 10. Range and status of wildlife species that may interact with Oregon Coast hatchery salmon and steelhead.

Species	Range along the Oregon Coast	Federal Listing Status	Type of Interaction with Salmon and Steelhead in Analysis Area
Snowy plover	Ten discrete locations along Oregon Coast beaches	Threatened	• No interaction
Northern spotted owl	Forest habitat Coast Range and Cascade Mountains	Threatened	• No interaction
Marbled murrelet	Forest habitat west of crest of Coast Range Mountains (in general)	Threatened	• Potential predator of juvenile salmon and steelhead in freshwater and saltwater areas • May consume similar prey items in the ocean
Other bird species dependent upon aquatic environment (osprey, heron, cormorant, bald eagle, dipper, gull, Caspian tern, duck, geese)	Throughout region	Not listed	• Predators of juvenile and adult salmon and steelhead in freshwater and saltwater areas
Small mammals (river otter, mink, raccoon, beaver, weasel, fisher)	Throughout region. Typically riparian areas	Not listed. Fisher is a candidate species	• Predators of juvenile and adult salmon and steelhead in freshwater areas
Grey wolf, Canada lynx	Not currently present	Wolf-endangered. Lynx-threatened	• Not applicable.
Southern resident killer whale	Estuary and marine waters along Oregon Coast	Endangered	• Predator of salmon and steelhead
Eastern DPS Steller sea lion	Estuary and marine waters along Oregon Coast	Threatened	• Predator of salmon and steelhead
Blue whale	Coastwide	Endangered	• May consume similar prey items in the ocean
Fin whale	Coastwide	Endangered	• May consume similar prey items in the ocean
Humpback whale	Coastwide	Endangered	• May consume similar prey items in the ocean

Species	Range along the Oregon Coast	Federal Listing Status	Type of Interaction with Salmon and Steelhead in Analysis Area
Sperm whale	Not likely to be found along Oregon Coast	Endangered	• Possibly occur in similar marine waters (rare)
Sei whale	Coastwide	Endangered	• May consume similar prey items in the ocean
Other marine mammals (harbor seal, California sea lion)	Coastwide	Not listed	• Predator of juvenile and adult salmon and steelhead in freshwater and saltwater areas
Leatherback sea turtle	Coastwide	Endangered	• Possibly occur in similar marine waters (rare)
Green sea turtle	Coastwide	Endangered	• Possibly occur in similar marine waters (rare)
Olive Ridley sea turtle	Coastwide	Endangered	• Possibly occur in similar marine waters (rare)
Loggerhead sea turtle	Coastwide	Threatened	• Possibly occur in similar marine waters (rare)
Other reptile species dependent upon aquatic environment (e.g., snakes, lizards)	Coastwide	Not Federally listed, although California mountain kingsnake, Northern sagebrush lizard, common kingsnake are species of concern (USFWS 2013)	• Predators of juvenile and adult salmon and steelhead in freshwater areas
Amphibians (e.g., tree frog, red-legged frog, western toad, northwestern salamander)	Coastwide	Not Federally listed, although many of these species are species of concern	• Potential predator of eggs, fry, carcasses in freshwater areas

Sources: NMFS (2013), USFWS (2013), and http://pages.uoregon.edu/titus/herp/ (accessed April 8, 2014).

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 economic impact regions where the hatchery facilities operate and where hatchery fish are released. Hatchery facilities generate economic activity by providing employment opportunities and through local procurement of goods and services for hatchery operations.

For the Oregon Coast Region, no studies were found evaluating the economics for all of the 10 hatchery facilities and programs for this specific region. All of the most recent studies found evaluated a different geographic region and/or included other fishery-related economic benefits in addition to hatchery fish. The information reported below is the best available information related to hatchery programs and associated economic benefits from several different studies.

ODFW (2014a) reported most of the angling effort in the bays and rivers of the Oregon Coast ESU (southern Oregon coast was not part of this survey) in 2012 was focused on fall Chinook salmon and winter steelhead. Approximately 67 percent of the days fished in this region targeted fall Chinook salmon and winter steelhead (ODFW 2014a). The remaining time spent fishing focused on coho salmon (12 percent), spring Chinook salmon (7.8 percent), summer steelhead (6.3 percent), cutthroat trout (6.1 percent), and chum salmon (0.9 percent). The Tillamook and Umpqua bay and rivers were the most popular areas to fish, with 38 percent of the fishing effort occurring in these two areas (ODFW 2014a). Hatchery fish returning to these areas make up an important component of these fisheries (in addition to natural origin fish).

ODFW (2010) assessed the economic benefits of Oregon coastal hatcheries (but did not include Cole Rivers hatchery, which is the largest facility). All of the Oregon Coastal hatcheries have an economic benefit:cost ratio greater than one (ODFW 2010). This means the economic benefit of the hatchery fish exceeded the cost of producing the hatchery fish. These estimates were derived using the number of hatchery fish harvested and estimated economic expenditures accrued while harvesting hatchery fish after subtracting out the costs of producing the hatchery fish. Overall, the winter steelhead hatchery program has the greatest benefit – $3.98 for every dollar invested in hatchery production (Figure 14). The spring Chinook salmon programs had the lowest benefits – $1.53 for every dollar invested in hatchery production.

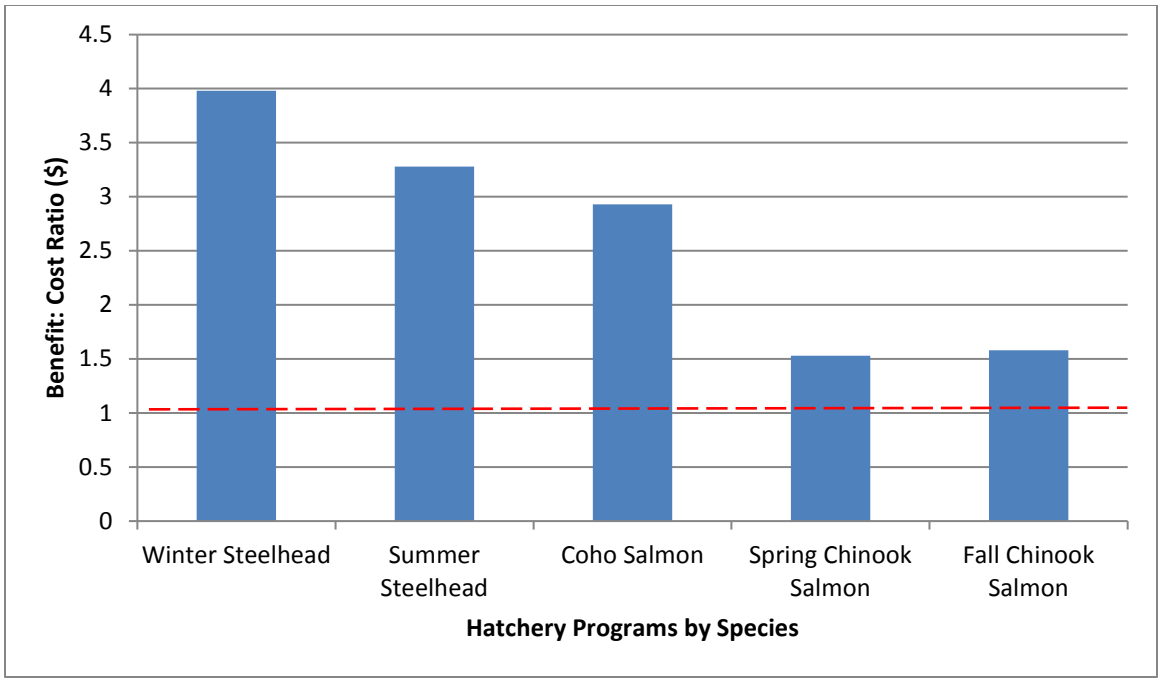


Figure 16. Estimated benefit:cost ratios of Oregon Coast hatcheries (excluding Cole Rivers). Values greater than one mean economic benefit exceeds the cost of producing the hatchery fish (indicated by dashed line). Values taken from ODFW (2010).

Sport fisheries contribute to local economies through the purchase of supplies such as fishing gear, camping equipment, consumables, lodging, and fuel at local businesses. All of these expenditures support local businesses while fishing for salmon and steelhead. Along the Oregon Coast, sport anglers spend between $56 to $97 for every salmon and steelhead caught, respectively (ODFW 2010). In recent years, ODFW (2010) reported more than 44,000 hatchery salmon and steelhead from Oregon Coast hatcheries (excluding Cole Rivers) were caught in fisheries. Applying the lowest cost estimates, this catch would equate to more than $2.5 million generated per year from the harvest of hatchery-origin (i.e., not including natural-origin fish) salmon and steelhead from Oregon coastal hatcheries. ODFW (2014a) estimated the average annual catch from inland fisheries within only the Oregon Coast ESU has been greater than 70,000 fish annually (natural and hatchery fish; Figure 15). Using the cost expenditure of $56 per fish caught would equate to an average annual expenditure of more than $3.9 million per year. If the economic benefits of Cole Rivers hatchery fish and rainbow trout production are also included, the likely economic benefit of the hatchery fish harvested annually from these hatchery programs is in the range of $4-$8 million, using the estimates provided in ODFW (2010).

In a separate economic study, The Research Group (2011) reported the economic impact of recreational fishing on Oregon coastal communities in 2010 to be $20.6 million from all fisheries in the ocean and

freshwater catching both hatchery-origin and natural-origin salmon and steelhead. These studies provide the minimum impact of recreational fishing along the Oregon Coast because the analyses did not include other multiplier effects such as generated local, state, and Federal tax revenue. In another economic study considering additional economic impacts (such as generated tax revenues from the sale of fishing-related supplies and equipment, or salaries), ASA (2013) reported the total economic contribution of recreational fishing for the entire state of Oregon, including the Oregon Coast Region, to be $2.4 billion (Table 11). Since the Oregon Coast Region represents an important area for salmon and steelhead fishing in the state of Oregon and the only region in Oregon for marine fishing, these estimates show recreational fishing along the Oregon Coast Region to be an important economic contributor in the state of Oregon. No estimates were found specifically for the Oregon Coast Region from this study.

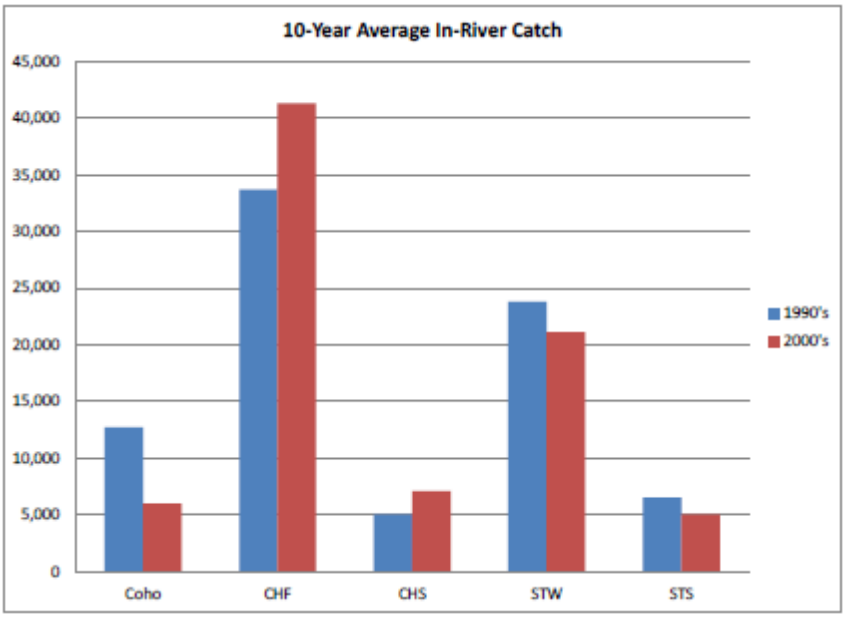


Figure 17. In-river catch of coho salmon, fall Chinook salmon (chf), spring Chinook salmon (chs), winter steelhead (stw) and summer steelhead (sts). Figure taken from ODFW (2014a).

Table 11. Economic impact of sportfishing (all types) in the state of Oregon in 2011. Data taken from ASA (2013).

Economic Attribute	Economic impact in the state of Oregon
Retail Sales	$680,636,132
Total Multiplier or Ripple Effect	$1,172,481,577
Salaries and Wages	$382,802,979
Number of Jobs	11,043
Federal Tax Revenues	$91,781,493
State and Local Tax Revenues	$72,381,359

Commercial fisheries also target hatchery and natural origin salmon in the ocean. Along the Oregon Coast, important commercial salmon fishery fleets sail out of the ports of Brookings, Charleston, and Garibaldi, and Winchester, Siuslaw, and Yaquina Bays. These fisheries provide personal income for fishermen, support goods and services in the local communities, create job opportunities in related sectors of the economy, and allow for fish processing plants and transportation services that generate revenue and create jobs for these economies. The Research Group (2006) estimated the landed value of salmon harvested from Oregon Coast ports was more than $8.7 million dollars in 2003 (the last year available for that report). The highest year on record (1987) from 1970-2003 brought in a landed value of salmon of $55 million (The Research Group 2006). The Research Group (2011) reported the commercial salmon fishery contributed $4.0 million in economic benefits from the limited salmon fishery. These estimates include the harvest of both wild and hatchery salmon.

The 10 Oregon Coast hatchery programs directly employ 49 full-time employees (ODFW 2013b). These programs also rely upon volunteers that donate thousands of hours of labor and resource expenditures to help operate the hatchery programs (e.g., collecting and spawning broodstock, feeding juvenile fish). The employees' personal incomes spent in the local economies also provide additional economic benefits.

3.8. 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[3]
- 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."

[3] "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 environmental impact statement, 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, lower per capita income, and percentage below poverty level are meaningfully greater than the percentage of minority, lower per capita income, and percentage below poverty level in the state of Oregon as a whole.

The 10 hatchery facilities located in the Oregon Coast Region release hatchery coho salmon, Chinook salmon, and steelhead into coastal rivers, which are located in the counties listed in Table 12. All of the counties in the analysis area are environmental justice communities of concern because they meaningfully exceed thresholds for low income or minority populations, with the exception of Jackson and Clatsop Counties (Table 12). When compared to the statewide average for Oregon, lower income levels and higher proportion of American Indian/Alaska Natives in the analysis area were the most common characteristics identified.

Table 12. Demographic information regarding counties in the analysis area (USCB 2013).

County	Black (percent)	American Indian or Alaska Native (percent)	Hispanic or Latino (percent)	Poverty Rate (percent)	Per Capita Income (dollars)
Curry	0.4	2.0	5.9	14.2	24,190
Josephine	0.5	1.5	6.5	18.8	21,535
Jackson	0.8	1.5	11.2	15.8	24,263
Coos	0.5	2.7	5.6	16.0	21,771
Douglas	0.4	1.9	4.8	16.0	21,440
Lane	1.1	1.3	7.6	17.4	24,105
Benton	1.1	0.9	6.7	21.0	26,370
Lincoln	0.7	3.9	8.1	16.2	24,799
Polk	0.7	2.5	12.4	12.7	24,794
Yamhill	1.1	2.0	15.1	12.8	23,759
Tillamook	0.4	1.3	9.3	17.6	22,709
Clatsop	0.7	1.3	7.8	14.2	25,395
Oregon (statewide average)	**2.0**	**1.8**	**12.0**	**14.8**	**26,561**

Note: Shaded cells represent values that were meaningfully different (greater than or less than 10 percent) than those of the reference population (which is treated here as the state of Oregon average values), making them an environmental justice community of concern.

Source: http://quickfacts.census.gov/qfd/states/41000.html. Data accessed March 12, 2013.

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).

Five Native American Tribes are in the analysis area: Cow Creek Band of Umpqua Tribe of Indians; Coquille Indian Tribe; The Confederated Tribes of Coos, Lower Umpqua, and Siuslaw Indians; Confederated Tribes of Siletz Indians; and The Confederated Tribes of Grand Ronde. Even though none of these tribes have established fishery-related treaty rights, fisheries are a potentially important resource for all of the tribes within the Oregon Coast Region. The Confederated Tribes of Siletz Indians have demonstrated the most interest in harvesting fall Chinook salmon and coho salmon in the Siletz River, based upon recent catch information. No other information was found on the occurrence of other Native American Tribes harvesting salmon and steelhead in the project area in recent years; however, Chinook salmon may have cultural and economic importance to other tribes in the future.

4. ENVIRONMENTAL CONSEQUENCES

4.1. Introduction

This section evaluates the potential effects of the three alternatives (including the Proposed Action) on the biological, physical, and human resources described in Subsection 3, Affected Environment. NMFS has defined the No-action Alternative (Alternative 1) as the continued operation of the hatchery programs without ESA authorization (Subsection 2.1, Alternative 1 (No-action): Do Not Approve ODFW's HGMPs for Operation of Hatchery Programs on the Oregon Coast). The Proposed Action Alternative (Alternative 2) is NMFS approval of the HGMPs under limit 5 of the 4(d) Rule. Alternative 3 is the termination of all existing hatchery programs along the Oregon Coast.

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 or greatly beneficial.

In this chapter, there are two general aspects of effects analyzed. First, is the effect from the operation of the hatchery facility (e.g., Cole Rivers Hatchery) on the affected environment. Second, is the effect from releasing hatchery fish from a particular program (e.g., Coos fall Chinook program) on the affected environment. Because of the relatively large number of programs considered here, many of the effects on resources evaluated in this section lend themselves more readily to either a discussion based on hatchery facility or discussion based on specific program. To a large extent, it is most appropriate to consider effects on water quantity (Subsection 4.2, Effects on Water Quantity), water quality (Subsection 4.3, Effects on Water Quality), wildlife (Subsection 4.6, Effects on Wildlife), and on habitat (Subsection 4.4, Effects on Salmon and Steelhead and Their Habitats, and Subsection 4.5, Effects on Other Fish and Their Habitats) largely in terms of the facilities, since facility operation and other associated structures are the primary, potential source of impact, though any effects of individual programs on such resources are also addressed. Conversely, effects that are more the result of interactions of an ecological nature with fish originating from the proposed programs are the primary focus of the analyses on salmon and steelhead (Subsection 4.4, Effects on Salmon and Steelhead and Their Habitats) and other fish (Subsection 4.5, Effects on Other Fish and Their Habitats). Consequently, the analyses also addresses potential effects

from individual programs. Effects on socioeconomics (Subsection 4.7, Effects on Socioeconomics), and environmental justice (Subsection 4.8, Effects on Environmental Justice) would also be expected to accrue more from the presence and/or exploitation of the proposed fish releases; therefore, analyses of these resources primarily addresses the effects of the individual programs.

4.2. Effects on Water Quantity

4.2.1. Alternative 1 (No-Action) – Do Not Approve ODFW's HGMPs for Operation of Hatchery Programs on the Oregon Coast

Under Alternative 1, the 10 hatchery facilities along the Oregon Coast would continue to operate as proposed in the submitted HGMPs (Subsection 2.2, Alternative 2 (Proposed Action/Preferred Alternative): Approve ODFW's HGMPs for Operation of Hatchery Programs on the Oregon Coast); Appendix A). Consequently, short- and long-term surface water and groundwater use would be the same as current conditions (no changes are proposed to current hatchery operations). There would be no change in compliance with water permits or water rights at any of the hatchery facilities under Alternative 1 because the hatchery programs have existing permits and water rights to divert water as proposed in the submitted HGMPs. An analysis of the site-specific effects under Alternative 1 is provided below.

Cole Rivers Hatchery, Bandon Hatchery, Rock Hatchery, Alsea Hatchery, Salmon Hatchery, Cedar Hatchery, Trask Hatchery, and Oregon Hatchery Research Center use surface water exclusively. All water diverted from the stream or river (minus evaporation) is returned after it circulates through each facility, so the only segment of the river that may be impacted by these hatchery facilities would be the area between the water intake and discharge structures (Subsection 3.2, Water Quantity). Indian Hatchery, Elk Hatchery, and Nehalem Hatchery are permitted to use both surface and groundwater (Table 13). However, most of the water used is surface water because the groundwater water rights are low (0.06 to 2.2 cfs) (Table 13).

4.2.1.1 Amount of Water Used

Under Alternative 1, all of the hatchery facilities would continue to operate, and between 3 and 224 cfs of water could be used (by permitted water rights) from rivers, streams, and reservoirs between the water intake and discharge structures at the specific hatchery location (Table 13).

For the Oregon Coast Region, streamflows from August through October are typically the lowest throughout the year. During this period of low streamflow, if the hatchery facility uses water up to the full water right this could result in low streamflows in the area affected by the hatchery's water withdrawal (the area affected is described below). For each hatchery facility, the actual water use by the facility was assessed for the time period of lowest streamflows in the stream or river where the hatchery facility is located (ODFW 2013e). Streamflow information is available for every location except Nehalem Hatchery, Cedar Hatchery, and Indian Hatchery (Table 2).

Water use by the hatchery facilities during the minimum mean monthly surface flows ranges from zero to 120 cfs (Table 2). The percentage of streamflow affected during the lowest streamflows is reported in Table 9. Indian Hatchery is not in operation during the low streamflow period of August through October and, thus does not use any water then. The greatest use is for Cole Rivers Hatchery, where 120 cfs is used in October during the lowest flows of the Rogue River. However, at Cole Rivers Hatchery, no diversion occurs. The water is piped directly to the hatchery from within Lost Creek reservoir. Bandon Hatchery uses the full water right of three cfs during the lowest streamflows in September, which represents the entire streamflow of Ferry and Geiger Creeks. However, Bandon Hatchery is located directly below the reservoirs, and water flows from the dam, through the hatchery, and then continues downstream. There is no passage at these dams, so adverse impacts on fish migration from water use at Bandon Hatchery would be negligible under Alternative 1.

For the remaining hatchery facilities, the percent of the adjacent stream or river diverted during low streamflows ranges from four to 39 percent (Table 9). The hatchery facilities would not completely dewater the adjacent stream or river nor inhibit rearing and migration of any fish species. Therefore, under Alternative 1, if hatchery operations continue as proposed, there would continue to be negligible adverse impact from water withdrawal for the operation of the hatchery facilities (Table 9). The length of stream affected by the water diversion at the hatchery facilities is described below.

4.2.1.2 Length of Stream Affected by Water Use

Under Alternative 1, the length of stream or river impacted from having the water withdrawn for hatchery purposes would range from 100 to 5,943 feet in length (Table 2). This length of stream or river is the distance between the intake and outlet of the hatchery facility (the length of water diversion for hatchery purposes). The percent of stream habitat affected by the hatchery facilities water withdrawal within the watershed would range from zero to 0.23 percent of the total critical habitat designated for coho salmon

within each watershed (Table 9). Thus, the amount of stream habitat affected by the hatchery facilities use of water before getting returned back to the stream or river under Alternative 1 would be low and only adversely affect the stream around the localized area of the hatchery.

It is important to describe the specific circumstances associated with Cole Rivers Hatchery on the Rogue River because this hatchery has the longest distance between diversion and discharge (Table 2 and Table 9). Cole Rivers Hatchery is located at the base of Lost Creek Reservoir Dam (an impassable federal dam). Water for the hatchery is piped directly from within the reservoir to the hatchery facility (5,943 feet in length), and so no diversion occurs from the free-flowing portion of the Rogue River. The hatchery facility decreases the amount of water within Lost Creek reservoir. This effect is negligible considering the amount of water storage within the reservoir and use by the hatchery facility. The hatchery effluent is discharged into the Rogue River below the hatchery, which increases the river's discharge below the hatchery. The continued effects associated with water withdrawal from the reservoir to Cole Rivers Hatchery would be low (beneficial) and localized under Alternative 1.

Table 13. Water use (cubic feet per second [cfs]) by hatchery facility and alternative.

Hatchery Facility	Alternative 1 (No-action)		Alternative 2 (Proposed Action)	Alternative 3 (Terminate hatchery programs)		Alternative 4 (Reduced Hatchery Production)		Alternative 5 (Terminate Highest Risk Programs, Implement Reforms)		Maximum Percentage of Surface Water Diverted Under Alternatives 1,2,4 (percent)[1]	Percent of stream miles[3] affected by the hatchery's water withdrawal (percent)
	Surface[1]	Ground[1]		Surface	Ground	Surface	Ground				
Cole Rivers Hatchery	224	0	Same as Alt 1	0	0	112	0	Same as Alt 1		0 (from reservoir)	0
Indian Hatchery	1.75	0.06	Same as Alt 1	0	0	0.875	0.03	Same as Alt 1		Unknown	0.002
Elk Hatchery	20	0.7	Same as Alt 1	0	0	10	0.35	9	0.33	36	0.1
Bandon Hatchery	3	0	Same as Alt 1	0	0	1.5	0	Same as Alt 1		100[1]	0.05
Rock Hatchery	55	0	Same as Alt 1	0	0	27.5	0	42	0	4	0.01
Alsea Hatchery	47	0	Same as Alt 1	0	0	23.5	0	Same as Alt 1		39	0.05
Salmon Hatchery	30	0	Same as Alt 1	0	0	15	0	Same as Alt 4		24	0.23
Cedar Hatchery	116	0	Same as Alt 1	0	0	58	0	Same as Alt 4		Unknown	0.07
Trask Hatchery	19	0	Same as Alt 1	0	0	9.5	0	Same as Alt 4		6	0.11

Nehalem Hatchery	21	2.2	Same as Alt 1	0	0	10.5	1.1	Same as Alt 3	Unknown	0.007
Oregon Hatchery Research Center[2]	20[3]	0	Same as Alt 1	0	0	10	0	Same as Alt 1	Varies depending upon research	0.08

Source: HGMPs (see Appendix 1 for citations), United States Geological Survey data sets (http://waterdata.usgs.gov), http://streamflow.engr.oregonstate.edu/links/gages_mainx.htm

[1] This calculation is the actual surface water use by the hatchery facility (column 6 of Table 2 in Section 3.2, Water Quantity) divided by the minimum mean surface water flows during lowest annual streamflows (column 5 of Table 2 in Section 3.2, Water Quantity). Bandon Hatchery is reported to use 100 percent of surface water. However, the hatchery is located at the base of Geiger and Ferry Dams where water flows from the dam directly through hatchery raceways immediately downstream (no water is diverted out of the stream).

[2] The Oregon Hatchery Research Center only uses water when needed for research purposes. If no research is being conducted, then water is not used.

[3] This metric is calculated as the total stream miles of designated critical habitat for coho salmon in the population area where the hatchery facility is located for the Oregon Coast ESU (NMFS 2007). For the hatchery facilities in the SONCC ESU (Cole Rivers, Indian, Elk), where the total miles of designated critical habitat was not available for the population area, the number of stream miles for coho salmon distribution from the StreamNet database (streamnet.org) was used.

4.2.2. Alternative 2 (Proposed Action/Preferred Alternative) – Approve ODFW's HGMPs for Operation of Hatchery Programs on the Oregon Coast

Under Alternative 2, the 10 hatchery facilities along the Oregon Coast would operate as proposed in the submitted HGMPs (Subsection 2.2, Alternative 2 (Proposed Action/Preferred Alternative): Approve ODFW's HGMPs for Operation of Hatchery Programs on the Oregon Coast; Appendix A). Short- and long-term surface water and groundwater use would be the same under Alternative 2 as described under Alternative 1 (No-Action). There would be no change in compliance with water permits or water rights at any of the hatchery facilities under Alternative 2 because the hatchery programs have existing permits and water rights to divert water as proposed in the submitted HGMPs. The analysis of the site-specific effects under Alternative 2 would be identical to effects analyzed under Alternative 1 (which result in negligible adverse impacts from water withdrawals at the hatcheries).

4.2.3. Alternative 3 – Terminate Hatchery Programs on the Oregon Coast

Under Alternative 3, operation of the 10 hatchery facilities along the Oregon Coast would be terminated (Subsection 2.3, Alternative 3: Terminate Hatchery Programs on the Oregon Coast). The hatchery facilities would no longer use water for operations throughout the year. An analysis of the site-specific effects of Alternative 3 is provided below. All effects of Alternative 3 would occur within a limited geographic extent (primarily localized to the area of the given facility or structure).

Cole Rivers Hatchery, Bandon Hatchery, Rock Hatchery, Alsea Hatchery, Salmon Hatchery, Cedar Hatchery, Trask Hatchery, and Oregon Hatchery Research Center use surface water exclusively. Indian, Elk, and Nehalem hatcheries use both surface and groundwater throughout the year. However, surface water represents the majority of water used, given that the facilities' groundwater water rights are limited (Table 13). An assessment of the effects on surface water by the hatchery facilities is provided below, with particular comparison to the No-action Alternative 1.

4.2.3.1. Amount of Water Used

Under Alternative 3, all of the hatchery facilities would be closed and no hatchery fish would be propagated and released. In comparison to the No-action Alternative 1, between 3 and 224 cfs of water would not be used by the hatchery facility and would remain in the stream or river between the water intake and discharge structures at the specific hatchery location (Table 13). Alternative 3 would provide a negligible beneficial impact on water quantity compared to Alternative 1.

For the Oregon Coast Region, streamflows from August through October are typically the lowest throughout the year. During this period of low streamflow, the hatchery facility would not use any water under Alternative 3. The natural low flow conditions during this period would not be affected by the hatchery facilities. For each hatchery facility, the actual water use by the facility was assessed for the time period of lowest streamflows in the stream or river where the hatchery facility is located (ODFW 2013e). Streamflow information is available for every location except Nehalem Hatchery, Cedar Hatchery, and Indian Hatchery (Table 2). Alternative 3 would provide a negligible benefit compared to the No-action Alternative 1 from not using water from the adjacent stream reach during the low streamflow months of the year.

Compared to the No-action Alternative 1, an additional zero to 120 cfs of water would not be used by the hatchery facilities and therefore remain in the stream or river (Table 2). The percentage of streamflow

affected during the lowest streamflows is reported in Table 9. Indian Hatchery is not in operation during the low streamflow period of August through October and thus does not use any water then and impacts under Alternative 3 would be the same as Alternative 1. The greatest use is for Cole Rivers Hatchery, where 120 cfs is used in October during the lowest flows of the Rogue River. However, at Cole Rivers Hatchery, no diversion occurs. The water is piped directly to the hatchery from within Lost Creek reservoir. Therefore, Alternative 3 would have a negligible adverse impact compared to Alternative 1 by not having the additional water from the reservoir discharged below the hatchery into the Rogue River. Bandon Hatchery uses the full water right of three cfs during the lowest streamflows in September, which represents the entire streamflow of Ferry and Geiger Creeks. However, Bandon Hatchery is located directly below the reservoirs, and water flows from the dam, through the hatchery, and then continues downstream. There is no passage at these dams, so the beneficial effects of not using water at Bandon Hatchery under Alternative 3 would be undetectable compared to Alternative 1.

For the remaining hatchery facilities, the percent of the adjacent stream or river that would remain in the river or stream under Alternative 3 and not be diverted into the hatchery facilities ranges from 4 to 39 percent of the streamflow (Table 9). Alternative 3 would provide a negligible beneficial effect compared to Alternative 1 at these hatchery facilities because the majority of the streamflow remains in the stream or river from the hatchery intake to hatchery discharge location (Table 9). The length of stream affected by the water diversion at the hatchery facilities is described below.

4.2.3.2. **Length of Stream Affected by Water Use**

Under Alternative 3 no water would be used by the hatchery facilities and therefore the stream or river from point of water intake to discharge would no longer be affected compared to Alternative 1. The length of stream or river that would no longer be impacted (compared to Alternative 1) ranges from 100 to 5,943 feet in length (Table 2). The percent of stream habitat affected by the hatchery facilities not withdrawing water under Alternative 3 would range from zero to 0.23 percent of the total critical habitat designated for coho salmon within each watershed (Table 9). Thus, the amount of stream habitat affected by the hatchery facilities use of water before getting returned back to the stream or river under Alternative 3 would be negligible, beneficial, and localized compared to Alternative 1.

The longest hatchery water diversion is Cole Rivers Hatchery on the Rogue River. Even though it would seem Alternative 3 would provide some benefit to the Rogue River compared to Alternative 1 by not using water for the hatchery, the specific circumstances associated with Cole Rivers Hatchery on the

Rogue River make the effects of Alternative 3 the same as Alternative 1 (which is a negligible adverse impact). Cole Rivers Hatchery is located at the base of Lost Creek Reservoir Dam (an impassable federal dam). Water for the hatchery is piped directly from within the reservoir to the hatchery facility (5,943 feet in length), and so no diversion occurs from the free-flowing portion of the Rogue River. That is, there is no detectable effect on the amount of water released from the dam as a result of hatchery operations.

4.2.4. Alternative 4 – Reduced Hatchery Production

Under Alternative 4, hatchery production would be reduced at the 10 hatchery facilities along the Oregon Coast by 50 percent compared to the No-action Alternative. The hatchery facilities would still use water for operations throughout the year, but the quantity would be 50 percent less. An analysis of the site-specific effects of Alternative 4 is provided below. All effects of Alternative 4 would occur within a limited geographic extent (primarily localized to the area of the given facility or structure).

Cole Rivers Hatchery, Bandon Hatchery, Rock Hatchery, Alsea Hatchery, Salmon Hatchery, Cedar Hatchery, Trask Hatchery, and Oregon Hatchery Research Center use surface water exclusively. Indian, Elk, and Nehalem hatcheries use both surface and groundwater throughout the year. However, surface water represents the majority of water used, given that the facilities' groundwater water rights are limited (Table 13). An assessment of the effects on surface water by the hatchery facilities is provided below, with particular comparison to the No-action Alternative 1.

4.2.4.1. Amount of Water Used

Under Alternative 4, all of the hatchery facilities would produce 50 percent less hatchery fish for release compared to the No-action (Alternative 1). Since the amount of water used by a hatchery is dependent upon the number of hatchery fish reared, a 50 percent reduction in hatchery production would equate to 50 percent less water being use by the hatchery facilities compared to the No-action (Alternative 1). In comparison to the No-action Alternative 1, between 1.5 and 112 cfs of water would be used by the hatchery facilities for the production of hatchery fish. The use of this water would affect the stream or river between the water intake and discharge structures at the specific hatchery location (Table 13). Alternative 4 would provide a negligible beneficial impact on water quantity compared to Alternative 1 (50 percent less water would be used by the hatchery facilities), but result in a low adverse impact compared to Alternative 3 (termination of the hatchery facilities).

For the Oregon Coast Region, streamflows from August through October are typically the lowest throughout the year. During this period of low streamflow, the hatchery facilities would use water as specified in Table 10. The natural low flow conditions during this period would be affected by the hatchery facilities. For each hatchery facility, the actual water use by the facility was assessed for the time period of lowest streamflows in the stream or river where the hatchery facility is located (ODFW 2013e). Streamflow information is available for every location except Nehalem Hatchery, Cedar Hatchery, and Indian Hatchery (Table 2). Alternative 4 would provide a negligible beneficial impact compared to the No-action Alternative 1 from using 50 percent less water from the adjacent stream reach during the low streamflow months of the year. Alternative 4 would result in a low adverse impact from using water compared to Alternative 3 (terminate the hatchery facilities).

Compared to the No-action Alternative 1, an additional zero to 60 cfs of water would not be used by the hatchery facilities and therefore remain in the stream or river (Table 2). The percentage of streamflow affected during the lowest streamflows is reported in Table 9. Indian Hatchery is not in operation during the low streamflow period of August through October and thus, does not use any water then; therefore, impacts under Alternative 4 would be the same as Alternative 1. The greatest use is for Cole Rivers Hatchery, where 60 cfs is used in October during the lowest flows of the Rogue River. However, at Cole Rivers Hatchery, no diversion occurs. The water is piped directly to the hatchery from within Lost Creek reservoir. Therefore, Alternative 4 would have a negligible beneficial effect compared to Alternative 1 by having 50 percent less water being used by the hatchery facility.

For the remaining hatchery facilities, the percent of the adjacent stream or river that would remain in the river or stream under Alternative 4 (compared to the No-action Alternative) and not be diverted into the hatchery facilities ranges from two to 19.5 percent of the streamflow (Table 10). Alternative 4 would provide a negligible beneficial effect compared to Alternative 1 at these hatchery facilities because the majority of the streamflow remains in the stream or river from the hatchery intake to hatchery discharge location (Table 10). The length of stream affected by the water diversion at the hatchery facilities is described below.

4.2.4.2. **Length of Stream Affected by Water Use**

Under Alternative 4, the hatchery facilities would use 50 percent of the water compared to the No-action Alternative. However, water would still be used by the hatchery facilities compared to the No-action Alternative, and consequently, the length of stream or river affected from water withdrawals under

Alternative 4 would be exactly the same as the No-action Alternative. Alternative 4 would continue to result in a low adverse impact on the adjacent stream or river because of the limited number of miles affected.

4.2.5. Alternative 5 – Terminate Highest Risk Hatchery Programs and Implement Hatchery Program Reforms

Under Alternative 5, the highest risk hatchery programs on natural-origin salmon and steelhead populations would be terminated and hatchery reforms implemented for the remaining programs. Under this alternative, the Nehalem hatchery would be the only facility closed because all of the hatchery programs would be eliminated from this facility. All of the other facilities would continue to propagate hatchery fish for the remaining programs. Cole Rivers Hatchery, Indian Hatchery, Bandon Hatchery, and Alsea Hatchery would not be affected at all because none of the programs are eliminated at these facilities under Alternative 5. All effects of Alternative 5 would occur within a limited geographic extent (primarily localized to the area of the given facility or structure).

4.2.5.1. Amount of Water Used

Under Alternative 5, Cole River Hatchery, Indian Hatchery, Bandon Hatchery, and Alsea Hatchery would continue to produce the same number of hatchery fish for release compared to the No-action (Alternative 1). No change in the amount of water used at the hatcheries in the Rogue, Coquille, and Alsea basins would occur (**Table 13**). Nehalem Hatchery would be closed, and therefore, the 21 and 2.2 cfs of surface and groundwater, respectively, would not be used for hatchery purposes and remain in the stream from the intake to discharge location at the hatchery. For the other hatchery facilities, a range of benefits would accrue under Alternative 5 compared to the No-action Alternative (**T**able 13).

4.2.5.2. Length of Stream Affected by Water Use

Under Alternative 5, the Nehalem Hatchery would be the only facility that is terminated and not continuing to use water to propagate hatchery fish. All of the other hatchery facilities would continue to rear hatchery fish. Consequently, the length of stream or river affected from water withdrawals under Alternative 5 would be exactly the same as the No-action Alternative, except at Nehalem Hatchery. In all cases, Alternative 5 would continue to result in a low adverse impact on the adjacent stream or river because of the limited number of miles affected (Table 13).

4.3. Effects on Water Quality

4.3.1. Alternative 1 (No-Action) – Do Not Approve ODFW's HGMPs for Operation of Hatchery Programs on the Oregon Coast

Under Alternative 1, the 10 hatchery facilities along the Oregon Coast would continue to operate as proposed in the submitted HGMPs (Subsection 2.2, Alternative 2 (Proposed Action/Preferred Alternative): Approve ODFW's HGMPs for Operation of Hatchery Programs on the Oregon Coast). Consequently, discharge of treated effluent (in compliance with the hatchery facility's NPDES permit) would continue as under current conditions. Levels of ammonia, nitrogen, phosphorus, and antibiotics (the most typical substances discharged)) would continue to be monitored at the hatchery facilities to ensure the effluent is within specified limits. The effect of the effluent discharge into adjacent streams and rivers would be low and temporary because the effluent plume would mix with natural streamflows. Aquatic organisms would be exposed to higher concentrations of chemicals, viruses, parasites, and bacteria within the outfall plume immediately below the hatchery facilities. However, the effect is likely to be undetectable farther than 200 meters downstream of the hatchery outfall (Bartholomew 2013).

Bartholomew (2013) found hatchery-related disease and pathogen transmission and outbreak in effluent of Willamette River hatchery facilities to be localized, with greatest mortality occurring at the hatchery and no mortality of fish observed in the receiving waters 400 feet downstream from the hatchery. Therefore, the potential adverse impacts are expected to be temporary and confined exclusively to the small area directly at the hatchery outfall. No impacts are expected on critical habitat and EFH as the effluent dilutes downstream (see Chapter 3, Affected Environment).

Alternative 1 would not be expected to change any of the Clean Water Act 303(d) standards because effluent resulting from the 10 hatchery facilities is included in the current conditions of the streams and rivers described in Subsection 3.3, Water Quality. In addition, the current 303(d) list violations relate to temperature, fecal coliform, sedimentation, and dissolved oxygen, of which hatchery effluent would not affect (Table 3). For example, the 303(d) listing for Elk River is attributed to elevated stream temperatures due to timber harvest and loss of riparian habitat (Table 3); hatchery-related effluent parameters are not a factor in this listing. Also, the 303(d) listings apply to most of the streams and rivers within the Oregon Coast Region, of which most do not have any hatchery facility within the watershed. Therefore, operation of hatchery facilities in the project area do not contribute to the Clean Water Act 303(d) list violations for the streams and rivers near the hatchery facilities, and do not contribute in any

detectable manner to the existing water quality issues in the streams and rivers near the hatchery facilities. Thus, any impacts are expected to be undetectable.

4.3.2. Alternative 2 (Proposed Action/Preferred Alternative) – Approve ODFW's HGMPs for Operation of Hatchery Programs on the Oregon Coast

Under Alternative 2, the 10 hatchery facilities along the Oregon Coast would operate as proposed in submitted HGMPs (Subsection 2.2, Alternative 2 (Proposed Action/Preferred Alternative): Approve ODFW's HGMPs for Operation of Hatchery Programs on the Oregon Coast)). Consequently, discharge of treated effluent (in compliance with the hatchery facility's NPDES permit) would continue as under current conditions and as analyzed under Alternative 1. This would be a localized, small area of adverse impact directly below the hatchery outfall from discharge of hatchery effluent. However, as the effluent mixes with surrounding waters in the streams and rivers, the impact from hatchery discharge is likely to be undetectable 400 feet downstream from the hatchery outfall. Impacts from hatchery effluent on water quality parameters and NPDES 303(d) listings would be identical to those described under Alternative 1. Present water quality concerns are related to temperature, fecal coliform, sedimentation, and dissolved oxygen, of which the hatchery facility does not affect.

4.3.3. Alternative 3 – Terminate Hatchery Programs on the Oregon Coast

Under Alternative 3, operation of the 10 hatchery facilities along the Oregon Coast would be terminated (Subsection 2.3, Alternative 3: Terminate Hatchery Programs on the Oregon Coast). The hatchery facilities would no longer use water, discharge effluent into adjacent streams and rivers, or grow and release hatchery fish. NPDES permits for effluent discharge would no longer be required. The elevated levels of ammonia, nitrogen, phosphorus, and antibiotics (the most typical substances discharged under Alternative 1) would be eliminated under Alternative 3. The benefits of eliminating effluent discharge from the hatchery facility would be in the area immediately downstream of the outfall. There would be no detectable benefit greater than 200 meters downstream of the outfall (Bartholomew 2013).

Alternative 3 would not be expected to change any of the Clean Water Act 303(d) standards because none of the violations are related to the operation of the hatchery facilities. The current 303(d) lists violations relative to temperature, fecal coliform, sedimentation, and dissolved oxygen; all of which are primarily the result of forest and agricultural management uses. Therefore, Alternative 3 would result in undetectable improvements to water quality parameters of the streams and rivers of the Oregon Coast Region because the hatchery facilities are not the cause of the current water quality issues.

4.3.4. Alternative 4 – Reduced Hatchery Production

Under Alternative 4, hatchery production would be reduced at the 10 hatchery facilities along the Oregon Coast by 50 percent compared to the No-action Alternative. The hatchery facilities would use 50 percent less water, discharge 50 percent less effluent into adjacent streams and rivers, and grow and release 50 percent of the hatchery fish compared to the No-action Alternative. NPDES permits for effluent discharge would still be in place and the specified criteria in these permits for water quality attributes would not be exceeded because 50 percent less water and discharge is required under Alternative 4. The benefits of 50 percent less effluent discharge from the hatchery facility would be in the area immediately downstream of the outfall. There would be no detectable benefit greater than approximately 600 feet(200 meters) downstream of the outfall (Bartholomew 2013), similar to the No-action Alternative.

Alternative 4 would not be expected to change any of the Clean Water Act 303(d) standards because none of the violations are related to the operation of the hatchery facilities. The current 303(d) lists violations relative to temperature, fecal coliform, sedimentation, and dissolved oxygen; all of which are primarily the result of forest and agricultural management uses. Therefore, Alternative 4 would result in undetectable improvements to water quality parameters of the streams and rivers of the Oregon Coast Region because the hatchery facilities are not the cause of the current water quality issues.

4.3.5. Alternative 5 – Terminate Highest Risk Hatchery Programs and Implement Hatchery Program Reforms

Under Alternative 5, the highest risk hatchery programs would be terminated and hatchery reforms implemented in the remaining programs. The Nehalem Hatchery would be the only facility closed in entirety. All of the other facilities would continue to rear fish for the remaining programs. NPDES permits for effluent discharge would still be in place and the specified criteria in these permits for water quality attributes would not be exceeded because less water and discharge is required under Alternative 5 for all facilities except Cole Rivers, Indian, Bandon, and Alsea hatcheries. The benefits of less effluent discharge from the hatchery facility would be in the area immediately downstream of the outfall. There would be no detectable benefit greater than approximately 600 feet (200 meters) downstream of the outfall (Bartholomew 2013), similar to the No-action Alternative.

Alternative 5 would not be expected to change any of the Clean Water Act 303(d) standards because none of the violations are related to the operation of the hatchery facilities (even in the Nehalem Basin with the

closure of Nehalem hatchery). The current 303(d) lists violations relative to temperature, fecal coliform, sedimentation, and dissolved oxygen; all of which are primarily the result of forest and agricultural management uses. Therefore, Alternative 5 would result in undetectable improvements to water quality parameters of the streams and rivers of the Oregon Coast Region because the hatchery facilities are not the cause of the current water quality issues.

4.4. Effects on Salmon and Steelhead and Their Habitats

The environmental consequences of Alternatives 1-5 on salmon and steelhead and their habitats are described below. The principal mechanisms upon which hatchery programs can affect salmon and steelhead are found in Table 6. To summarize, hatchery programs can affect the genetics of natural populations from straying and interbreeding in the wild. Hatchery fish can compete and predate upon co-occurring natural-origin fish. Hatchery fish can transfer diseases and pathogens to natural-origin fish after release from the hatchery. Hatchery fish can contribute marine-derived nutrients to the freshwater environment from decomposing carcasses.

The effects of the hatchery programs builds upon information presented in prior sections of this document. It is important to consider the specific locations of the hatchery facilities within the population areas (see Table 1 and Figure 1). describes the time periods and size at release of hatchery fish, which helps inform potential competition and predation effects. Figure 4 shows the location and numbers of hatchery fish released along the Oregon Coast. Figure 5 shows the populations of salmon and steelhead that have hatchery fish released and the populations where no hatchery fish are released.

The following assessment information informs the environmental consequences of Alternatives 1-5 on salmon and steelhead and their habitats (Table 14; Figure 16; Figure 17; Figure 18; Figure 19; Figure 20; Figure 21; Figure 22; Figure 23). This information is related to the ecological interactions between natural- and hatchery-origin juvenile and adults while in the freshwater areas of the Oregon Coast Region. Overall, the interaction area where hatchery fish are present within the Oregon portion of the SONCC coho salmon ESU represents approximately 16 percent of the total coho salmon spawning and rearing habitat. For the Oregon Coast coho salmon ESU, the interaction area where hatchery fish are present represents approximately 11 percent of the designated critical habitat. This information is further evaluated under each alternative for each salmon and steelhead species.

The overall density metrics for hatchery fish in the natural population areas along the Oregon Coast is specified in Table 8. For the effects analysis here, the quantitative relative densities have been categorized into low, medium, and high based upon the numerical values (Table 14). This provides an important index measure of hatchery fish co-occurring with natural-origin fish in freshwater and estuarine habitats. The species-specific effects are further analyzed below.

Table 14. Assessment of hatchery fish releases and risk of interaction with natural-origin salmon and steelhead in freshwater areas along the Oregon Coast. See Table 8 for the metrics used to quantitatively assess these interactions. The metrics were categorized into low, medium, and high based upon the range of values.

Population Area where Hatchery Fish Released	Time Period for Hatchery Fish Releases[4]	Potential Area of Overlap between Hatchery and Natural Salmon and Steelhead	Freshwater Habitat (Relative Magnitude of Potential Hatchery Fish Interaction with Natural-origin Salmon and Steelhead)	Estuarine Habitat (Relative Magnitude of Potential Hatchery Fish Interaction with Natural-origin Salmon and Steelhead)
Chetco River	ChF-Oct, StW-April	Chetco, Ferry	Medium	High
Rogue River	Co-May, ChS-Aug-Sept, StS-April, StW-April	Applegate, Rogue, Indian	Low	High
Elk River	ChF-Sept	Elk	High	High
Coquille River	ChF-May-June, StW-April	SF, EF, NF Coquille, lower Coquille	Low	Medium
Coos Bay	ChF-May-June, StW-April	Millicoma and SF Coos, Coos Bay	High	Low
Tenmile Creek	StW-April	Tenmile Creek	Low	Medium
Umpqua River	Co-April, June, ChF-May, Oct, ChS-February, Sept, StS-March, April, StW-March, April	NF and SF Umpqua, Mainstem Umpqua	Low	Low

[4] Abbreviations: ChF (fall Chinook salmon), ChS (spring Chinook salmon), Co (coho salmon), StS (summer steelhead), and StW (winter steelhead).

Population Area where Hatchery Fish Released	Time Period for Hatchery Fish Releases[4]	Potential Area of Overlap between Hatchery and Natural Salmon and Steelhead	Freshwater Habitat (Relative Magnitude of Potential Hatchery Fish Interaction with Natural-origin Salmon and Steelhead)	Estuarine Habitat (Relative Magnitude of Potential Hatchery Fish Interaction with Natural-origin Salmon and Steelhead)
Siuslaw River	StW-May	Whittaker, Green, Siuslaw	Low	Low
Alsea River	StW-April	NF Alsea, Five Rivers, Alsea	Low	Low
Siletz River	StW-April, StS-April	Siletz	Low	Low
Salmon River	ChF-Aug	Salmon	High	Medium
Nestucca River	ChF-Sept, ChS-July, StS-April, StW-April	Three Rivers, Nestucca, Beaver, Little Nestucca	Medium	Medium
Tillamook Bay	Co-April, ChF-July, ChS-July, StS-April, StW-April,	SF Wilson, Wilson, EF Trask, Trask	High	Low
Nehalem River	Co-April, StW-April	NF Nehalem, Nehalem	Low	Low
Necanicum River	ChF-Sept, StW-April	Necanicum	Medium	Low

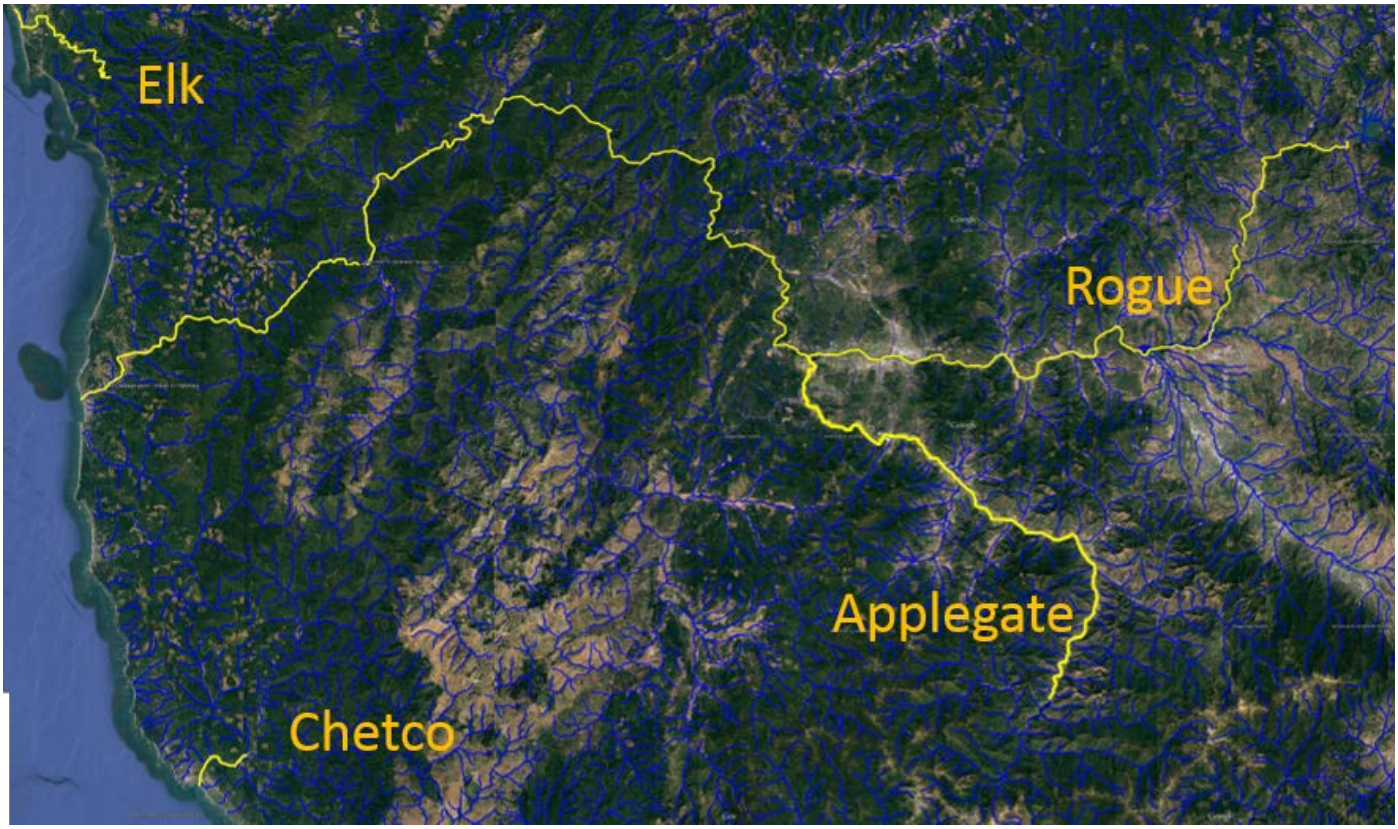


Figure 18. Geographic extent of the interaction area between hatchery fish and natural fish compared to available stream habitat. Hatchery fish are released into the Elk, Rogue, and Chetco Rivers. The reaches where hatchery fish are released are the yellow lines. All stream reaches are identified as the blue colored lines (coho critical habitat layer was not available so all stream reaches were used instead).

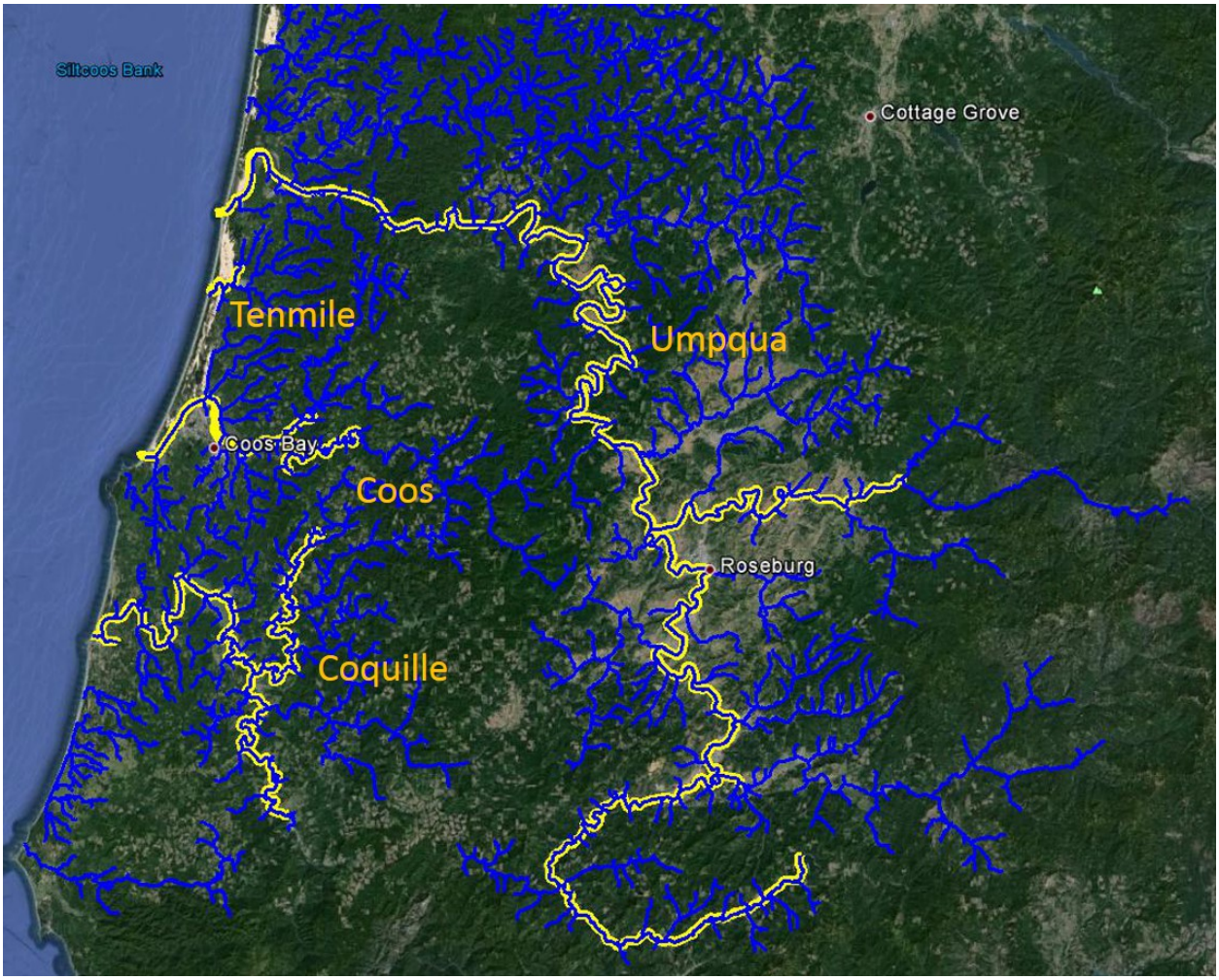


Figure 19. Geographic extent of the interaction area between hatchery fish and natural fish compared to coho salmon critical habitat. Hatchery fish are released into the Coquille, Coos, Tenmile, and Umpqua Rivers. The reaches where hatchery fish are released are the yellow lines. Stream reaches designated as critical habitat for Oregon Coast coho salmon is identified as the blue colored lines.

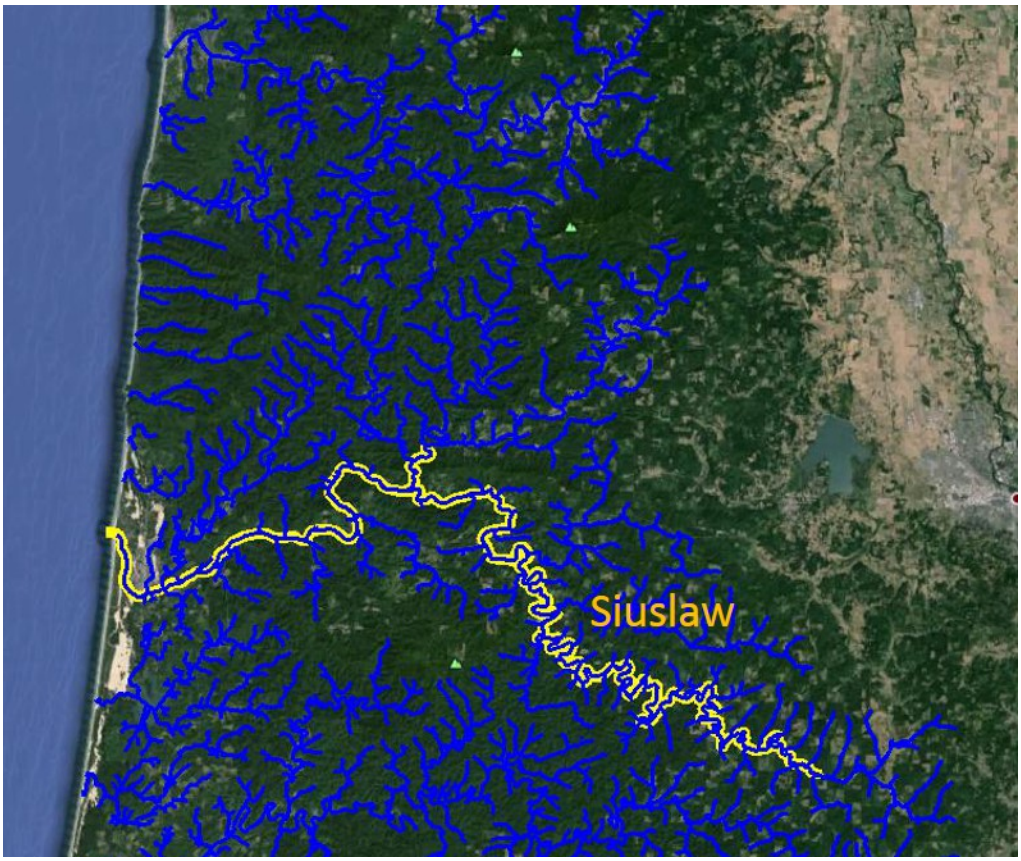


Figure 20. Geographic extent of the interaction area between hatchery fish and natural fish compared to coho salmon critical habitat. Hatchery fish are released into the Siuslaw River. The reaches where hatchery fish are released are the yellow lines. Stream reaches designated as critical habitat for Oregon Coast coho salmon is identified as the blue colored lines.

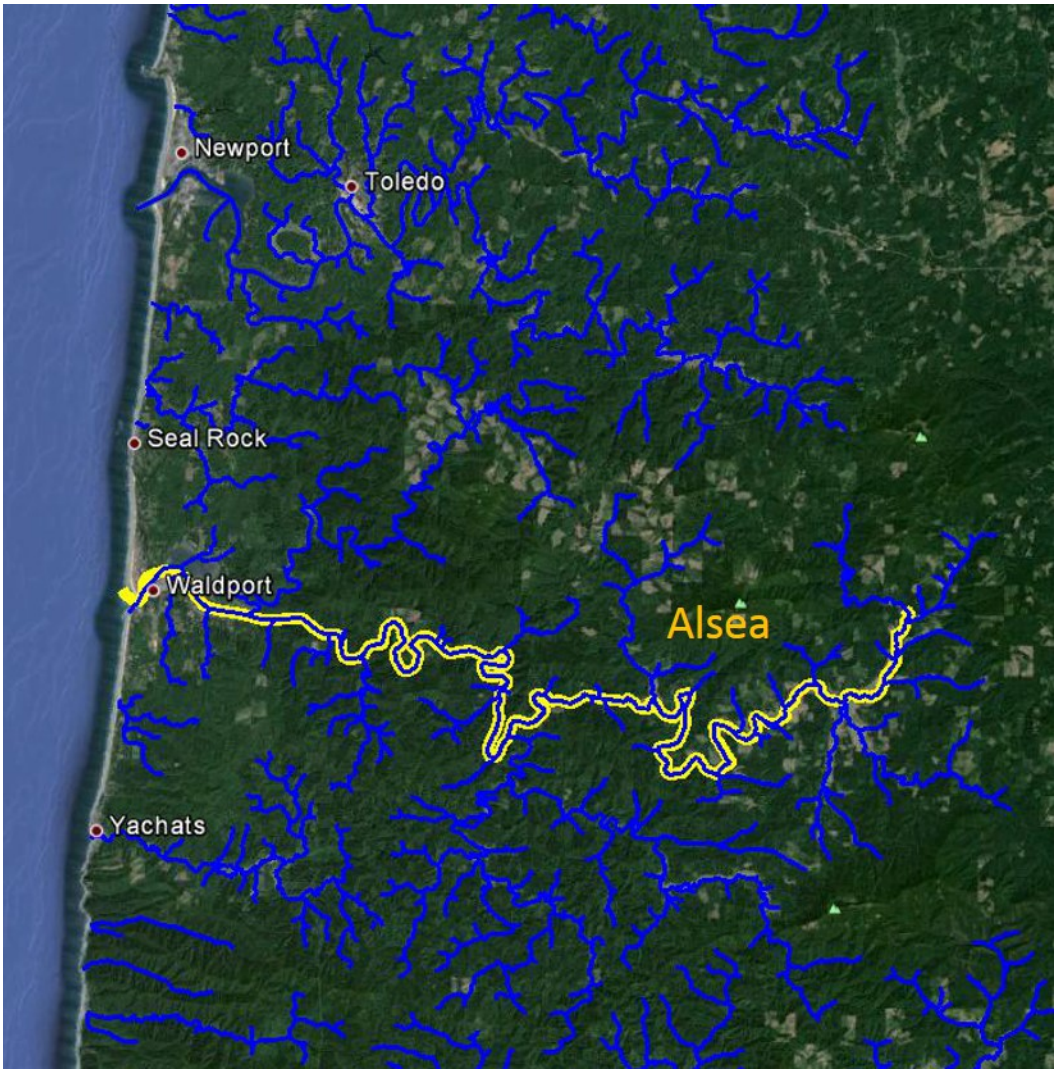


Figure 21. Geographic extent of the interaction area between hatchery fish and natural fish compared to coho salmon critical habitat. Hatchery fish are released into the Alsea River. The reaches where hatchery fish are released are the yellow lines. Stream reaches designated as critical habitat for Oregon Coast coho salmon is identified as the blue colored lines.

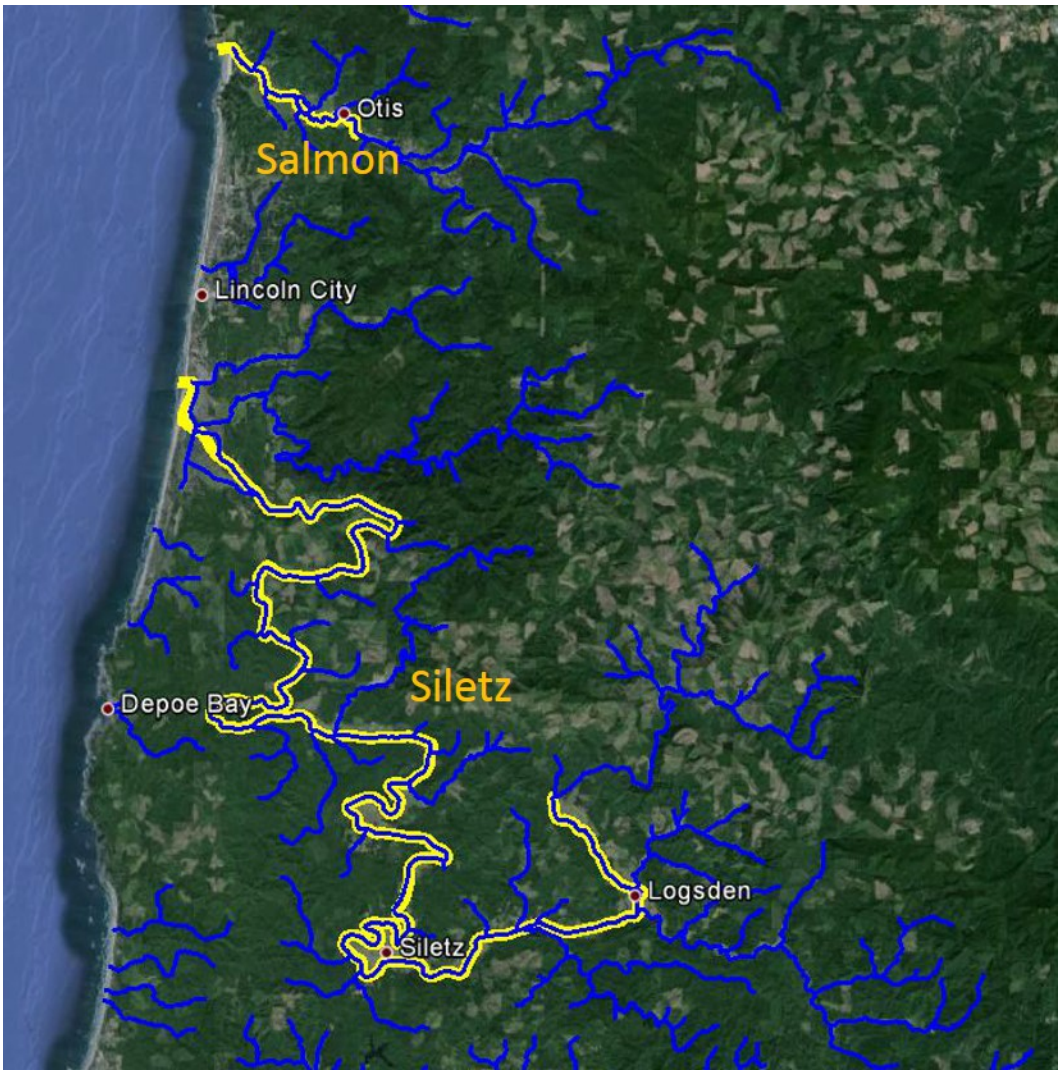


Figure 22. Geographic extent of the interaction area between hatchery fish and natural fish compared to coho salmon critical habitat. Hatchery fish are released into the Siletz and Salmon Rivers. The reaches where hatchery fish are released are the yellow lines. Stream reaches designated as critical habitat for Oregon Coast coho salmon is identified as the blue colored lines.

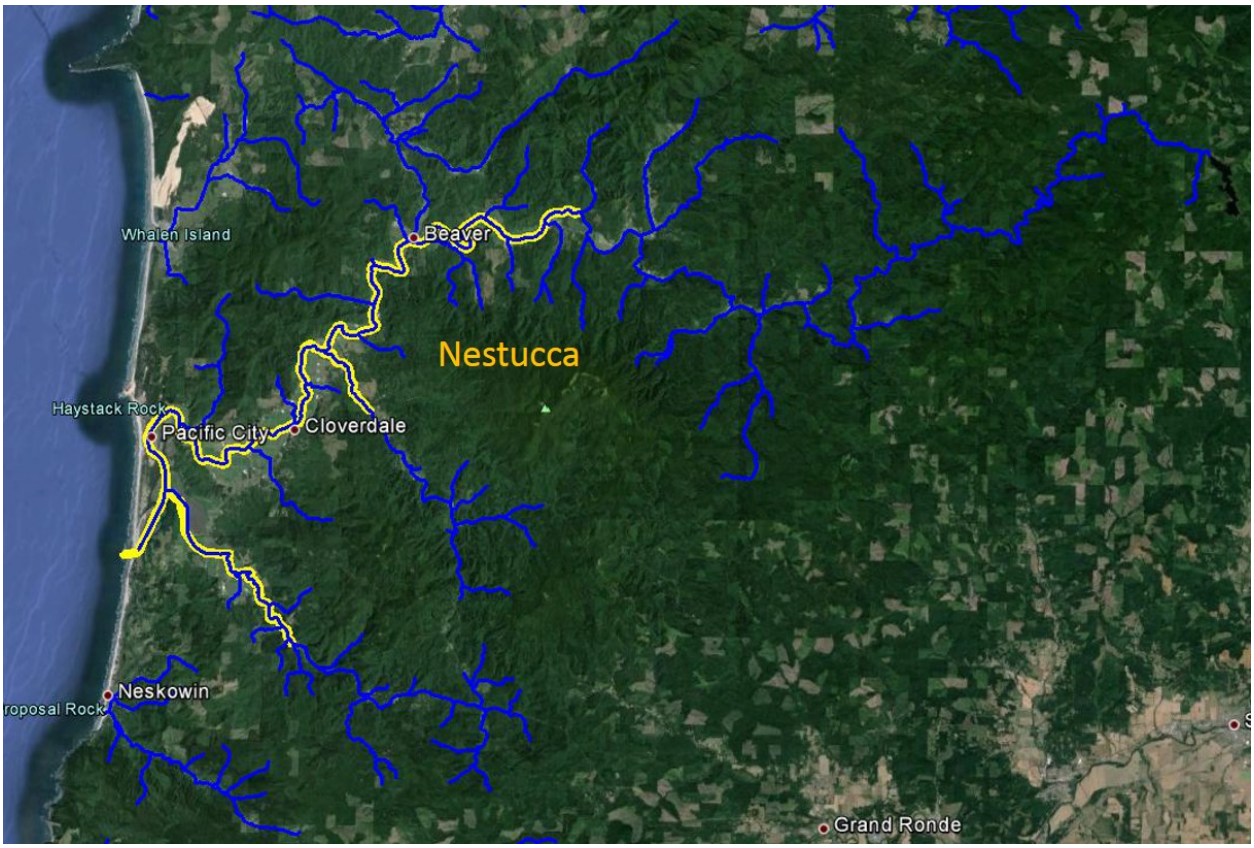


Figure 23. Geographic extent of the interaction area between hatchery fish and natural fish compared to coho salmon critical habitat. Hatchery fish are released into the Nestucca and Little Nestucca Rivers. The reaches where hatchery fish are released are the yellow lines. Stream reaches designated as critical habitat for Oregon Coast coho salmon is identified as the blue colored lines.

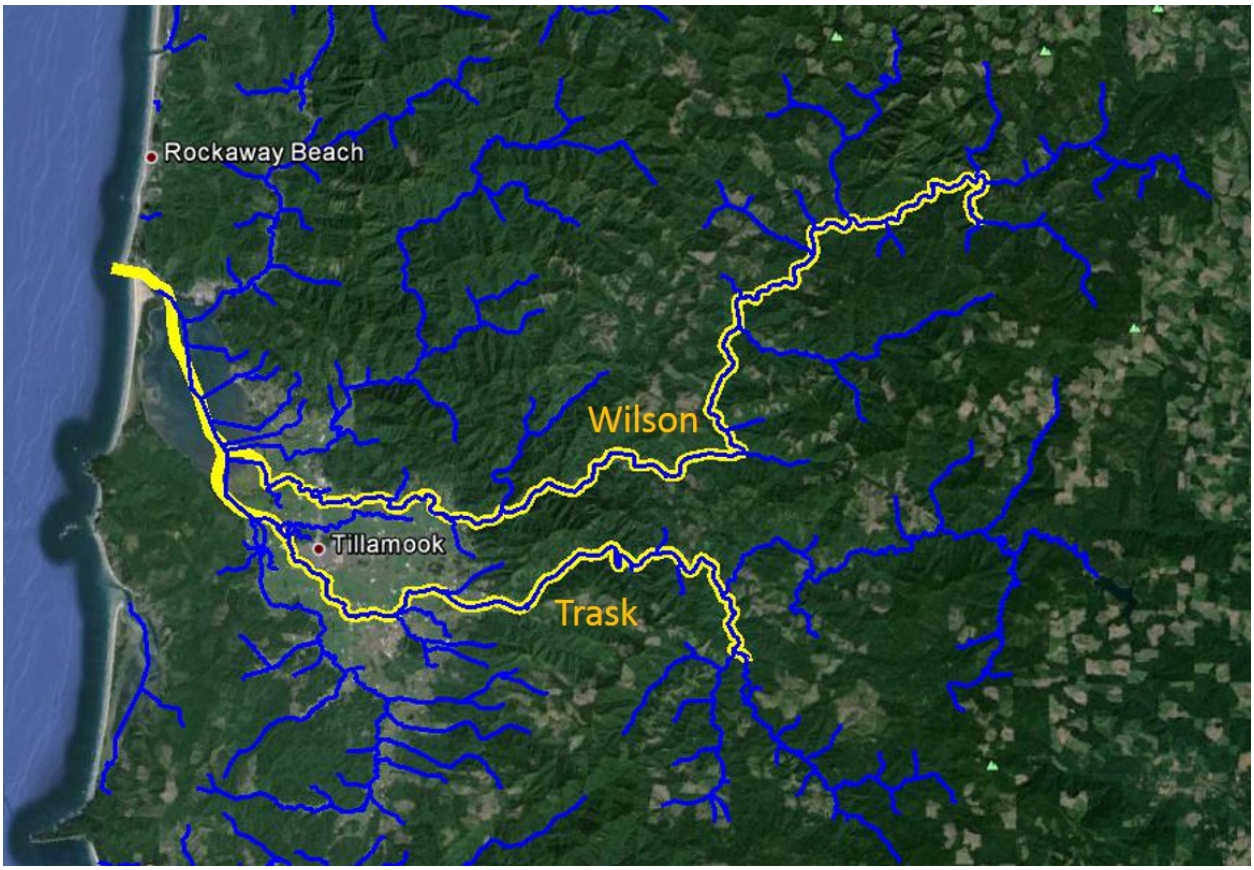


Figure 24. Geographic extent of the interaction area between hatchery fish and natural fish compared to coho salmon critical habitat. Hatchery fish are released into the Trask and Wilson Rivers. The reaches where hatchery fish are released are the yellow lines. Stream reaches designated as critical habitat for Oregon Coast coho salmon is identified as the blue colored lines.

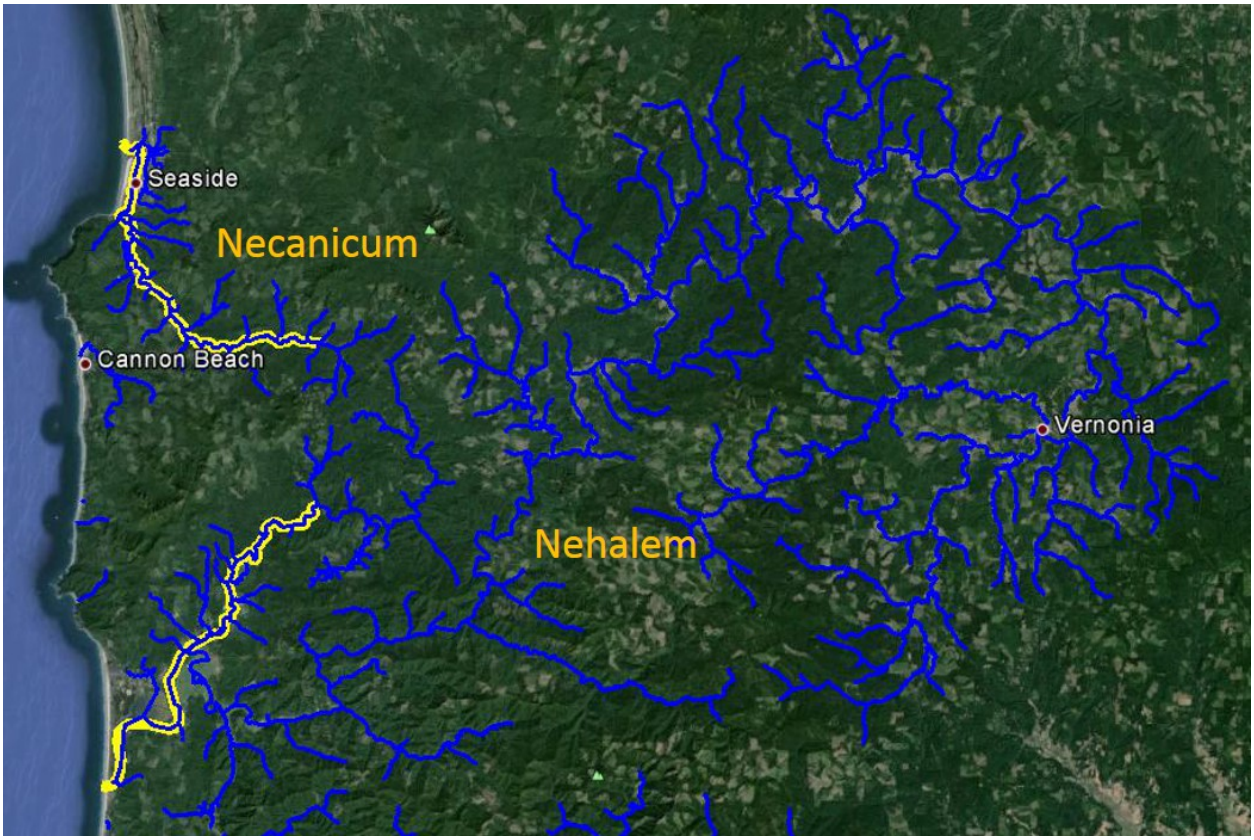


Figure 25. Geographic extent of the interaction area between hatchery fish and natural fish compared to coho salmon critical habitat. Hatchery fish are released into the Nehalem and Necanicum Rivers. The reaches where hatchery fish are released are the yellow lines. Stream reaches designated as critical habitat for Oregon Coast coho salmon is identified as the blue colored lines.

4.4.1. Alternative 1 (No-Action) – Do Not Approve ODFW's HGMPs for Operation of Hatchery Programs on the Oregon Coast

Under Alternative 1, 10 hatchery facilities, and associated hatchery programs, along the Oregon Coast would continue to operate as proposed in submitted HGMPs (Subsection 2.2, Alternative 2 (Proposed Action/Preferred Alternative): Approve ODFW's HGMPs for Operation of Hatchery Programs on the Oregon Coast)). Alternative 1 would continue to pose short- and long-term risks associated with genetic effects, competition and predation, facility effects, masking of natural population status from hatchery fish spawning, incidental fishing effects, and transfer of pathogens from hatchery fish and/or the hatchery facility to the adjacent river or stream. Alternative 1 would continue to provide some benefits to salmon and steelhead from hatchery fish carcasses and nutrient cycling in the ecosystem (Subsection 3.4, Salmon and Steelhead and Their Habitat). The species-specific effects of Alternative 1 are discussed below.

Critical Habitat under the ESA is only designated for coho salmon. Essential Fish Habitat under the Magnuson-Stevens Fishery Conservation and Management Act applies to coho salmon, Chinook salmon, and chum salmon along the Oregon Coast. The operation of the 10 hatchery facilities adversely affects critical habitat and EFH in the local vicinity where the facilities are located. The primary impact on critical habitat and EFH is from the effluent discharge from the hatchery facilities (Subsection 4.3.1, Alternative 1 (No-action) – Do Not Approve ODFW's HGMPs for Operation of the Hatchery Programs on the Oregon Coast, above). Alternative 1 would result in undetectable physical habitat changes to critical habitat and EFH compared to current conditions.

Oregon Coastal Coho Salmon

Under Alternative 1, all existing hatchery programs along the Oregon Coast would continue. The genetic effects of the hatchery programs on coho salmon would be low because there are only four small hatchery programs for coho salmon along the entire Oregon Coast. Consequently, few hatchery coho salmon have been observed spawning in natural areas of the ESUs in recent years (Stout et al. 2012; ODFW 2013a). The average proportion of hatchery coho salmon on the spawning grounds (pHOS) for the Oregon Coast ESU from 2009 to 2014 was 1.3 percent (ODFW 2016a). Even though recent data is lacking in the Oregon portion of the SONCC coho salmon ESU, pHOS is expected to be very low because few hatchery coho salmon spawn naturally in the Upper Rogue River population where the hatchery program exists. In recent years, the hatchery coho program in the Rogue River has been reduced by 63 percent to a smolt production of 75,000 fish.

The highest risks for hatchery coho salmon interbreeding with natural-origin coho occurs in the Upper Rogue, South Umpqua, Trask, and North Fork Nehalem population areas where hatchery coho salmon are released. For all of these populations, the programs are managed to have less than 10 percent naturally spawning hatchery coho salmon to reduce the risk of genetic introgression. From 2009-2014, average pHOS has been two percent (Nehalem, Tillamook, Rogue) to five percent (South Umpqua; Table 7; ODFW 2016a). Recent PNI values for these programs has been very low due to no natural-origin coho salmon being incorporated into the broodstock (PNI values are expected to be improve to >0.9 if and when the HGMPs are approved under the ESA). These four independent populations are needed for recovery of the ESU, and the risks associated with hatchery operations are more concerning than with other populations less closely associated with ESU recovery. As long as pHOS continues to be low (<10 percent) population wide, it is expected there will be reduced productivity from naturally-spawning hatchery fish interbreeding with natural-origin coho salmon. However, there are 26 other independent

populations where no hatchery coho salmon programs exist. In total, only four out of a total of 69 independent and dependent coho populations would be affected genetically by the hatchery coho salmon programs released into these populations (Stout et al. 2012; NMFS 2014; NMFS 2016a). Having only four populations affected genetically by hatchery coho salmon is the primary reason the Oregon Coast coho salmon recovery plan did not identify hatcheries as a key limiting factor/threat (NMFS 2016a).

The reductions in pHOS observed over the last decade is the result of substantial decreases in the number of hatchery coho salmon released within the Oregon Coast Region (Subsection 3.4, Salmon and Steelhead and Their Habitats). Buhle et al. (2009) concluded the increases in natural-origin coho salmon returns to the Oregon Coast ESU were influenced by these hatchery reforms. Approximately 20 percent of the improvement was attributed to decreases in pHOS for these years.

The ecological effects (interactions between hatchery- and natural-origin salmon and steelhead) of hatchery programs would continue on coho salmon in the populations where the hatchery programs occur (Table 14; Figure 5; Figure 16; Figure 17; Figure 18; Figure 19; Figure 20; Figure 21; Figure 22; Figure 23). Potential effects are greatest in the population areas that have the greatest density of hatchery fish per habitat area in freshwater and in the estuary (Table 8). The highest densities of hatchery fish co-occurring with natural-origin coho salmon in freshwater habitat is found in the Elk, Coos, Salmon, and Tillamook populations (Table 14). The highest densities of hatchery fish co-occurring with natural-origin coho salmon in estuarine habitat is found in the Chetco, Rogue, and Elk population areas (Table 14). The potential ecological effects are also influenced by the location where hatchery fish are released in the watershed. Releases of hatchery fish in the upper areas of the watershed would potentially have the greatest amount of time and space to affect naturally-occurring salmonids. In addition, if hatchery fish are released in principal spawning and rearing areas of natural-origin salmonids (i.e., tributaries), then interactions would be potentially greater than if hatchery fish are released in mainstem river areas. Therefore, the potential ecological interactions between hatchery fish and coho salmon is dependent upon space and time within the specific population areas (Table 14).

The ecological interaction space between hatchery fish and coho salmon was evaluated as the percent of Oregon Coast coho salmon critical habitat affected by the releases of all species of hatchery fish. The river and stream reaches where hatchery fish are released compared to coho salmon critical habitat is shown in Figures 13-20. Since specific stream reaches of critical habitat for SONCC coho salmon have not been delineated by NMFS, the ODFW assessment of coho salmon spawning and rearing distribution was used for southern Oregon. Overall, 11 percent of critical habitat is affected by hatchery fish in the

Oregon Coast ESU and 16 percent of coho salmon habitat is affected by hatchery fish in the SONCC ESU. The principal habitat areas affected by hatchery fish are the mainstem river areas and estuaries. The vast majority of coho salmon tributary habitat is not affected by hatchery fish (Figures 13-20).

In addition to the geographic extent of hatchery fish released within a population area (i.e., space), another aspect of the interaction between hatchery- and natural-origin salmon and steelhead is the period of time affected by the presence of hatchery fish in the streams and rivers. The target release size for hatchery fish along the Oregon Coast is the smolt life stage for all steelhead, coho salmon, and spring Chinook salmon. Hatchery fall Chinook salmon are released as smolts or just prior to smolting as fingerlings (presmolts). Depending upon the species, average fork length ranges from two inches (~60 mm) for fall Chinook salmon (the smallest) to up to eight inches (~200 mm) for summer and winter steelhead (the largest). Given hatchery coho salmon, spring Chinook salmon, and steelhead are released as smolts and fall Chinook salmon released as presmolts and smolts, the interaction period is relatively short-lived because the hatchery fish are actively emigrating to the estuary and ocean. The physiological condition of the hatchery smolts triggers their desire to emigrate. Therefore, in the population areas where the hatchery fish are released near the estuary and ocean (e.g., Chetco, Elk, Coos, Tenmile, Necanicum), the time of interaction between hatchery- and natural-origin fish in the space where hatchery fish are released (Figures 13-20) is very limited (likely hours to a few days). For the population areas where hatchery fish are released many miles from the ocean (i.e., Rogue, Umpqua, Siuslaw), it takes more time to emigrate to the estuary and ocean from the hatchery release point because of the relatively long travel distances, so the total amount of time hatchery fish could potentially interact with natural-origin fish in freshwater habitat areas may be up to 1 to 2 weeks. During this one to two week period of interaction while in freshwater, the greatest impact is likely to occur in areas where hatchery steelhead are co-occurring with natural-origin salmonids (e.g., mainstem Rogue River). Hatchery steelhead are the largest sized hatchery fish released within the Oregon Coast region, and thus have the greatest potential to prey upon a variety of other fish species.

Specific studies on predation of natural-origin salmonids by hatchery fish within the Oregon Coast Region are sparse. However, Naman and Sharpe (2012) reported a wide range of predation impacts from hatchery fish on natural-origin salmonids when they reviewed studies along the West Coast. Predation rates were greatest when the number of hatchery fish released was high and the release coincided with the presence of natural-origin salmonids. In most cases, predation by hatchery fish was low overall. However, in specific circumstances and locations, hatchery fish predation could be substantial (i.e., loss of tens of thousands juvenile salmonids). For the Oregon Coast Region, predation by hatchery fish on

natural-origin salmonids does occur. Hatchery steelhead predation upon coho and Chinook salmon fry during the release periods of April through May is likely to be the greatest impact. Steelhead fry are probably less impacted because most of the steelhead are still incubating in the gravel. The other species of hatchery fish (i.e., coho salmon and Chinook salmon) are likely to have lower impacts on natural-origin fish species because they are smaller in size (i.e. more similar in size to natural-origin fish) and thus cannot consume as many fish compared to the larger hatchery steelhead. In all cases, the vulnerability of natural-origin fish to co-occurring hatchery fish is limited in time to a couple of weeks as the majority of the hatchery smolts actively emigrate through the river to the estuary and ocean. In local situations at the individual fish scale, it may be limited to hours or days as the hatchery fish emigrate downstream.

Competition between hatchery fish and natural-origin coho salmon may occur if a resource becomes limited in space and time. Quantifying the impact is difficult because of the variety of factors influencing competition such as availability of potentially limiting resources in space and time and variability in natural-origin salmonid production from year to year that influences density-dependence. Within the Oregon Coast Region, competition between hatchery fish and natural-origin coho salmon is likely to be very low or non-existent for the following reasons. The greatest impact from hatchery fish are likely to occur if the hatchery fish residualize and do not emigrate to the ocean. Recent information indicates less than 10 percent of the total hatchery release residualize and hatchery steelhead are the most prominent species (Hausch and Melnychuk 2012). The primary area of competitive interaction area is the area below the hatchery. Since this interaction area is relatively small compared to the total amount of habitat available for rearing (Figure 16; Figure 17; Figure 18; Figure 19; Figure 20; Figure 21; Figure 22; Figure 23), impacts from competition between hatchery fish and natural-origin fish is likely to be low.

Buhle et al. (2009) evaluated the influence of hatchery coho salmon reforms in the late 1990s to the improvements in natural-origin fish observed in 2000-2003. Approximately seven percent of the improvement was attributed to the reduction in impacts associated with terminating most of the hatchery coho salmon releases in the Oregon Coast ESU (i.e., millions of hatchery coho salmon, Subsection 3.4, Salmon and Steelhead and Their Habitats). The effect was from the negative ecological interaction between hatchery coho salmon smolts and natural-origin juvenile coho salmon co-occurring in freshwater habitat.

Hatchery program impacts have not been identified as a primary or secondary limiting factor/threat for coho salmon in the federal recovery plans along the Oregon Coast (NMFS 2014; NMFS 2016a). The

hatchery reform actions taken since ESA listings in 1997-1998 have eliminated impacts so that current hatchery management is no longer a factor impeding recovery.

Oregon Coastal Chinook Salmon

Alternative 1 would maintain all existing hatchery programs along the Oregon Coast. Effects of Alternative 1 would be substantially similar to current conditions for Chinook salmon, where some populations are affected by hatchery programs and facilities and may have various genetic and ecological risks from hatchery fish on natural-origin Chinook salmon. Genetic risks from hatchery Chinook salmon spawning in the wild would continue to be low to moderate depending upon the specific population and run type (Subsection 3.4, Salmon and Steelhead and Their Habitats).

For fall Chinook salmon, the two programs that had the highest percentage of naturally spawning hatchery fall Chinook salmon (i.e., Elk and Salmon River populations) would be reduced in Alternative 1 from recent ODFW management reforms (ODFW 2014a). For these populations, it is expected productivity may be reduced from naturally spawning hatchery fall Chinook salmon and the associated hatchery-influenced selection (domestication) effects. The reduced fitness of hatchery Chinook salmon interbreeding with natural-origin Chinook salmon is likely reducing population productivity (to an unknown extent). Recent PNI values for these populations range from 0.16 for the Elk River to 0.50 for the Salmon River (Table 7); indicating hatchery selective forces are dominating natural selection (Mobrand et al. 2005). For the other fall Chinook salmon populations, the potential genetic effects are either non-existent because no hatchery fall Chinook salmon are released in the population area (most populations) or low impact because pHOS is low (e.g., Umpqua and Coos).

For spring Chinook salmon, hatchery spring Chinook salmon are released into the Rogue, Nestucca, Trask, and Wilson Rivers. The Rogue River spring Chinook population is relatively abundant and pHOS in the Upper Rogue River, where the hatchery is located, has averaged nine percent from 2006-2015. The hatchery-influenced selection (domestication) effects from hatchery fish potentially interbreeding with natural-origin fish is low for the Rogue River because pHOS is low. For the other spring Chinook salmon populations, natural-origin returns are at very low abundance levels and may even be non-viable. Consequently, a few hatchery fish strays into these populations equates to a high pHOS (in the range of 49-93 percent for these populations) and very low PNI values (Table 7). The effects of hatchery Chinook salmon in these populations is likely mixed: hatchery fish interbreeding with natural Chinook salmon is likely reducing productivity from hatchery-influenced selection (domestication) impacts (Nickum et al.

2004). However, due to low population sizes, the hatchery fish are increasing overall spawning escapement (natural and hatchery salmon) and likely producing more offspring, which has been shown to be a demographic benefit to the natural population (Banks et al. 2013; Evans et al. 2014; O'Malley et al. 2015). All of the hatchery stocks are locally-derived within the ESU, so genetic risks are primarily from hatchery domestication effects, and not from out-of-ESU genetic resources.

The ecological effects (interactions between hatchery- and natural-origin salmon and steelhead) of hatchery programs would continue on Chinook salmon in the populations where the hatchery programs occur (Figure 5; Figure 16; Figure 17; Figure 18; Figure 19; Figure 20; Figure 21; Figure 22; Figure 23). Potential effects are greatest in the population areas that have the greatest density of hatchery fish per habitat area in freshwater and in the estuary (Table 8). The highest densities of hatchery fish co-occurring with natural-origin coho salmon in freshwater habitat is found in the Elk, Coos, Salmon, and Tillamook populations (Table 14). The highest densities of hatchery fish co-occurring with natural-origin coho salmon in estuarine habitat are found in the Chetco, Rogue, and Elk population areas (Table 14). The potential ecological effects are also influenced by the location where hatchery fish are released in the watershed. Releases of hatchery fish in the upper areas of the watershed would potentially have the greatest amount of time and space to affect naturally-occurring salmonids. In addition, if hatchery fish are released in principal spawning and rearing areas of natural-origin salmonids (i.e., tributaries), then interactions would be potentially greater than if hatchery fish are released in mainstem river areas. Therefore, the potential ecological interactions between hatchery fish and Chinook salmon is dependent upon space and time within the specific population areas (Table 14).

The ecological interaction space between hatchery fish and Chinook salmon was evaluated as the percent of Oregon Coast coho salmon critical habitat affected by the releases of all species of hatchery fish. Coho salmon critical habitat was used as a proxy for Chinook salmon; however, since the spawning and rearing distribution of Chinook salmon is less than coho salmon, this would be a worst case scenario for Chinook salmon. The river and stream reaches where hatchery fish are released compared to critical habitat is shown in Figures 13 through Figure 20. Overall, less than 11 percent of critical habitat is affected by hatchery fish in the Oregon Coast ESU and less than 16 percent of Chinook salmon habitat is affected by hatchery fish in the SONCC ESU. The principal habitat areas affected by hatchery fish are the mainstem river areas and estuaries. The vast majority of Chinook salmon tributary habitat is not affected by hatchery fish (Figures 13-20).

In addition to the geographic extent of hatchery fish released within a population area (i.e., space), another aspect of the interaction between hatchery- and natural-origin salmon and steelhead is the period of time affected by the presence of hatchery fish in the streams and rivers. The target release size for hatchery fish along the Oregon Coast is the smolt life stage for all steelhead, coho salmon, and spring Chinook salmon. Hatchery fall Chinook salmon are released as smolts or just prior to smolting as fingerlings (presmolts). Depending upon the species, average fork length ranges from 60 mm for fall Chinook salmon (the smallest) to 195 mm for summer and winter steelhead (the largest). Given hatchery coho salmon, spring Chinook salmon, and steelhead are released as smolts and fall Chinook salmon released as presmolts and smolts, the interaction period is relatively short-lived because the hatchery fish are actively emigrating to the estuary and ocean. The physiological condition of the hatchery smolts triggers their desire to emigrate. Therefore, in the population areas where the hatchery fish are released near the estuary and ocean (e.g., Chetco, Elk, Coos, Tenmile, Necanicum), the time of interaction between hatchery- and natural-origin fish in the space where hatchery fish are released (Figure 13-20) is very limited (likely hours to a few days). For the population areas where hatchery fish are released many miles from the ocean (i.e., Rogue, Umpqua, Siuslaw), it takes more time to emigrate to the estuary and ocean from the hatchery release point because of the relatively long travel distances, so the total amount of time hatchery fish could potentially interact with natural-origin fish in freshwater habitat areas may be up to 1 to 2 weeks.

Overall, the greatest ecological risks of hatchery fish to Chinook salmon likely occur in the spring Chinook salmon populations. These populations have a different life history type and are less abundant than fall Chinook salmon populations. Juvenile spring Chinook salmon along the Oregon Coast reside in freshwater for up to one year before smolting. Therefore, these populations have the most exposure to hatchery fish releases while being in freshwater. All of the hatchery releases into these population areas would interact for at least some time with juvenile spring Chinook salmon. The abundance of spring Chinook salmon is much lower than fall Chinook salmon (especially in the Nestucca, Trask, and Wilson Rivers). The risks are greater when population abundances are lower. Ecological interactions between hatchery fish and spring Chinook salmon is likely to be short-lived, with interaction periods up to 2 weeks. The overall impact is expected to be low to moderate level for spring Chinook salmon.

Oregon Coastal Chum Salmon

Alternative 1 would maintain all existing hatchery programs along the Oregon Coast. Effects of Alternative 1 would be similar to effects under current conditions for chum salmon, where some

populations are affected by hatchery facilities and hatchery fish. Since chum salmon primarily occur in rivers draining into Tillamook Bay, the Trask Hatchery programs for steelhead, Chinook salmon, and coho salmon are most likely to affect chum salmon. Chum salmon are also periodically observed in the Alsea River. All of the other rivers along the Oregon Coast within the ESU do not consistently have chum salmon present.

There would be no genetic effects from the hatchery programs because no hatchery chum salmon are released along the Oregon Coast and other salmonid species do not spawn with chum salmon in the wild. Chum salmon would benefit from Alternative 1 because hatchery fish of other species present in the rivers of Tillamook Bay would contribute nutrients to the ecosystem, benefitting existing natural-origin chum salmon populations. Fisheries would continue to be managed entirely for catch and release of all chum salmon. The incidental adverse effect of catching and releasing chum salmon while targeting other salmon would be low because few chum salmon are caught, the migrating timing of chum salmon is short when these fish are exposed to fishing while in freshwater (i.e., 1 to 2 weeks in duration). Therefore, Alternative 1 would result in genetic and fishery impacts on chum salmon essentially the same as under current conditions.

Alternative 1 could potentially result in adverse ecological effects on chum salmon due to predation and competition with hatchery fish. Hatchery fall Chinook salmon fingerlings and smolts are most likely to interact with juvenile chum salmon while in freshwater because of the overlap between the release of these hatchery fish and the emergence timing of chum salmon fry. Hatchery fall Chinook salmon and chum salmon could be present at the same time in Tillamook Bay. The impact of hatchery fall Chinook salmon is expected to be low because of the relatively low number of hatchery fish released and the relatively large habitat area of Tillamook Bay (Table 14). Predation is not likely because the two groups of fish are similar in size. All of the other hatchery fish releases occur (February-April) prior to the peak emigration of chum salmon into Tillamook Bay (May-August), and, therefore, the adverse effects are expected to be negligible.

Oregon Coastal Steelhead

Alternative 1 would maintain all existing hatchery programs along the Oregon Coast. Effects under Alternative 1 would be similar to those under current conditions for steelhead, where most populations are affected by hatchery facilities and the release of hatchery fish.

Genetic risks of hatchery steelhead spawning in the wild would continue to be low to moderate depending upon the population/strata and run type (Figure 10; Table 7; Subsection 3.4, Salmon and Steelhead and Their Habitats). The genetic risks are highest in the population areas where hatchery steelhead are released: Chetco, Rogue, Coquille, Coos, Umpqua, Tenmile, Siuslaw, Alsea, Siletz, Nestucca, Wilson, Nehalem, and Necanicum rivers. The proportion of hatchery steelhead spawning in the wild ranges from five percent (south coast), seven percent (Rogue River Basin), six percent (Umpqua River Basin), 17 percent (mid-south coast streams, like Coos, Coquille), 22 percent mid-coast, (e.g., Siuslaw, Alsea, Siletz), and 11 percent (north coast, e.g., Wilson, Nehalem, Necanicum) (Jacobsen et al. 2015). In the populations with the greatest pHOS and lowest pNOB, genetic impacts are likely to be highest (i.e., Necanicum, Nehalem, Siletz). Recent PNI values for these populations has been low; indicating hatchery selective forces are dominating natural selection (Table 7). The genetic population structure of these natural-origin winter steelhead populations are likely to be most impacted by hatchery-influenced selection (domestication). Hatchery steelhead have been shown to reduce the fitness of natural-origin steelhead when interbreeding together in the wild (Araki et al. 2007). These pHOS estimates are likely to remain similar to previous years under Alternative 1. In populations where pHOS is above 10%, there is uncertainty as to whether the natural-origin population in the wild is indeed sustainable given the continual infusion of unintentional hatchery fish supplementation (Grant 1997). Given the lack of genetic pedigree data for all populations of steelhead on the Oregon Coast, the extent hatchery steelhead may be (or not be) infusing their genes into the natural population is unknown (and the extent at the population scale). There are no estimates of the effective pHOS in the populations compared to census pHOS (NMFS 2016b). For this analysis, NMFS is assuming census pHOS represents impacts of the hatchery program on natural populations (worst case scenario for environmental consequences on natural-origin populations).

Natural spawning by hatchery steelhead is likely to be concentrated most in the areas around where the fish were released as smolts. Consequently, natural-origin fish will be most affected in these areas. If the hatchery fish point of release, or hatchery facility, is located near prime spawning areas, then interbreeding between hatchery and natural steelhead is likely to occur. The risks of hatchery-influenced selection will be highest in these areas. Other spawning areas not in the vicinity of the hatchery fish release points are not likely to be affected at all. Overall, given the pHOS estimates, populations of steelhead associated with the Necanicum, Nehalem, Siuslaw, Alsea, Siletz, Coos, and Coquille hatchery programs are likely to be moderately impacted by interbreeding between hatchery and natural steelhead.

The ecological effects (interactions between hatchery- and natural-origin salmon and steelhead) of hatchery programs would continue on steelhead in the populations where the hatchery programs occur (Figure 5; Figure 16; Figure 17; Figure 18; Figure 19; Figure 20; Figure 21; Figure 22; Figure 23). Potential effects are greatest in the population areas that have the greatest density of hatchery fish per habitat area in freshwater and in the estuary (Table 8). The highest densities of hatchery fish co-occurring with natural-origin coho salmon in freshwater habitat is found in the Elk, Coos, Salmon, and Tillamook populations (Table 14). The highest densities of hatchery fish co-occurring with natural-origin coho salmon in estuarine habitat is found in the Chetco, Rogue, and Elk population areas (Table 14). The potential ecological effects are also influenced by the location where hatchery fish are released in the watershed. Releases of hatchery fish in the upper areas of the watershed would potentially have the greatest amount of time and space to affect naturally-occurring salmonids. In addition, if hatchery fish are released in principal spawning and rearing areas of natural-origin salmonids (i.e., tributaries), then interactions would be potentially greater than if hatchery fish are released in mainstem river areas. Therefore, the potential ecological interactions between hatchery fish and steelhead is dependent upon space and time within the specific population areas (Table 14).

The ecological interaction space between hatchery fish and steelhead was evaluated as the percent of Oregon Coast coho salmon critical habitat affected by the releases of all species of hatchery fish. Coho salmon critical habitat is a good proxy for steelhead distribution. Overall, 11 percent of critical habitat is affected by hatchery fish in the Oregon Coast ESU and approximately 16 percent of steelhead habitat is affected by hatchery fish in the SONCC ESU. The principal habitat areas affected by hatchery fish are the mainstem river areas and estuaries. The vast majority of salmon and steelhead habitat is not affected by hatchery fish (Figures 13-20).

In addition to the geographic extent of hatchery fish released within a population area (i.e., space), another aspect of the interaction between hatchery- and natural-origin salmon and steelhead is the period of time affected by the presence of hatchery fish in the streams and rivers. The target release size for hatchery fish along the Oregon Coast is the smolt life stage for all steelhead, coho salmon, and spring Chinook salmon. Hatchery fall Chinook salmon are released as smolts or just prior to smolting as fingerlings (presmolts). Depending upon the species, average fork length ranges from 60 mm for fall Chinook salmon (the smallest) to 195 mm for summer and winter steelhead (the largest). Given hatchery coho salmon, spring Chinook salmon, and steelhead are released as smolts and fall Chinook salmon released as presmolts and smolts, the interaction period with juvenile steelhead is relatively short-lived because the hatchery fish are actively emigrating to the estuary and ocean. The physiological condition of

the hatchery smolts triggers their desire to emigrate. Therefore, in the population areas where the hatchery fish are released near the estuary and ocean (e.g., Chetco, Elk, Coos, Tenmile, Necanicum), the time of interaction between hatchery- and natural-origin fish in the space where hatchery fish are released (Figures 13-20) is very limited (likely hours to a few days). For the population areas where hatchery fish are released many miles from the ocean (i.e., Rogue, Umpqua, Siuslaw), it takes more time to emigrate to the estuary and ocean from the hatchery release point because of the relatively long travel distances, so the total amount of time hatchery fish could potentially interact with natural-origin fish in freshwater habitat areas may be up to 1 to 2 weeks.

Hatchery fish would contribute nutrients to the ecosystem from some natural spawning and outplanting of surplus carcasses from the hatcheries, with a resulting benefit to natural-origin steelhead. Even though hatchery carcasses would be a minority compared to the abundance of natural-origin fish, any additional marine derived nutrient is a benefit to the ecosystem. Fisheries for hatchery- and natural-origin steelhead would continue to be managed similar to current conditions. Alternative 1 would result in hatchery impacts on steelhead essentially the same as under current conditions.

4.4.2. Alternative 2 (Proposed Action/Preferred Alternative) – Approve ODFW's HGMPs for Operation of Hatchery Programs on the Oregon Coast

Under Alternative 2, the 10 hatchery facilities and associated hatchery programs along the Oregon Coast would operate as proposed in the submitted HGMPs (Subsection 2.2, Alternative 2 (Proposed Action/Preferred Alternative): Approve ODFW’s HGMPs for Operation of Hatchery Programs on the Oregon Coast); Appendix A). 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 would be the same under Alternative 2 as described under Alternative 1 (No-Action). There would be no change in the genetic and ecological effects under Alternative 2 because the hatchery programs have been operating according to the submitted HGMPs in Alternative 1. The analysis of the site-specific effects under Alternative 2 would be identical to effects analyzed under Alternative 1. The hatchery programs would continue to pose short- and long-term adverse risks associated with genetic effects, competition and predation, facility effects, masking of natural population status from hatchery fish spawning, incidental fishing effects, and transfer of pathogens from hatchery fish and/or the hatchery facility to the adjacent river or stream. The hatchery programs would continue to provide some benefits to salmon and steelhead from hatchery fish carcasses and nutrient cycling in the ecosystem.

4.4.3. Alternative 3 – Terminate Hatchery Programs on the Oregon Coast

Under Alternative 3, operation of the 10 hatchery facilities along the Oregon Coast would be terminated immediately (Subsection 2.3, Alternative 3: Terminate Hatchery Programs on the Oregon Coast). Consequently, Alternative 3 would eliminate all of the short- and long-term risks associated with hatcheries (genetic effects, competition and predation, facility effects, masking of natural population status from hatchery fish spawning, incidental fishing effects, and transfer of pathogens from hatchery fish and/or the hatchery facility to the adjacent river or stream). Alternative 3 would eliminate all hatchery-related risks to salmon and steelhead compared to Alternative 1. Alternative 3 would also eliminate the benefits from the hatchery programs providing marine derived nutrients from fish carcasses in the aquatic ecosystem. This would result in some adverse effect compared to Alternative 1 (Subsection 3.5, Other Fish and Their Habitats). The effects of Alternative 3 on each species are discussed below.

Alternative 3 would terminate all of the hatchery facility operations and ancillary sites used for broodstock collection and smolt releases along the Oregon Coast. The hatchery facilities would still remain in place physically, but all of the operations associated with the hatchery programs would be terminated under Alternative 3. The hatchery facilities would cease to operate the fish ladders and trap to collect returning hatchery fish and no hatchery fish would be spawned and propagated under Alternative 3. Any potential delays associated with broodstock collection at trap locations would be eliminated – the magnitude of this benefit would be minor because the traps have been managed to minimize delay of fish migration and most of the watershed is not affected by hatchery traps and is, instead, freely accessible. Incidental capture of natural-origin salmon and steelhead at hatchery collection facilities would also be eliminated under Alternative 3. The hatchery facilities would not have an effect on salmon under Alternative 3. Weirs or their panels would be removed; traps would be fully open or fully closed, and would not trap fish. Alternative 3 would be expected to benefit salmon and steelhead from ceasing to operate the hatchery collection facilities compared to the No-action Alternative.

Critical habitat under the ESA is only designated for coho salmon. Essential Fish Habitat under the Magnuson-Stevens Fishery Conservation and Management Act applies to coho salmon, Chinook salmon, and chum salmon along the Oregon Coast. The termination of the 10 hatchery facilities under Alternative 3 would provide some benefits to critical habitat and EFH in the local vicinity where the facilities are currently located compared to Alternative 1. The primary benefits to critical habitat and EFH would be from not having effluent discharged from the hatchery facilities to receiving waters (discussed in Subsection 4.3, Effects on Water Quality). The benefits are likely to be negligible because the impacts

under current conditions are short-lived and confined exclusively to the area near the hatchery outfall. Alternative 3 would not result in any improvements to the physical habitat components of critical habitat and EFH (besides the effects of not operating the hatchery collection facilities previously discussed) compared to the No-action Alternative 1.

Oregon Coastal Coho Salmon

Under Alternative 3, all existing hatchery programs along the Oregon Coast would be terminated. This would include four hatchery coho salmon programs (Cow, Munsel (STEP), Trask, and Nehalem). At this time, none of the hatchery programs are managed to provide population viability benefits to coho salmon. The primary benefits of Alternative 3 for coho salmon would be a reduction in competition and predation of hatchery-origin fish on natural-origin coho salmon, and elimination of the effects of the operation of the hatchery facilities on juvenile and adult coho salmon compared to the No-action Alternative 1. The proportion of naturally spawning hatchery coho salmon (pHOS) in these populations is already very low under current conditions (zero to five percent per population; ODFW 2016a). Therefore little to no benefits would be expected from eliminating pHOS on coho salmon. No natural-origin coho salmon would be incorporated into hatchery broodstocks because the hatchery programs would be eliminated in this alternative. This would increase natural spawning escapement in the South Umpqua, Trask, and Nehalem populations by less than one percent (the levels of fish removed for broodstock proposed in the HGMPs).

Under Alternative 3, the greatest proportion of hatchery fish would be eliminated from the Coos and Coquille Rivers. Approximately 42 percent of the total hatchery production within the ESU would be eliminated in these two population areas under Alternative 3 compared to the No-action Alternative (ODFW 2013c). The other 58 percent of hatchery production is distributed among 16 other coho salmon populations in Tenmile, South Umpqua, North Umpqua, lower Umpqua, Siuslaw, Alsea, Yaquina, Siletz, Salmon, Nestucca, Trask, Wilson, Kilchis, North Fork Nehalem, and Necanicum Rivers (ODFW 2013c). In thirty-nine out of 56 coho salmon populations, no hatchery fish are currently released and, thus, those 39 populations would not see a benefit from Alternative 3 compared to Alternative 1 (No-action).

Under Alternative 3, the populations with the largest total hatchery releases eliminated would be expected to see the greatest benefits, particularly in the Coos population where large fall Chinook salmon hatchery programs would be eliminated. However, the coho salmon populations in the Coos and Coquille Rivers are amongst the most abundant in the ESU (Stout et al. 2012; ODFW 2013a). Therefore, eliminating the

highest densities of hatchery fish in these two populations would be expected to result in few, if any, recovery benefits for the ESU under Alternative 3 compared to the No-action Alternative 1.

For the SONCC ESU along the Oregon Coast, hatchery fish are currently released into the Chetco, Rogue, and Elk Rivers (ODFW 2013c). Seventy-six percent of the hatchery fish from these three programs are released into the Rogue River (2.24 million fish) and thus the greatest likelihood of competition and predation on coho salmon is downstream from Cole Rivers Hatchery on the mainstem Rogue River. Under Alternative 3, if all of the hatchery programs were terminated, coho salmon would benefit from reduced competition and predation, particularly in the mainstem Rogue River.

Eliminating the release of all hatchery fish under Alternative 3, and, therefore, their return as adults, would decrease the amount of carcass nutrients provided to the natural habitat from decomposing hatchery fish. Hatchery fish contribute nutrients if they spawn in the wild or are intentionally outplanted by hatchery personnel. In 2012, more than 16,000 hatchery fish carcasses were outplanted from the hatcheries for nutrient enhancement within the Oregon Coast Region (ODFW 2013d). The percentage of total carcasses attributable to hatchery fish is estimated to be less than 20 percent. More than 80 percent of spawning salmon and steelhead are of natural-origin (Figure 8; ODFW 2014). Even though the hatchery programs may only contribute up to 20 percent of marine-derived nutrients to the freshwater environment, this additional contribution from the hatchery programs is important because habitat productivity is a key limiting factor and these watersheds are naturally low in nutrients (Stout et al. 2012; ODFW 2014) – and, for example, this would mean that nearly 20,000 hatchery fish would be contributing nutrients to natural production areas in the Rogue River. Since natural-origin salmon and steelhead returns are greatly reduced from historical levels (to 20 percent or less of historical), all additional marine-derived nutrients could help increase the productivity of the aquatic environment (Cederholm et al. 1999). Therefore, discontinuing the hatchery programs under Alternative 3 would result in an adverse effect on nutrient enhancement of the ecosystem compared to the No-action Alternative 1.

Regarding fishery impacts, Alternative 3 would eliminate returning hatchery fish from four relatively small hatchery coho salmon programs that are targeted in recreational and commercial fisheries along the Oregon Coast. Fishing effort and catch would likely change focus from hatchery fish to areas where natural-origin fish can be legally harvested. For coho salmon, retention of natural-origin fish has been allowed under the ESA in years when the returns are abundant (NMFS 2009). If returning hatchery fish are eliminated under Alternative 3, fishery effort for natural-origin coho salmon would likely increase in years when the fishery is allowed compared to current conditions. However, the harvest impact on

natural-origin coho salmon would be managed to remain the same under ESA fishery regulatory management plans (harvest impacts could not legally increase on natural-origin coho above the rates specified in Amendment 13 to the Pacific Salmon Plan (NMFS 2009). Therefore, harvest impacts on natural-origin coho salmon would remain unchanged under Alternative 3. The potential effect on fishing opportunity for hatchery coho salmon is considered in Subsection 4.7, Effects on Socioeconomics, and Subsection 4.8, Effects on Environmental Justice. Bycatch of coho salmon in fisheries targeting other species would be low, similar to the No-action Alternative conditions, given the low level of incidental take of other species in coho salmon-directed fisheries (PFMC 2013).

Oregon Coastal Chinook Salmon

Under Alternative 3, all existing hatchery programs along the Oregon Coast would be terminated. Most of the hatchery production within the Oregon Coast Region is spring and fall Chinook salmon (72 percent of all salmonid hatchery production in the Oregon Coast Region). At this time, none of the hatchery programs are intended to provide population viability benefits to Chinook salmon. The primary benefits of Alternative 3 to Chinook salmon (compared to the No-action Alternative) would be a reduction in genetic risks, reduction in competition, and reduction in predation of hatchery-origin fish on natural-origin Chinook salmon. Since natural spawning by hatchery fish in the wild was identified as a concern for two Chinook salmon populations (Elk River and Salmon River; Subsection 3.4, Salmon and Steelhead and Their Habitats), Alternative 3 would likely decrease the genetic risks to natural-origin Chinook salmon in these two populations and reduce ecological interactions between natural- and hatchery-origin Chinook compared to Alternative 1.

Eliminating all hatchery fish under Alternative 3 would decrease the amount of carcass nutrients provided to the natural habitat from decomposing hatchery fish in the short term compared to the No-action Alternative. Even though hatchery fish represent a relatively low proportion of available carcasses in Oregon Coast streams and rivers (20 percent or less of the total), any decrease in number would likely result in an adverse effect because habitat productivity is substantially reduced from historical levels and remains a key limiting factor. Over the long term, natural production of Chinook salmon populations may increase some from the elimination of the hatchery programs, which would compensate for the immediate loss of hatchery fish carcass nutrients from the discontinuation of the hatchery programs under Alternative 3 compared to the No-action Alternative 1.

Alternative 3 would eliminate the operation of the 10 hatchery facilities and all other ancillary sites used for broodstock collection and release of juvenile hatchery fish. Delay and handling of juvenile and adult Chinook salmon associated with trap operations would be eliminated. All of the hatchery facilities would cease to use water for hatchery operations and no hatchery effluent would be released. All of the hatchery facilities would still be in place physically, but their collection traps, operations, and associated impacts would be terminated under Alternative 3. Weirs or their panels would be removed; traps would be fully open or fully closed, and would not trap fish. Alternative 3 would be expected to benefit Chinook salmon compared to the No-action Alternative.

Alternative 3 would eliminate returning hatchery fish that are targeted in recreational and commercial fisheries along the Oregon Coast. Fishing effort and catch would likely change focus from hatchery fish to areas where natural-origin fish can be harvested (since hatchery Chinook salmon would be eliminated under this alternative). For Chinook salmon, retention of natural-origin fish is allowed in nearly every river (with the exception of spring Chinook salmon). If returning hatchery fish are eliminated under Alternative 3, two possible outcomes are likely, depending upon the abundance of natural-origin Chinook salmon. First, if hatchery Chinook salmon are eliminated from an area where hatchery fish made up the bulk of harvested fish, fishing effort would likely decrease under Alternative 3 because too few natural-origin Chinook would be available to sustain the fishery. Second, if hatchery fish are eliminated from an area where natural-origin Chinook salmon are abundant, the fisheries would likely switch over to harvesting a greater number of natural-origin fish in the same area (this is the most likely situation with fall Chinook salmon). In these situations, fishery effort on natural-origin Chinook salmon would likely increase compared to baseline conditions in fisheries where natural-origin Chinook salmon can be retained under current fishing regulations. These Chinook salmon fisheries are intensive and the harvest rate on natural-origin Chinook salmon would be expected to increase substantially because hatchery Chinook salmon would no longer be available for harvest. The State of Oregon might have to change current regulations, which is within its purview for non-ESA-listed species and those without a prescriptive management plan, in order to maintain harvest rates at a sustainable level for natural-origin Chinook salmon in those areas where hatchery programs are eliminated under Alternative 3. Compared to the No-action Alternative, Alternative 3 (termination of hatchery Chinook salmon programs) would be expected to result in a higher impact on natural-origin Chinook salmon because fishery effort and harvest would be directed more at natural-origin Chinook salmon. The overall number of Chinook salmon harvested would be expected to decrease under Alternative 3 because natural-origin Chinook salmon populations cannot sustain the higher harvest rates that can be directed at hatchery fish programs.

Oregon Coastal Chum Salmon

Alternative 3 would terminate all existing hatchery programs along the Oregon Coast. At this time, none of the hatchery programs are intended to provide population viability benefits to chum salmon because no hatchery chum salmon programs exist along the Oregon Coast. The primary effect of Alternative 3 on chum salmon would be a reduction in competition with and predation by hatchery-origin fish on natural-origin chum salmon. Alternative 3 would benefit chum salmon in the Yaquina, Siletz, Salmon, Nestucca, Netarts, Tillamook, Nehalem, and Necanicum River Basins compared to the No-action Alternative conditions by eliminating all hatchery fish released into those watersheds (Subsection 3.4, Salmon and Steelhead and Their Habitats). Since chum salmon are depressed in all of these areas along the Oregon Coast, the greatest benefit to chum salmon from Alternative 3 is most likely to occur in Tillamook Bay because this area would have the largest reduction in the number of hatchery fish released. In all cases, because chum salmon populations are in low numbers and poor condition, they would likely benefit to some extent from the reduction of interactions with hatchery-origin fish, but the available data are insufficient to indicate any substantial benefit.

The greatest benefit to chum salmon from the termination of hatchery programs under Alternative 4 would be for the hatchery smolt programs in Tillamook Bay. Under Alternative 4, termination of the winter and summer steelhead smolt release programs in the Wilson and Trask Rivers, coho salmon in the Trask River, and spring Chinook smolt program in the Wilson and Trask Rivers would provide the greatest potential benefits to chum salmon because the hatchery smolts are large enough to predate upon newly emerged chum salmon fry during the period of hatchery fish releases in February through April, (Table 14, Figure 4, Figure 22).

Eliminating all hatchery fish under Alternative 3 would decrease the amount of carcass nutrients provided to the natural habitat from decomposing hatchery fish. Even though hatchery fish represent a relatively low proportion of available carcasses in Oregon Coast streams and rivers (less than 20 percent of the total), any decrease in number would likely result in an adverse effect because habitat productivity is substantially reduced from historical levels and remains a key limiting factor. Therefore, Alternative 3 would result in less marine-derived nutrients from hatchery fish carcasses compared to the No-action Alternative.

Alternative 3 would eliminate the operation of the 10 hatchery facilities and all other ancillary sites used for broodstock collection and release of juvenile hatchery fish. Delay and handling of juvenile and adult

chum salmon associated with trap operations would be eliminated in the population areas where chum salmon occur (Tillamook and Nehalem). All of the hatchery facilities would cease to use water for hatchery operations and no hatchery effluent would be released. The hatchery facilities would still be in place physically, but their operations and associated impacts would be terminated under Alternative 3. Alternative 3 would be expected to benefit chum salmon compared to Alternative 1. However, the expected benefit is negligible because most of the hatchery facilities do not exist in the lowland areas where chum salmon spawn and rear; only Salmon River, Cedar Creek, Trask, and Nehalem Hatcheries are located where chum salmon could potentially co-occur, so those chum salmon populations in the Salmon, Nestucca, Tillamook, and Nehalem Rivers are the ones that would benefit, albeit only slightly, from cessation of the facility operations.

Alternative 3 would eliminate returning hatchery fish that are targeted in recreational and commercial fisheries along the Oregon Coast. Fishing effort and catch would likely change focus from hatchery fish to areas where natural-origin fish can be harvested. For chum salmon, no retention is allowed along the Oregon Coast. If returning hatchery fish are eliminated under Alternative 3, fishery effort for chum salmon would not likely change compared to Alternative 1 because fisheries targeting chum salmon are essentially non-existent (with the exception of the Kilchis and Miami Rivers in Tillamook Bay where chum salmon are incidentally caught). Compared to Alternative 1, Alternative 3 would be expected to result in an undetectable benefit to chum salmon from changes in fishery harvest from the elimination of hatchery fish because chum salmon are not subject to directed fisheries and are not taken incidentally in meaningful numbers in other fisheries.

Oregon Coastal Steelhead

Alternative 3 would terminate all existing hatchery programs along the Oregon Coast. As proposed, none of the hatchery programs are intended to provide population viability benefits to summer and winter steelhead. The primary benefits of Alternative 3 to steelhead would be a reduction in genetic risks, competition, and predation of hatchery-origin fish on natural-origin steelhead. Since natural spawning by hatchery fish in the wild was identified as a concern for many steelhead populations (Subsection 3.4, Salmon and Steelhead and Their Habitats), Alternative 3 would benefit steelhead compared to Alternative 1 by eliminating all hatchery fish along the Oregon Coast. The greatest benefits from Alternative 3 to steelhead would be in the population areas that currently have the highest pHOS (22 percent average in mid-coast streams). The potential benefit would be moderately positive in these populations. The genetic structure of these winter steelhead populations would be improved by not having hatchery steelhead

released into these populations. Natural selection would enhance the fitness of these populations without having the continual infusion of hatchery-selected genes into the wild population. For the other steelhead populations, the potential benefits would be low positive because pHOS is currently less than seven percent for the south coast, Rogue, and Umpqua Basins (Jacobsen et al. 2015). Since the existing hatchery steelhead are all derived from local broodstock, pHOS levels in the range of zero to seven percent are within the range of natural inter-population straying levels (Grant 1997) and resultant PNI values are still high. Quinn (2005) stated natural straying occurs in rates of one to five percent of any salmonid population. Given this aspect of natural straying, it would be expected that termination of the hatchery steelhead programs would eliminate human-induced, hatchery-influenced selection effects (domestication) from hatchery steelhead being reared in a hatchery, but natural straying impacts would continue to occur from adjacent wild populations.

Eliminating all hatchery fish under Alternative 3 would decrease the amount of carcass nutrients provided to the natural habitat from decomposing hatchery fish. Even though hatchery fish represent a relatively low proportion of available carcasses in Oregon Coast streams and rivers (less than 20 percent of the total), any decrease in number would likely result in an adverse effect because habitat productivity is substantially reduced from historical levels and remains a key limiting factor. Therefore, Alternative 3 would result in less marine-derived nutrients from hatchery fish carcasses compared to the No-action Alternative.

Alternative 3 would eliminate the operation of the 10 hatchery facilities and all other ancillary sites used for broodstock collection and release of juvenile hatchery fish. The hatchery facilities would remain in place physically but the associated operations and effects would all be terminated under Alternative 3. Delay and handling of juvenile and adult steelhead associated with trap operations would be eliminated. All of the hatchery facilities would cease to use water for hatchery operations and no hatchery effluent would be released. Because of the elimination of the operation of hatchery facilities, Alternative 3 would be expected to benefit steelhead compared to the No-action Alternative.

Alternative 3 would eliminate returning hatchery fish that are targeted in recreational fisheries along the Oregon Coast. Fishing effort and catch would likely change focus from hatchery fish to the few areas where natural-origin fish can be harvested. For steelhead, retention of natural-origin fish is allowed in some southern Oregon rivers. If returning hatchery fish are eliminated under Alternative 3, fishery effort for natural-origin steelhead would likely increase compared to the No-action Alternative. These steelhead fisheries are intensive and the impact rate on some stocks (like summer-run) would be expected to

increase substantially even from catch and release. The State of Oregon might have to change current regulations in order to maintain harvest impact rates at a level appropriate for the populations. Some other steelhead populations, where the hatchery program was eliminated, would likely have less fishing pressure and therefore less impact from fishing. Overall, compared to the No-action Alternative conditions, Alternative 3 would be expected to result in a higher impact on natural-origin steelhead from increased fishery exploitation rates.

4.4.4. Alternative 4 – Reduced Hatchery Production

Under Alternative 4, hatchery production would be reduced at the 10 hatchery facilities along the Oregon Coast by 50 percent compared to the No-action Alternative. Consequently, Alternative 4 would reduce all of the short- and long-term risks associated with hatcheries (genetic effects, competition and predation, facility effects, masking of natural population status from hatchery fish spawning, incidental fishing effects, and transfer of pathogens from hatchery fish and/or the hatchery facility to the adjacent river or stream) compared to the No-action Alternative. Alternative 4 would eliminate all hatchery-related risks to salmon and steelhead by at least 50 percent compared to Alternative 1. Alternative 4 would also eliminate some of the benefits from the hatchery programs providing marine-derived nutrients from fish carcasses in the aquatic ecosystem. This would result in adverse effects compared to Alternative 1 (Subsection 3.5, Other Fish and Their Habitats). The effects of Alternative 4 on each species are discussed below.

Critical habitat under the ESA is only designated for coho salmon. Essential Fish Habitat under the Magnuson-Stevens Fishery Conservation and Management Act applies to coho salmon, Chinook salmon, and chum salmon along the Oregon Coast. The reduction in hatchery production at the 10 hatchery facilities under Alternative 4 would provide some benefits to critical habitat and EFH in the local vicinity where the facilities are currently located compared to Alternative 1. The primary benefits to critical habitat and EFH would be from not having as much effluent discharged from the hatchery facilities to receiving waters (discussed in Subsection 4.3, Effects on Water Quality). The benefits are likely to be negligible because the impacts under current conditions are short-lived and confined exclusively to the area near the hatchery outfall. Alternative 4 would not result in any improvements to the physical habitat components of critical habitat and EFH compared to the No-action Alternative 1 because the hatchery collection facilities would still be in operation, but more limited in time of operation.

Oregon Coastal Coho Salmon

Under Alternative 4, all existing hatchery programs along the Oregon Coast would be reduced by 50 percent. At this time, none of the hatchery coho salmon programs (Cow, Munsel (STEP), Trask, Nehalem) are managed to provide population viability benefits to natural coho salmon. The primary benefits of Alternative 4 for coho salmon would be a reduction in competition and predation of hatchery-origin fish on natural-origin coho salmon, and a 50 percent reduction of the effects of the operation of the hatchery facilities on juvenile and adult coho salmon compared to the No-action Alternative 1.

Under Alternative 4, a 50 percent reduction in hatchery production would equate to the greatest elimination of hatchery fish released in the Coo and Coquille Rivers because approximately 42 percent of the total hatchery production within the ESU occurs in these rivers compared to the No-action Alternative (ODFW 2013c). The other 58 percent of hatchery production is distributed among 16 other coho salmon populations in Tenmile, South Umpqua, North Umpqua, lower Umpqua, Siuslaw, Alsea, Yaquina, Siletz, Salmon, Nestucca, Trask, Wilson, Kilchis, North Fork Nehalem, and Necanicum Rivers (ODFW 2013c). In thirty-nine out of 56 coho salmon populations, no hatchery fish are currently released and, thus, those 39 populations would not see a benefit from Alternative 4 compared to Alternative 1 (No-action).

Under Alternative 4, the populations with the largest total hatchery releases eliminated would be expected to see the greatest benefits, particularly in the Coos and Coquille populations where large fall Chinook salmon hatchery programs would be eliminated by 50 percent. No hatchery coho salmon are present in the Coquille and Coos populations so impacts under Alternative 4 would not be genetic, but ecological. The coho salmon populations in the Coos and Coquille Rivers are amongst the most abundant and productive in the ESU (Stout et al. 2012; ODFW 2013a). Therefore, reducing the highest densities of hatchery fish by 50 percent in these two populations would be expected to result in few, if any, recovery benefits for the ESU under Alternative 4 compared to the No-action Alternative 1.

For the SONCC ESU along the Oregon Coast, hatchery fish are currently released into the Chetco, Rogue, and Elk Rivers (ODFW 2013c). Seventy-six percent of the hatchery fish from these three programs are released into the Rogue River (2.24 million fish) and thus the greatest likelihood of competition and predation on natural-origin coho salmon is downstream from Cole Rivers Hatchery on the mainstem Rogue River. Under Alternative 4, if the hatchery programs were reduced by 50 percent, natural-origin coho salmon would slightly benefit from reduced competition and predation, particularly in the mainstem Rogue River.

Reducing the release of hatchery fish by 50 percent under Alternative 4, and, therefore, their return as adults, would decrease the amount of carcass nutrients provided to the natural habitat from decomposing hatchery fish. Hatchery fish contribute nutrients if they spawn in the wild or are intentionally outplanted by hatchery personnel. In 2012, more than 16,000 hatchery fish carcasses were outplanted from the hatcheries for nutrient enhancement within the Oregon Coast Region (ODFW 2013d). Therefore, under Alternative 4 only 8,000 hatchery fish may be available for outplanting. The percentage of total carcasses attributable to hatchery fish under Alternative 4 is estimated to be less than 10 percent. More than 90 percent of spawning salmon and steelhead are of natural-origin, and therefore, natural-origin fish make up most of the nutrient contribution along the Oregon Coast (Figure 8; ODFW 2014a).

Even though the hatchery programs may only contribute up to 10 percent of marine-derived nutrients to the freshwater environment under Alternative 4, this additional contribution from the hatchery programs is important because habitat productivity is a key limiting factor and these watersheds are naturally low in nutrients (Stout et al. 2012; ODFW 2014a). Since natural-origin salmon and steelhead returns are greatly reduced from historical levels (to 20 percent or less of historical), all additional marine-derived nutrients could help increase the productivity of the aquatic environment (Cederholm et al. 1999). Therefore, reducing the hatchery programs under Alternative 4 would result in an adverse effect on nutrient enhancement of the ecosystem compared to the No-action Alternative 1.

Alternative 4 would reduce operations of the hatchery facilities and ancillary sites used for broodstock collection and smolt releases by 50 percent along the Oregon Coast. The hatchery facilities would still remain in place physically, but all of the operations associated with the hatchery programs would be reduced under Alternative 4. The hatchery facilities would continue to operate the fish ladders and trap to collect returning hatchery fish, but operations would be reduced compared to the No-action Alternative. Potential delays associated with broodstock collection at trap locations would be reduced – the magnitude of this benefit would be minor because the traps have been managed to minimize delay of fish migration and most of the watershed is not affected by hatchery traps and is, instead, freely accessible. Incidental capture of natural-origin coho salmon at hatchery collection facilities would also be reduced by 50 percent under Alternative 4. However, the current reported incidental capture of natural-origin coho salmon is minimal, but would be a negligible beneficial effect of this alternative compared to the No-action alternative. The hatchery facilities would still have an effect on salmon under Alternative 4, but at a reduced rate. Weirs or their panels would still be in place; traps would still be in operation, and 50

percent of the fish would be trapped as compared to the No-action Alternative. Alternative 4 would be expected to provide a negligible benefit to coho salmon compared to the No-action Alternative.

Regarding fishery impacts, Alternative 4 would reduce returning hatchery fish from four relatively small hatchery coho salmon programs that are targeted in recreational and commercial fisheries along the Oregon Coast. Fishing effort and catch would likely change focus from hatchery fish to areas where natural-origin fish can be legally harvested. For coho salmon, retention of natural-origin fish has been allowed under the ESA in years when the returns are abundant (NMFS 2009). If returning hatchery fish are reduced under Alternative 4, fishery effort for natural-origin coho salmon would likely increase in years when the fishery is allowed compared to current conditions. However, the harvest impact on natural-origin coho salmon would be managed to remain the same under ESA fishery regulatory management plans (harvest impacts could not legally increase on natural-origin coho above the rates specified in Amendment 13 to the Pacific Salmon Plan (NMFS 2009). Therefore, harvest impacts on natural-origin coho salmon would remain unchanged under Alternative 4. The potential effect on fishing opportunity for hatchery coho salmon is considered in subsection 4.7, Effects on Socioeconomics, and subsection 4.8, Effects on Environmental Justice. Bycatch of coho salmon in fisheries targeting other species would be low, similar to the No-action Alternative conditions, given the low level of incidental take of other species in coho salmon-directed fisheries (PFMC 2013).

Oregon Coastal Chinook Salmon

Under Alternative 4, existing hatchery programs along the Oregon Coast would be reduced by 50 percent. Most of the hatchery production along the Oregon Coast Region is spring and fall Chinook salmon (72 percent of all salmonid hatchery production in the Oregon Coast Region). At this time, none of the hatchery programs are intended to provide population viability benefits to Chinook salmon. The primary benefits of Alternative 4 to Chinook salmon (compared to the No-action Alternative) would be a reduction in genetic risks, reduction in competition, and reduction in predation of hatchery-origin fish on natural-origin Chinook salmon. Since natural spawning by hatchery fish in the wild was identified as a concern for two Chinook salmon populations (Elk River and Salmon River; Subsection 3.4, Salmon and Steelhead and Their Habitats), Alternative 4 would likely substantially reduce the genetic risks from hatchery Chinook salmon on natural-origin Chinook salmon in these two populations and reduce ecological interactions between natural- and hatchery-origin Chinook. It is expected pHOS in these populations would be reduced by more than 50% because as hatchery production is reduced the remaining hatchery fish have a higher collection efficiency back at the hatchery, thus reducing pHOS by more than

the 50% smolt reduction. It would be anticipated pHOS levels under this Alternative 4 would be less than 25% for the Elk and Salmon Rivers (Table 7) and likely meet the population goals for pHOS identified by ODFW (Figure 6). This alternative would provide a beneficial effect on the genetic integrity of the natural-origin fall Chinook salmon population compared to Alternative 1.

Reducing the releases of hatchery fish under Alternative 4 would decrease the amount of carcass nutrients provided to the natural habitat from decomposing hatchery fish in the short term compared to the No-action Alternative. Even though hatchery fish represent a relatively low proportion of available carcasses in Oregon Coast streams and rivers (20 percent or less of the total), any decrease in number would likely result in an adverse effect because habitat productivity is substantially reduced from historical levels and remains a key limiting factor. Over the long term, natural production of Chinook salmon may increase slightly in the populations where hatchery fish were reduced by 50 percent under Alternative 4 from having fewer hatchery fish negative interactions with natural Chinook salmon, which would compensate for the reduction in hatchery fish carcass nutrients from Alternative 4 compared to the No-action Alternative 1.

Alternative 4 would reduce the operation of the 10 hatchery facilities and other ancillary sites used for broodstock collection and release of juvenile hatchery fish. Delay and handling of juvenile and adult Chinook salmon associated with trap operations would still occur but at a lower level. All of the hatchery facilities would use less water for hatchery operations and less hatchery effluent would be released. All of the hatchery facilities would still be in place physically, but the operation of the collection traps, operations, and associated impacts would be reduced under Alternative 4. Weirs or their panels would still be place; traps would be operated less because 50 percent less fish would need to be trapped under Alternative 4. Alternative 4 would be expected to be a negligible benefit to natural Chinook salmon compared to the No-action Alternative because hatchery facilities impacts are low.

Alternative 4 would reduce the number of hatchery fish that are available for recreational and commercial fisheries along the Oregon Coast compared to the No-action Alternative. Fishing effort and catch would likely change focus from hatchery fish to areas where natural-origin fish can be harvested (since hatchery Chinook salmon would be reduced by 50 percent under this alternative).

For Chinook salmon, retention of natural-origin fish is allowed in nearly every river (with the exception of spring Chinook salmon). If returning hatchery fish are reduced under Alternative 4, two possible outcomes are likely, depending upon the abundance of natural-origin Chinook salmon. First, if hatchery

Chinook salmon are reduced by 50 percent from an area where hatchery fish made up the bulk of harvested fish, fishing effort would likely decrease under Alternative 4 as compared to the No-action Alternative 1 because too few natural-origin would be available to sustain the fishery. Second, if hatchery fish are reduced from an area where natural-origin Chinook salmon are abundant, the fisheries would likely switch over to harvesting a greater number of natural-origin fish in the same area (this is the most likely situation with fall Chinook salmon). In these situations, fishery effort on natural-origin Chinook salmon would likely increase compared to the No-action Alternative in fisheries where natural-origin Chinook salmon can be retained under current fishing regulations.

These Chinook salmon fisheries are intensive, and the harvest rate on natural-origin Chinook salmon would be expected to increase because fewer hatchery Chinook salmon would be available for harvest. An increase of 10 to 20% harvest rate on natural-origin Chinook salmon could be expected if the fall Chinook hatchery programs were reduced under Alternative 4. The outcome of this change would be one of two things. The natural-origin populations could be exposed to higher harvest rates and a decrease in natural fish escapement. There would be some negative effects on the population in terms of abundance and productivity. Another possible outcome might be the State of Oregon modifying angling regulations to reduce the increased harvest of fall Chinook salmon expected under Alternative 4. This would result in a decrease in angling opportunity for these populations.

Compared to the No-action Alternative, Alternative 4 (reduction of hatchery Chinook salmon programs) would be expected to result in a greater adverse impact on natural-origin Chinook salmon because fishery effort and harvest would be directed more at natural-origin Chinook salmon. The overall number of Chinook salmon harvested would be expected to decrease under Alternative 4 because natural-origin Chinook salmon populations cannot sustain the higher harvest rates that can be directed at hatchery fish programs.

Oregon Coastal Chum Salmon

Alternative 4 would reduce existing hatchery programs along the Oregon Coast by 50 percent compared to the No-action Alternative. At this time, none of the hatchery programs are intended to provide population viability benefits to chum salmon because no hatchery chum salmon programs exist along the Oregon Coast. The primary effect of Alternative 4 on chum salmon would be a reduction in competition with and predation by hatchery-origin fish on natural-origin chum salmon.

Alternative 4 would potentially benefit chum salmon in the Yaquina, Siletz, Salmon, Nestucca, Netarts, Tillamook, Nehalem, and Necanicum River Basins compared to the No-action Alternative conditions by eliminating 50 percent of all hatchery fish released into those watersheds (Subsection 3.4, Salmon and Steelhead and Their Habitats). Since chum salmon populations are depressed in all of these areas along the Oregon Coast, the greatest benefit to chum salmon from Alternative 4 is most likely to occur in Tillamook Bay because this area would have the largest reduction in the number of hatchery fish released and high potential for overlap in space and time (Table 14). In all cases, because chum salmon populations are in low numbers and poor condition, they would likely benefit to some extent from the reduction of interactions with hatchery-origin fish, but the available data are insufficient to indicate any substantial benefit.

Reducing the number of hatchery fish under Alternative 4 would decrease the amount of carcass nutrients provided to the natural habitat from decomposing hatchery fish. Even though hatchery fish represent a relatively low proportion of available carcasses in Oregon Coast streams and rivers (less than 20 percent of the total), any decrease in number would likely result in an adverse effect because habitat productivity is substantially reduced from historical levels and remains a key limiting factor. Therefore, Alternative 4 would result in less marine-derived nutrients from hatchery fish carcasses and low adverse effects compared to the No-action Alternative.

Alternative 4 would reduce hatchery fish releases by 50 percent and consequently reduce the operation of the 10 hatchery facilities and all other ancillary sites used for broodstock collection and release of juvenile hatchery fish. Delay and handling of juvenile and adult chum salmon associated with trap operations would be reduced in the population areas where chum salmon occur (Tillamook and Nehalem). All of the hatchery facilities would decrease water use for hatchery operations and 50 percent less hatchery effluent would be released. The hatchery facilities would still be in place physically, but their operations and associated impacts would be reduced by 50 percent under Alternative 4 compared to the No-action Alternative. Alternative 4 would be expected to benefit chum salmon compared to Alternative 1. However, the expected benefit is low because most of the hatchery facilities do not exist in the lowland areas where chum salmon spawn and rear; only Salmon River, Cedar Creek, Trask, and Nehalem Hatcheries are located where chum salmon could potentially co-occur, so those chum salmon populations in the Salmon, Nestucca, Tillamook, and Nehalem Rivers are the ones that would benefit, albeit only slightly, from a reduction in operation of the facility operations.

Alternative 4 would reduce the number of returning hatchery fish that are available in recreational and commercial fisheries along the Oregon Coast compared to the No-action Alternative. Fishing effort and catch would likely change focus from hatchery fish to areas where natural-origin fish can be harvested. For chum salmon, no retention is allowed along the Oregon Coast. If returning hatchery fish are reduced under Alternative 4, fishery effort for chum salmon would not likely change compared to Alternative 1 because fisheries targeting chum salmon are essentially non-existent (with the exception of the Kilchis and Miami Rivers in Tillamook Bay where chum salmon are incidentally caught). Compared to Alternative 1, Alternative 4 would be expected to result in an undetectable benefit to chum salmon from changes in fishery harvest from the elimination of hatchery fish because chum salmon are not subject to directed fisheries and are not taken incidentally in meaningful numbers in other fisheries.

Oregon Coastal Steelhead

Alternative 4 would reduce all existing hatchery programs by 50 percent along the Oregon Coast compared to the No-action Alternative As proposed, none of the hatchery programs are intended to provide population viability benefits to summer and winter steelhead. The primary benefits of Alternative 4 to steelhead would be a reduction in genetic risks, competition, and predation of hatchery-origin fish on natural-origin steelhead. Since natural spawning by hatchery fish in the wild was identified as a concern for many steelhead populations (Subsection 3.4, Salmon and Steelhead and Their Habitats), Alternative 4 would benefit steelhead compared to the No-action Alternative by eliminating 50 percent of all hatchery fish along the Oregon Coast. It is expected, current pHOS values in the steelhead populations would be reduced by more than 50% (Table 7) under this Alternative 4. Therefore, nearly all of the steelhead populations would meet the goals identified by ODFW for pHOS (Figure 6).

Eliminating 50 percent of all hatchery fish under Alternative 4 would decrease the amount of carcass nutrients provided to the natural habitat from decomposing hatchery fish compared to the No-action Alternative. Even though hatchery fish represent a relatively low proportion of available carcasses in Oregon Coast streams and rivers (less than 20 percent of the total), any decrease in number would likely result in an adverse effect because habitat productivity is substantially reduced from historical levels and remains a key limiting factor. Therefore, Alternative 4 would result in less marine-derived nutrients from hatchery fish carcasses and low adverse effects compared to the No-action Alternative.

Alternative 4 would reduce the operation of the 10 hatchery facilities and all other ancillary sites used for broodstock collection and release of juvenile hatchery fish. The hatchery facilities would remain in place

physically, but the associated operations and effects would all be reduced by 50 percent under Alternative 4. Delay and handling of juvenile and adult steelhead associated with trap operations would be reduced as compared to the No-action Alternative. All of the hatchery facilities would reduce water use for hatchery operations and less hatchery effluent would be released. Because of the reduction in the operation of hatchery facilities, Alternative 4 would be expected to have a low beneficial effect on steelhead compared to the No-action Alternative.

Alternative 4 would reduce returning hatchery fish that are targeted in recreational fisheries along the Oregon Coast as compared to the No-action Alternative. Fishing effort and catch would likely change focus from hatchery fish to the few areas where natural-origin fish can be harvested. For steelhead, retention of natural-origin fish is allowed in some southern Oregon rivers. If returning hatchery fish are reduced by 50 percent under Alternative 4, fishery effort for natural-origin steelhead would likely increase compared to the No-action Alternative.

These steelhead fisheries are intensive, and the impact rate on some stocks (like summer-run) would be expected to increase substantially even from catch and release. The State of Oregon might have to change current regulations to maintain harvest impact rates at a level appropriate for the populations. Some other steelhead populations, where the hatchery program was reduced, would likely have less fishing pressure and therefore less impact from fishing. Overall, compared to the No-action Alternative conditions, Alternative 4 would be expected to result in a greater adverse impact on natural-origin steelhead from increased fishery exploitation rates.

4.4.5. Alternative 5 – Terminate Highest Risk Hatchery Programs and Implement Hatchery Program Reforms

Under Alternative 5, the highest risk hatchery programs would be terminated and hatchery reforms would be implemented for the remaining programs. Consequently, this alternative would reduce all of the short- and long-term risks associated with hatcheries (genetic effects, competition and predation, facility effects, masking of natural population status from hatchery fish spawning, incidental fishing effects, and transfer of pathogens from hatchery fish and/or the hatchery facility to the adjacent river or stream) in all of the population areas where hatchery programs occur compared to the No-action Alternative. Alternative 5 would provide the greatest potential benefits to natural-origin salmon and steelhead in the Elk, South Umpqua, Siletz, Nestucca, Trask, Wilson, Nehalem, and Necanicum population areas because hatchery programs would be eliminated in these areas. Alternative 4 would also eliminate some of the benefits

from the hatchery programs providing marine-derived nutrients from fish carcasses in the aquatic ecosystem. This would result in adverse effects compared to Alternative 1 (Subsection 3.5, Other Fish and Their Habitats). The effects of Alternative 5 on each species are discussed below.

Critical habitat under the ESA is only designated for coho salmon. Essential Fish Habitat under the Magnuson-Stevens Fishery Conservation and Management Act applies to coho salmon, Chinook salmon, and chum salmon along the Oregon Coast. Nehalem Hatchery would be closed in Alternative 5 because all of the hatchery programs associated with this facility would be terminated. This would provide some benefits to critical habitat and EFH in the North Fork Nehalem River where the facility is currently located compared to Alternative 1. The primary benefits to critical habitat and EFH would be from not having effluent discharged from the hatchery facility to receiving waters (discussed in Subsection 4.3, Effects on Water Quality). The benefits are likely to be negligible because the impacts under current conditions are short-lived and confined exclusively to the area near the hatchery outfall. Alternative 5 would not result in any improvements to the physical habitat components of critical habitat and EFH compared to the No-action Alternative 1 because the hatchery collection facilities would still be in operation, but more limited in time of operation.

Oregon Coastal Coho Salmon

Under Alternative 5, three hatchery coho salmon programs would be terminated: South Umpqua, Trask, and Nehalem programs. The primary benefits of Alternative 5 for coho salmon would be a reduction in hatchery genetic impacts, competition, and predation of hatchery-origin fish on natural-origin coho salmon. The overall genetic benefits to the South Umpqua, Trask, and Nehalem populations would be small if these hatchery programs were terminated because currently pHOS ranges from 2% to 5%. There would also be a benefit to the natural population from not using natural-origin in hatchery broodstocks. An additional 100 natural-origin coho salmon would be available for natural spawning and production in each population in years when these fish would have been taken for hatchery broodstock. However, this increase in escapement would only equate to a less than one percent increase (per the HGMP broodstock criteria) compared to the No-action Alternative 1.

Under Alternative 5, the populations with the largest total hatchery releases eliminated (Elk, Trask, Nehalem Rivers) would be expected to see the greatest benefits to coho salmon. The greatest potential ecological benefits to coho salmon from the elimination of the hatchery programs would be in the Elk and Trask Rivers, where the density of hatchery is high compared to the amount of freshwater and estuarine

habitat available (Table 14). Therefore, eliminating hatchery fish by 100 percent in these two populations would be expected to result in some VSP benefits for the ESU in terms of reduced ecological interactions between hatchery fish and natural-origin juvenile coho salmon under Alternative 5 compared to the No-action Alternative 1. Abundance and productivity may increase in these populations. Predation by hatchery steelhead on newly emerged age-0 coho salmon would be eliminated in the populations where hatchery steelhead are currently released. For the remaining coho salmon populations, benefits of Alternative 5 would be slight compared to the No-action Alternative because either no hatchery fish are present in the population area, or if present, densities of hatchery fish are lower.

Eliminating the identified hatchery programs in Alternative 5 would reduce the release of hatchery fish by 1.16 million smolts annually, and, therefore, their return as adults, would decrease the amount of carcass nutrients provided to the natural habitat from decomposing hatchery fish. Hatchery fish contribute nutrients if they spawn in the wild or are intentionally outplanted by hatchery personnel. In 2012, more than 16,000 hatchery fish carcasses were outplanted from the hatcheries for nutrient enhancement within the Oregon Coast Region (ODFW 2013d). Therefore, under Alternative 5 approximately 14,200 hatchery fish may be available for outplanting based upon the hatchery production reduction. The percentage of total carcasses attributable to hatchery fish under Alternative 5 is estimated to be less than 10 percent. More than 90 percent of spawning salmon and steelhead are of natural-origin, and therefore, natural-origin fish make up most of the nutrient contribution along the Oregon Coast (Figure 8; ODFW 2014a).

Even though the hatchery programs may only contribute up to 10 percent of marine-derived nutrients to the freshwater environment under Alternative 5, this additional contribution from the hatchery programs is important because habitat productivity is a key limiting factor and these watersheds are naturally low in nutrients (Stout et al. 2012; ODFW 2014a). Since natural-origin salmon and steelhead returns are greatly reduced from historical levels (to 20 percent or less of historical), all additional marine-derived nutrients could help increase the productivity of the aquatic environment (Cederholm et al. 1999). Therefore, reducing the hatchery programs under Alternative 5 would result in an adverse effect on nutrient enhancement of the ecosystem compared to the No-action Alternative 1.

Alternative 5 would eliminate the operation of Nehalem Hatchery and reduce operations of the hatchery facilities and ancillary sites used for broodstock collection and smolt releases at Elk, Rock, Salmon, Cedar, and Trask Hatcheries due to some programs being eliminated. The hatchery facilities would still remain in place physically, but all of the operations associated with the hatchery programs would be reduced under Alternative 5. The hatchery facilities would continue to operate the fish ladders and trap to

collect returning hatchery fish, but operations would be reduced compared to the No-action Alternative. Potential delays associated with broodstock collection at trap locations would be reduced – the magnitude of this benefit would be minor because the traps have been managed to minimize delay of fish migration and most of the watershed is not affected by hatchery traps and is, instead, freely accessible. Incidental capture of natural-origin coho salmon at hatchery collection facilities would also be reduced under Alternative 5. However, the current reported incidental capture of natural-origin coho salmon is minimal, but would be a negligible beneficial effect of this alternative compared to the No-action alternative. The hatchery facilities would still have an effect on salmon under Alternative 5, but at a reduced rate. Weirs or their panels would still be in place; traps would still be in operation, and 90 percent of the fish would be trapped as compared to the No-action Alternative. Alternative 5 would be expected to provide a negligible benefit to coho salmon compared to the No-action Alternative with respect to facility effects.

Regarding fishery impacts, Alternative 5 would eliminate returning hatchery fish from three relatively small hatchery coho salmon programs (South Umpqua, Trask, Nehalem) that are targeted in recreational and commercial fisheries along the Oregon Coast. Fishing effort and catch would likely change focus from hatchery fish to areas where natural-origin fish can be legally harvested. For coho salmon, retention of natural-origin fish has been allowed under the ESA in years when the returns are abundant (NMFS 2009). If returning hatchery fish are reduced under Alternative 5, fishery effort for natural-origin coho salmon would likely increase in years when the fishery is allowed compared to current conditions. An increase in harvest mortality of natural-origin coho salmon in these populations would be expected up to the maximum allowable impact permitted under the ESA. The fishery would likely close earlier under Alternative 5 each season compared to Alternative 1, resulting in some loss of fishing opportunity. However, the harvest impact on natural-origin coho salmon would be managed to remain the same under ESA fishery regulatory management plans (harvest impacts could not legally increase on natural-origin coho above the rates specified in Amendment 13 to the Pacific Salmon Plan (NMFS 2009). The potential effect on fishing opportunity for hatchery coho salmon is considered in subsection 4.7, Effects on Socioeconomics, and subsection 4.8, Effects on Environmental Justice. Bycatch of coho salmon in fisheries targeting other species would be low, similar to the No-action Alternative conditions, given the low level of incidental take of other species in coho salmon-directed fisheries (PFMC 2013).

Oregon Coastal Chinook Salmon

Under Alternative 5, the fall Chinook salmon program in Elk River and the spring Chinook programs in the Nestucca and Trask Rivers would be terminated. At this time, none of the hatchery programs are

intended to provide population viability benefits to Chinook salmon. The primary benefits of Alternative 5 to Chinook salmon (compared to the No-action Alternative) would be a reduction in genetic risks to natural-origin fall Chinook salmon in the Elk River (identified as a limiting factor in ODFW (2014a), reduction in competition, and reduction in predation of hatchery-origin fish on natural-origin Chinook salmon. The elimination of the spring Chinook salmon programs in the Trask and Nestucca Rivers would likely provide only negligible genetic benefits to natural-origin spring Chinook salmon because natural production is very low and few natural fish are present. It is unlikely the natural population would recover from the termination of these hatchery programs because of the habitat limiting factors that have led to poor natural production of spring Chinook salmon. Alternative 5 would likely reduce the genetic risks from hatchery Chinook salmon on natural-origin Chinook salmon in these two populations and reduce ecological interactions between natural- and hatchery-origin Chinook; and thus be a beneficial effect compared to Alternative 1.

Reducing the releases of hatchery fish under Alternative 5 would decrease the amount of carcass nutrients provided to the natural habitat from decomposing hatchery fish in the short term compared to the No-action Alternative. Even though hatchery fish represent a relatively low proportion of available carcasses in Oregon Coast streams and rivers (20 percent or less of the total), any decrease in number would likely result in an adverse effect because habitat productivity is substantially reduced from historical levels and remains a key limiting factor. Over the long term, natural production of Chinook salmon may increase slightly in the populations where hatchery fish were reduced by 50 percent under Alternative 5 from having fewer hatchery fish negative interactions with natural Chinook salmon, which would compensate for the reduction in hatchery fish carcass nutrients from Alternative 5 compared to the No-action Alternative 1.

Alternative 5 would eliminate the operation of Nehalem Hatchery and reduce operations of the hatchery facilities and ancillary sites used for broodstock collection and smolt releases at Elk, Rock, Salmon, Cedar, and Trask Hatcheries due to some programs being eliminated. The hatchery facilities would still remain in place physically, but all of the operations associated with the hatchery programs would be reduced under Alternative 5. The hatchery facilities would continue to operate the fish ladders and trap to collect returning hatchery fish, but operations would be reduced compared to the No-action Alternative. Potential delays associated with broodstock collection at trap locations would be reduced – the magnitude of this benefit would be minor because the traps have been managed to minimize delay of fish migration and most of the watershed is not affected by hatchery traps and is, instead, freely accessible. Incidental capture of natural-origin Chinook salmon at hatchery collection facilities would also be reduced under

Alternative 5. The hatchery facilities would still have an effect on salmon under Alternative 5, but at a reduced rate. Weirs or their panels would still be in place; traps would still be in operation, and 90 percent of the fish would be trapped as compared to the No-action Alternative. Alternative 5 would be expected to provide a negligible facility effects benefit to Chinook salmon compared to the No-action Alternative.

Alternative 5 would reduce the number of hatchery fish that are available for recreational and commercial fisheries along the Oregon Coast compared to the No-action Alternative. Fishing effort and catch would likely change focus from hatchery fish to areas where natural-origin fish can be harvested (since hatchery Chinook salmon would be eliminated in the Elk, Nestucca, and Trask Rivers where hatchery fisheries are popular.

For Chinook salmon, retention of natural-origin fish is allowed in nearly every river (with the exception of spring Chinook salmon). If returning hatchery fish are reduced under Alternative 5, two possible outcomes are likely, depending upon the abundance of natural-origin Chinook salmon. First, if hatchery Chinook salmon are reduced from an area where hatchery fish made up the bulk of harvested fish (Trask, Nestucca), fishing effort would likely decrease under Alternative 5 as compared to the No-action Alternative 1 because too few natural-origin would be available to sustain the fishery. Second, if hatchery fish are reduced from an area where natural-origin Chinook salmon are abundant, the fisheries would likely switch over to harvesting a greater number of natural-origin fish in the same area (this is the most likely situation with fall Chinook salmon in the Elk River). In these situations, fishery effort on natural-origin Chinook salmon would likely increase compared to the No-action Alternative in fisheries where natural-origin Chinook salmon can be retained under current fishing regulations.

These Chinook salmon fisheries are intensive, and the harvest rate on natural-origin Chinook salmon would be expected to increase substantially because fewer hatchery Chinook salmon would be available for harvest. The State of Oregon might have to change current regulations, which is within its purview for non-ESA-listed species and those without a prescriptive management plan, to maintain harvest rates at a sustainable level for natural-origin Chinook salmon in those areas where hatchery programs are reduced under Alternative 5.

Compared to the No-action Alternative, Alternative 5 (reduction of hatchery Chinook salmon programs) would be expected to result in a greater adverse impact on natural-origin Chinook salmon because fishery effort and harvest would be directed more at natural-origin Chinook salmon. The overall number of

Chinook salmon harvested would be expected to decrease under Alternative 5 because natural-origin Chinook salmon populations cannot sustain the higher harvest rates that can be directed at hatchery fish programs.

Oregon Coastal Chum Salmon

Under Alternative 5, the highest risk hatchery programs would be terminated and hatchery reforms would be implemented for the remaining programs. No hatchery chum salmon programs exist along the Oregon Coast, so all effects are incidental effects from other hatchery programs propagating other species. The primary effect of Alternative 5 on chum salmon would be a reduction in competition with and predation by hatchery-origin fish on natural-origin chum salmon in Tillamook Bay (where chum salmon populations are known to be relatively abundant), and potentially in other areas such as the Siletz, Nestucca, and Nehalem Rivers.

Reducing the number of hatchery fish under Alternative 5 would decrease the amount of carcass nutrients provided to the natural habitat from decomposing hatchery fish. Even though hatchery fish represent a relatively low proportion of available carcasses in Oregon Coast streams and rivers (less than 20 percent of the total), any decrease in number would likely result in an adverse effect because habitat productivity is substantially reduced from historical levels and remains a key limiting factor. Therefore, Alternative 5 would result in less marine-derived nutrients from hatchery fish carcasses and low adverse effects compared to the No-action Alternative.

Alternative 5 would eliminate the operation of Nehalem Hatchery and reduce operations of the hatchery facilities and ancillary sites used for broodstock collection and smolt releases at Elk, Rock, Salmon, Cedar, and Trask Hatcheries due to some programs being eliminated. The hatchery facilities would still remain in place physically, but all of the operations associated with the hatchery programs would be reduced under Alternative 5. The hatchery facilities would continue to operate the fish ladders and trap to collect returning hatchery fish, but operations would be reduced compared to the No-action Alternative. Potential delays associated with broodstock collection at trap locations would be reduced – the magnitude of this benefit would be minor because the traps have been managed to minimize delay of fish migration and most of the watershed is not affected by hatchery traps and is, instead, freely accessible. Incidental capture of natural-origin chum salmon at hatchery collection facilities would also be reduced under Alternative 5. The hatchery facilities would still have an effect on salmon under Alternative 5, but at a reduced rate. Weirs or their panels would still be in place; traps would still be in operation, and 90

percent of the fish would be trapped as compared to the No-action Alternative. Alternative 5 would be expected to provide a negligible benefit to chum salmon compared to the No-action Alternative.

Alternative 5 would reduce the number of returning hatchery fish that are available in recreational and commercial fisheries along the Oregon Coast compared to the No-action Alternative. Fishing effort and catch would likely change focus from hatchery fish to areas where natural-origin fish can be harvested. For chum salmon, no retention is allowed along the Oregon Coast. If returning hatchery fish are reduced under Alternative 5, fishery effort for chum salmon would not likely change compared to Alternative 1 because fisheries targeting chum salmon are essentially non-existent (with the exception of the Kilchis and Miami Rivers in Tillamook Bay where chum salmon are incidentally caught). Compared to Alternative 1, Alternative 5 would be expected to result in an undetectable benefit to chum salmon from changes in fishery harvest from the elimination of hatchery fish because chum salmon are not subject to directed fisheries and are not taken incidentally in meaningful numbers in other fisheries.

Oregon Coastal Steelhead

Alternative 5 would eliminate the highest risk hatchery programs for steelhead (Siletz summer steelhead, Nehalem winter steelhead, and Necanicum winter steelhead) and implement reforms for the remaining programs. The primary benefits of Alternative 5 to steelhead would be a reduction in genetic risks for Siletz, Nehalem, and Necanicum natural-origin steelhead, competition between hatchery and natural steelhead, and predation of hatchery-origin fish on natural-origin steelhead. Since natural spawning by hatchery fish in the wild was identified as a concern for many steelhead populations (Subsection 3.4, Salmon and Steelhead and Their Habitats) and PNI values for these steelhead programs are very low (Table 7), Alternative 5 would benefit steelhead compared to the No-action Alternative by eliminating the highest risk programs along the Oregon Coast. PNI values for these populations would increase from 0.06-0.09 to 1 from the elimination of hatchery steelhead programs (Table 7). There would likely be some improvements to the abundance and productivity of natural steelhead for these populations under Alternative 5 compared to Alternative 1.

Terminating the highest risk hatchery programs (and associated 1.16 million smolts annually) under Alternative 5 would decrease the amount of carcass nutrients provided to the natural habitat from decomposing hatchery fish compared to the No-action Alternative. Even though hatchery fish represent a relatively low proportion of available carcasses in Oregon Coast streams and rivers (less than 20 percent of the total), any decrease in number would likely result in an adverse effect because habitat productivity

is substantially reduced from historical levels and remains a key limiting factor. Therefore, Alternative 5 would result in less marine-derived nutrients from hatchery fish carcasses and low adverse effects compared to the No-action Alternative.

Alternative 5 would eliminate the operation of Nehalem Hatchery and reduce operations of the hatchery facilities and ancillary sites used for broodstock collection and smolt releases at Elk, Rock, Salmon, Cedar, and Trask Hatcheries due to some programs being eliminated. The hatchery facilities would still remain in place physically, but all of the operations associated with the hatchery programs would be reduced under Alternative 5. The hatchery facilities would continue to operate the fish ladders and trap to collect returning hatchery fish, but operations would be reduced compared to the No-action Alternative. Potential delays associated with broodstock collection at trap locations would be reduced – the magnitude of this benefit would be minor because the traps have been managed to minimize delay of fish migration and most of the watershed is not affected by hatchery traps and is, instead, freely accessible. Incidental capture of natural-origin steelhead at hatchery collection facilities would also be reduced under Alternative 5. However, the current reported incidental capture of natural-origin steelhead is minimal, but would be a negligible beneficial effect of this alternative compared to the No-action alternative. The hatchery facilities would still have an effect on steelhead under Alternative 5, but at a reduced rate. Weirs or their panels would still be in place; traps would still be in operation, and 90 percent of the fish would be trapped as compared to the No-action Alternative. Alternative 5 would be expected to provide a negligible benefit to steelhead compared to the No-action Alternative.

Alternative 5 would reduce returning hatchery fish that are targeted in recreational fisheries along the Oregon Coast as compared to the No-action Alternative. Fishing effort and catch would likely change focus from hatchery fish to the few areas where natural-origin fish can be harvested. In addition, natural origin steelhead catch would increase in the Nehalem and Necanicum Rivers because hatchery steelhead would be terminated. Therefore, fishing impacts on natural-origin steelhead is likely to increase under Alternative 5 for the populations in the Nehalem and Necanicum and surrounding populations from the elimination of the steelhead hatchery programs compared to the No-action Alternative.

These steelhead fisheries are intensive, and the impact rate on some stocks (like Siletz summer-run) would be expected to increase substantially even from catch and release. The State of Oregon might have to change current regulations to maintain harvest impact rates at a level appropriate for the populations. Some other steelhead populations, where the hatchery program was reduced, would likely have less fishing pressure and therefore less impact from fishing. Overall, compared to the No-action Alternative

conditions, Alternative 5 would be expected to result in a greater adverse impact on natural-origin steelhead from increased fishery exploitation rates.

4.5. Effects on Other Fish and Their Habitats

4.5.1. Alternative 1 (No-Action) – Do Not Approve ODFW's HGMPs for Operation of Hatchery Programs on the Oregon Coast

Alternative 1 would maintain all existing hatchery programs along the Oregon Coast. Alternative 1 would continue current conditions for green and white sturgeon, southern eulachon, lamprey, sculpin, shiners, dace, trout, sucker, pikeminnow, chub, flatfish, forage fish, sharks (including Great White), rockfish, and non-native fish species (Table 9), where some populations (i.e., Chetco, Rogue, Elk, Coquille, Umpqua, Alsea, Salmon, Nestucca, Tillamook, and Nehalem river basins) are affected by hatchery facilities, fish compete with hatchery fish, and certain fish (i.e., redside shiners, dace, sculpin) are potentially eaten by hatchery fish. Other species such as lamprey, sturgeon, and sharks would benefit from hatchery fish as a potential prey base. Genetic risks of hatchery fish spawning in the wild would continue to be non-existent because no hatchery programs exist for these species. Hatchery fish would contribute nutrients from naturally spawning carcasses and from outplants of surplus fish from the hatcheries similar to current conditions. Even though less than 20 percent of salmon and steelhead carcass input comes from hatchery fish, this is still an important benefit (medium effect) because of the value of marine-derived nutrients to the freshwater ecosystem. Alternative 1 would result in similar hatchery impacts on these other fish species as under current conditions from incidental harvest impacts and operation of the hatchery collection facilities. Thus, the adverse effects of these impacts are expected to be negligible from the hatchery programs.

4.5.2. Alternative 2 (Proposed Action/Preferred Alternative) – Approve ODFW's HGMPs for Operation of Hatchery Programs on the Oregon Coast

Under Alternative 2, the 10 hatchery facilities along the Oregon Coast would operate as proposed in the submitted HGMPs (Subsection 2.2, Alternative 2 (Proposed Action/Preferred Alternative): Approve ODFW’s HGMPs for Operation of Hatchery Programs on the Oregon Coast); Appendix A). The current conditions for green and white sturgeon, southern eulachon, lamprey, sculpin, shiners, dace, trout, sucker, pikeminnow, chub, flatfish, forage fish, sharks (including Great White), rockfish, and non-native fish species (Table 9), where some populations (i.e., Chetco, Rogue, Elk, Coquille, Umpqua, Alsea, Salmon, Nestucca, Tillamook, and Nehalem river basins) are affected by hatchery facilities, fish compete with

hatchery fish, and certain fish (i.e., redside shiners, dace, sculpin) are eaten by hatchery fish would be the same under Alternative 2 as described under the Alternative 1 (No-Action). These effects are expected to be negligible in total, but result in some beneficial (medium effect from hatchery carcass nutrient enhancement) and low adverse effects (from operation of the hatchery facility and potential incidental catch of these species from targeting hatchery fish).

4.5.3. Alternative 3 – Terminate Hatchery Programs on the Oregon Coast

Under Alternative 3, 10 hatchery facilities along the Oregon Coast, and therefore their associated programs, would be terminated immediately (Subsection 2.3, Alternative 3: Terminate Hatchery Programs on the Oregon Coast). Alternative 3 would eliminate the water withdrawal and effluent discharge associated with the operation of the hatchery facilities in the Chetco, Rogue, Elk, Coquille, Umpqua, Alsea, Salmon, Nestucca, Tillamook, and Nehalem population, and would therefore benefit fish species such as lamprey, sculpin, shiners, dace, trout, sucker, pikeminnow, chub, lamprey, and non-native fish species in those areas (Table 9). Predation and competition between hatchery fish and freshwater fish species would be eliminated under Alternative 3 compared to No-action Alternative 1. This would eliminate this effect during the few week period when hatchery fish emigrate as smolts to the ocean. Alternative 3 would eliminate hatchery fish being a potential prey source for a variety of marine fish species compared to the No-action Alternative 1. There would be no difference in effect between Alternative 3 and the No-action Alternative 1 with respect to the genetic risks associated with hatchery fish spawning in the wild because none of the hatchery programs propagate these fish species. Hatchery fish would not contribute nutrients from naturally spawning carcasses and from outplants of surplus fish from the hatcheries, which would be an adverse effect compared to the No-action Alternative. Even though less than 20 percent of salmon and steelhead carcass input comes from hatchery fish, this is still an adverse effect because of the value of marine-derived nutrients to the freshwater ecosystem. Alternative 3 would not result in any change of impact from incidental harvest impacts, compared to Alternative 1, because these fish species are managed separately from salmon and steelhead harvest impacts. These effects from terminating the hatchery programs are expected to be negligible in total, but result in some adverse effects on these species (medium adverse effect from not having hatchery carcasses supplement ocean-derived nutrients in the freshwater ecosystem) and negligible beneficial effects (from closing the operation of the hatchery facilities and eliminating the potential catch of these species associated with targeting hatchery fish in fisheries).

4.5.4. Alternative 4 – Reduced Hatchery Production

Under Alternative 4, 10 hatchery facilities along the Oregon Coast, and therefore their associated programs, would be reduced by 50 percent compared to the No-action Alternative (Subsection 2.4, Alternative 4: Reduced Hatchery Production). Alternative 4 would reduce the water withdrawal and effluent discharge associated with the operation of the hatchery facilities in the Chetco, Rogue, Elk, Coquille, Umpqua, Alsea, Salmon, Nestucca, Tillamook, and Nehalem river basins, and would, therefore, benefit fish species such as lamprey, sculpin, shiners, dace, trout, sucker, pikeminnow, chub, lamprey, and non-native fish species in those areas compared to the No-action Alternative 1 (Table 9).

Predation and competition between hatchery fish and freshwater fish species would be reduced under Alternative 4 compared to No-action Alternative 1. This would reduce this impact during the few week period when hatchery fish emigrate as smolts to the ocean (Table 5). Alternative 4 would reduce hatchery fish being a potential prey source for a variety of marine fish species compared to the No-action Alternative 1.

There would be no difference in effect between Alternative 4 and the No-action Alternative 1 with respect to the genetic risks associated with hatchery fish spawning in the wild because none of the hatchery programs propagate these fish species. Hatchery fish would contribute fewer nutrients from naturally spawning carcasses and from outplants of surplus fish from the hatcheries, which would be an adverse effect compared to the No-action Alternative. Even though less than 20 percent of salmon and steelhead carcass input comes from hatchery fish, this is still an adverse effect because of the value of marine-derived nutrients to the freshwater ecosystem.

Alternative 4 would not result in any change of impact from incidental harvest impacts, compared to Alternative 1, because these fish species are managed separately from salmon and steelhead harvest impacts. The effects of reducing hatchery production by 50 percent are expected to be negligible in total, but result in some adverse effects on these species (medium adverse effect from not having hatchery carcasses supplement ocean-derived nutrients in the freshwater ecosystem) and negligible beneficial effects (from closing the operation of the hatchery facilities and eliminating the potential catch of these species associated with targeting hatchery fish in fisheries) compared to the No-action Alternative.

4.5.5. Alternative 5 – Terminate Highest Risk Hatchery Programs and Implement Hatchery Program Reforms

Under Alternative 5, the highest risk hatchery programs would be terminated and hatchery reforms implemented for the remaining hatchery programs. Only Nehalem Hatchery would be closed. All other hatchery facilities would remain in operation. However, some would produce less fish depending upon the hatchery. Alternative 5 would reduce the water withdrawal and effluent discharge associated with the operation of the hatchery facilities in the Elk, Umpqua, Siletz, Nestucca, Tillamook, and Nehalem river basins, and would, therefore, benefit fish species such as lamprey, sculpin, shiners, dace, trout, sucker, pikeminnow, chub, lamprey, and non-native fish species in those areas compared to the No-action Alternative 1 (Table 9).

Predation and competition between hatchery fish and freshwater fish species would be reduced under Alternative 5 compared to No-action Alternative 1. This would reduce this impact during the few week period when hatchery fish emigrate as smolts to the ocean (Table 5). Alternative 5 would reduce hatchery fish being a potential prey source for a variety of marine fish species compared to the No-action Alternative 1.

There would be no difference in effect between Alternative 5 and the No-action Alternative 1 with respect to the genetic risks associated with hatchery fish spawning in the wild because none of the hatchery programs propagate these fish species. Hatchery fish would contribute fewer nutrients from naturally spawning carcasses and from outplants of surplus fish from the hatcheries, which would be an adverse effect compared to the No-action Alternative. Even though less than 20 percent of salmon and steelhead carcass input comes from hatchery fish, this is still an adverse effect because of the value of marine-derived nutrients to the freshwater ecosystem.

Alternative 5 would not result in any change of impact from incidental harvest impacts, compared to Alternative 1, because these fish species are managed separately from salmon and steelhead harvest impacts. The effects of reducing hatchery production by 1.16 million hatchery fish is expected to be low on these fish species in total, but result in some adverse effects on these species (medium adverse effect from not having hatchery carcasses supplement ocean-derived nutrients in the freshwater ecosystem) and negligible beneficial effects (from closing Nehalem Hatchery and reducing operation of some other facilities and eliminating the potential catch of these species associated with targeting hatchery fish in fisheries) compared to the No-action Alternative.

4.6. Effects on Wildlife

4.6.1. Alternative 1 (No-Action) – Do Not Approve ODFW's HGMPs for Operation of Hatchery Programs on the Oregon Coast

Under Alternative 1, 10 hatchery facilities along the Oregon Coast would continue to operate as proposed in submitted HGMPs (Subsection 2.2, Alternative 2 (Proposed Action/Preferred Alternative): Approve ODFW's HGMPs for Operation of Hatchery Programs on the Oregon Coast)). Consequently, the number of salmon and steelhead (juvenile and adult) available to predators and scavengers that use salmon as a food source, including Federally listed Steller sea lions and southern resident killer whale (Subsection 3.6, Wildlife), would be the same as under current conditions.

Steller sea lions and California sea lions are known to feed on returning adult salmon along the Oregon Coast and are likely eating hatchery-origin fish from Oregon Coast hatcheries (Subsection 3.6, Wildlife). Consequently, Alternative 1 would result in the same number of salmon and steelhead available to Steller sea lions and California sea lions along the Oregon Coast as under current conditions. Alternative 1 is not expected to change sea lion diet, survival, or distribution relative to current conditions.

Southern resident killer whales also feed on adult salmon, and prefer Chinook salmon. However, because southern resident killer whales have limited spatial overlap with Oregon Coast salmon, few Chinook salmon from the proposed hatchery programs are likely to be eaten by southern resident killer whales (Subsection 3.6, Wildlife).

Alternative 1 would maintain the number of juvenile salmon and steelhead available as a food source for bird populations as current conditions

Habitat disruption may occur from physical damage or disruption by anglers targeting hatchery-origin salmon and steelhead. Operation of the hatchery facilities uses water from the adjacent stream. The area from intake to outfall would be affected, although these areas are extremely limited. There is also some potential for these activities to displace wildlife that may be in the area. Habitat impacts from fishing activities are usually localized and short-lived and are currently occurring related to ongoing fisheries in the analysis area. Additionally, fishery access points, roads, boat launches, and campsites are already present in the analysis area.

Alternative 1 would result in a negligible beneficial effect overall. The hatchery programs would provide hatchery fish as a prey source for all wildlife (e.g., birds, marine mammals, and terrestrial mammals) that feed upon juvenile and adult salmon and steelhead (medium benefit). There would be a negligible adverse impact from habitat alterations near the hatchery facilities from operation and anglers fishing near the local vicinity.

4.6.2. Alternative 2 (Proposed Action/Preferred Alternative) – Approve ODFW's HGMPs for Operation of Hatchery Programs on the Oregon Coast

Under Alternative 2, the 10 hatchery facilities along the Oregon Coast would operate as proposed in the submitted HGMPs (Subsection 2.2, Alternative 2 (Proposed Action/Preferred Alternative): Approve ODFW's HGMPs for Operation of Hatchery Programs on the Oregon Coast); Appendix A). Salmon and steelhead (juvenile and adult) would be available to predators and scavengers that use salmon as a food source, including Federally listed Steller sea lions and southern resident killer whales for Alternative 2 as described under Alternative 1 (No-Action).

The analysis of the site-specific effects under Alternative 2 would be identical to effects analyzed under Alternative 1. Alternative 2 would result in a negligible beneficial effect overall. The hatchery programs would provide hatchery fish as a prey source for all wildlife (e.g., birds, marine mammals, and terrestrial mammals) that feed upon juvenile and adult salmon and steelhead (medium benefit). There would be a negligible adverse impact from habitat alterations near the hatchery facilities from operation and anglers fishing near the local vicinity.

4.6.3. Alternative 3 – Terminate Hatchery Programs on the Oregon Coast

Under Alternative 3, 10 hatchery facilities along the Oregon Coast, and therefore their associated programs, would be terminated immediately (Subsection 2.1, Alternative 1 (No-action): Do Not Approve ODFW's HGMPs for Operation of Hatchery Programs on the Oregon Coast). Consequently, relative to the No-action Alternative, fewer salmon and steelhead (juvenile and adult) would be available as a food source for predators and scavengers that use salmon as a food source, including Federally listed Steller sea lion, and southern resident killer whale (Subsection 3.6, Wildlife).

Hatchery salmon and steelhead may represent an important component of sea lion diet during specific time periods, particularly if abundance is high and concentrated, like when salmon and steelhead return to freshwater. However, because sea lions are opportunistic predators, they transition to other marine and

estuary prey species during periods when salmon and steelhead abundance is low or when other prey species are more readily accessible. Given that hatchery salmon and steelhead make up a minor component of sea lion diet throughout their life along the Oregon Coast, Alternative 3 would only lead to a low reduction in the total number of salmon and steelhead available to sea lions, that availability would be seasonal, and sea lions would easily switch to feeding on alternative prey. The abundance of natural-origin salmon and steelhead produced from watersheds within the Oregon Coast Region and hatchery fish from areas outside the Oregon Coast would still be available under Alternative 3 for sea lions. Alternative 3 is not expected to change sea lion diet, survival, or distribution relative to the No-action Alternative.

Southern resident killer whales also feed on adult salmon and steelhead and marine fish species, but prefer Chinook salmon. Based upon available information, the time period when southern resident killer whales have been periodically observed along the Oregon Coast is from late fall through late winter. For the remainder of the year, these whales are primarily found in the Strait of Juan de Fuca and Puget Sound (Hilborn et al. 2012). If killer whales migrate to the Oregon Coast Region, a variety of salmon stocks from the entire West Coast are potentially available to them for food (Figure 24). For example, in June 2011, genetic testing of Chinook salmon caught in the commercial fishery off the Oregon Coast showed the presence of Chinook salmon originating from areas ranging from Alaska to California (Weitkamp 2010; Figure 24). Even though this is not the timeframe when killer whales are typically present along the Oregon Coast, this is when the fisheries began that year and probably reflects the composition of salmon along the Oregon Coast earlier in the year when killer whales might be present. In addition, a variety of marine species such as lingcod, greenling, sole, and herring are also available. Under Alternative 3, since killer whales prefer Chinook salmon, elimination of all of the hatchery Chinook salmon programs (see Appendix A) would be expected to cause the greatest impact on killer whales from late fall to late winter along the Oregon Coast. It is difficult to quantify how much this reduction in hatchery Chinook salmon would affect killer whales because the total abundance of salmon off the Oregon Coast is not known and varies greatly from year to year (PFMC 2013). However, adipose-fin clipped (hatchery-origin) Chinook salmon represent a minority of the Chinook salmon harvested in commercial and sport fisheries along the Oregon Coast (PFMC 2013). Of the hatchery Chinook salmon caught along the Oregon Coast, the majority of hatchery fish in the catch are Central Valley California and Klamath fall Chinook salmon because their ocean abundance is the highest (Figure 24; PFMC 2013). Therefore, available information suggests hatchery Chinook salmon released from Oregon Coast facilities would represent a low percentage of the total abundance of Chinook salmon (and hatchery-origin Chinook) along the Oregon Coast and, therefore, a low percentage of the total availability of Chinook

salmon to killer whales. Given the variety of Chinook salmon stocks from the entire West Coast that inhabit the Oregon Coast and the availability of other marine species, Alternative 3 is not expected to change the diet, survival, or distribution of southern resident killer whales relative to the No-action Alternative because hatchery salmon and steelhead from hatcheries along the Oregon Coast are not the prominent prey base for southern resident killer whales.

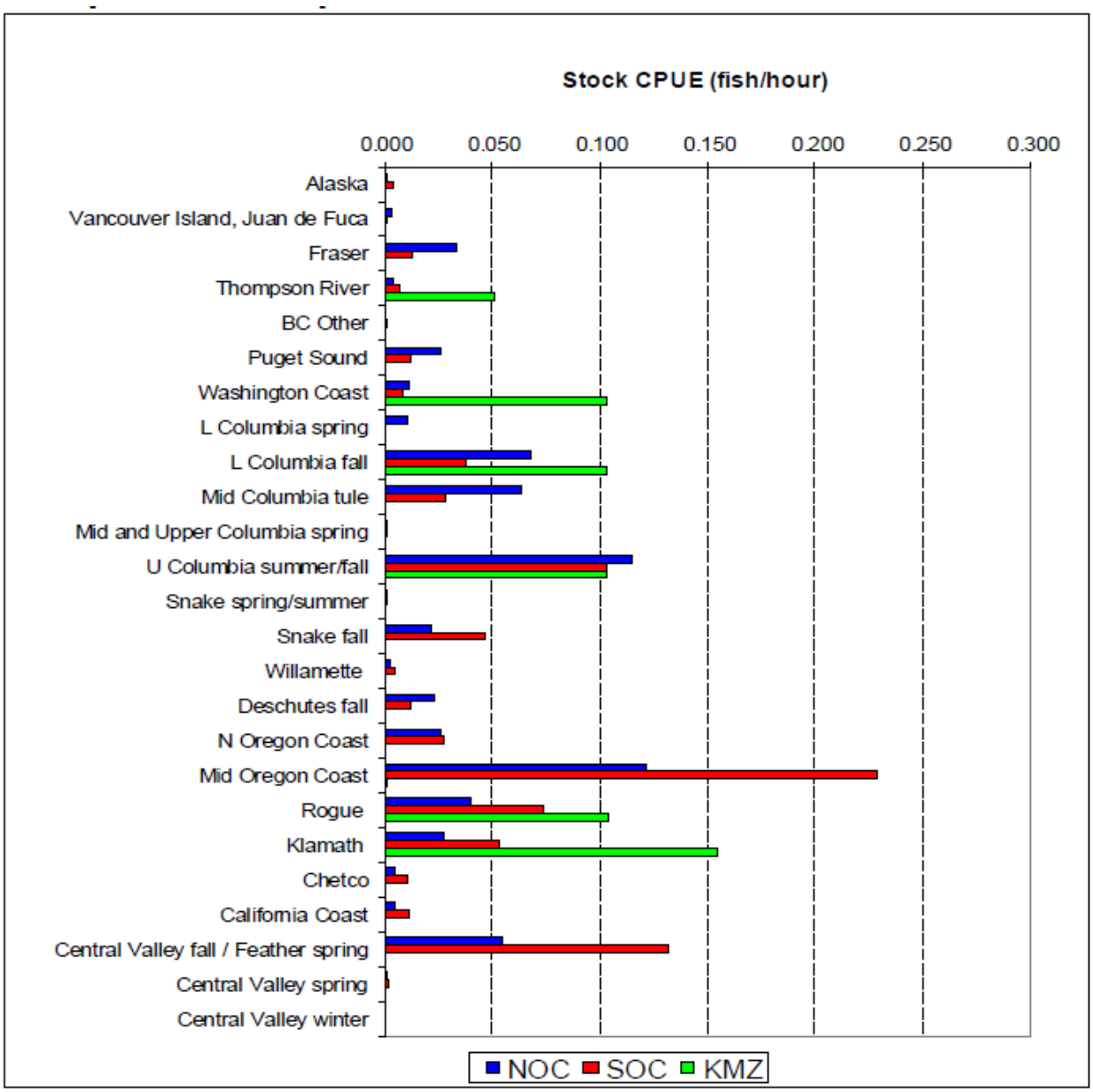


Figure 26. Genetic stock identification of Chinook salmon caught in the commercial salmon troll fishery from three regions along the Oregon Coast in June 2011. NOC ("Northern Oregon Coast") is from Cape Falcon to the Florence River south jetty, SOC ("Southern Oregon Coast") is from Florence River south jetty to Humbug Mountain, KMZ ("Klamath Management Zone") is from Humbug Mountain to the Oregon/California border. Figure taken from Pacific Fish Trax (2011).

Alternative 3 would reduce the number of juvenile salmon and steelhead available as a food source for Caspian terns, cormorants, and other bird populations in the analysis area that traditionally feed on juvenile salmon (Subsection 3.6, Wildlife). However, because Alternative 3 would reduce the total number of juvenile hatchery-origin salmon and steelhead by less than 20 percent, it would not be

expected to change the diet, survival, or distribution of Caspian terns, cormorants, or other bird populations relative to Alternative 1 because hatchery salmon and steelhead from hatcheries along the Oregon Coast are not the prominent prey base for bird species in the region.

Habitat disruption may occur from physical damage or disruption by anglers targeting hatchery-origin salmon and steelhead. There is some potential for these activities to displace wildlife that may be in the area. Habitat impacts from fishing activities are usually localized and short-lived and are currently occurring related to ongoing fisheries in the analysis area. Additionally, fishery access points, roads, boat launches, and campsites are already present in the analysis area. Alternative 3 would reduce the number of salmon and steelhead available for harvest along the Oregon Coast relative to Alternative 1. However, fishing for other fish species (e.g., trout) would still occur in the analysis area, and there would be no change in fishery access points, roads, boat launches, and campsites in the analysis area relative to Alternative 1. Therefore, Alternative 3 would not be expected to reduce adverse impacts on wildlife from fishing activities relative to the No-action Alternative to any great degree. Alternative 3 would result in a negligible benefit near the hatchery facility on wildlife from the termination of the hatchery programs of not having human disturbance from fishing and operations.

4.6.4. Alternative 4 – Reduced Hatchery Production

Under Alternative 4, 10 hatchery facilities along the Oregon Coast, and therefore their associated programs, would be reduced by 50 percent compared to the No-action Alternative. Consequently, fewer salmon and steelhead (juvenile and adult) would be available as a food source for predators and scavengers that use salmon as a food source, including federally-listed Steller sea lion, and southern resident killer whale (Subsection 3.6, Wildlife).

Hatchery salmon and steelhead may represent an important component of sea lion diet during specific time periods, particularly if abundance is high and concentrated, like when salmon and steelhead return to freshwater. However, because sea lions are opportunistic predators, they transition to other marine and estuarine prey species during periods when salmon and steelhead abundance is low or when other prey species are more readily accessible. Given that hatchery salmon and steelhead make up a minor component of sea lion diet throughout their life along the Oregon Coast, Alternative 4 would only lead to a very low reduction in the total number of salmon and steelhead available to sea lions, salmon, and steelhead availability would be seasonal, and sea lions would easily switch to feeding on alternative prey. The abundance of natural-origin salmon and steelhead produced from watersheds within the Oregon

Coast Region and hatchery fish from areas outside the Oregon Coast would still be available under Alternative 4 for sea lions. Alternative 4 is not expected to change sea lion diet, survival, or distribution relative to the No-action Alternative.

Southern resident killer whales also feed on adult salmon and steelhead and marine fish species, but prefer Chinook salmon. Based upon available information, the time period when southern resident killer whales have been periodically observed along the Oregon Coast is from late fall through late winter. For the remainder of the year, these whales are primarily found in the Strait of Juan de Fuca and Puget Sound (Hilborn et al. 2012). If killer whales migrate to the Oregon Coast Region, a variety of salmon stocks from the entire West Coast is potentially available to them for food (Figure 24). For example, in June 2011, genetic testing of Chinook salmon caught in the commercial fishery off the Oregon Coast showed the presence of Chinook salmon originating from areas ranging from Alaska to California (Weitkamp 2010; Figure 24). Even though this is not the timeframe when killer whales are typically present along the Oregon Coast, this is when the fisheries began that year and probably reflects the composition of salmon along the Oregon Coast earlier in the year when killer whales might be present. In addition, a variety of marine species such as lingcod, greenling, sole, and herring are also available.

Under Alternative 4, since killer whales prefer Chinook salmon, a 50 percent reduction in the hatchery Chinook salmon programs (see Appendix A) would be expected to cause the greatest impact on killer whales from late fall to late winter along the Oregon Coast. It is difficult to quantify how much this reduction in hatchery Chinook salmon would affect killer whales because the total abundance of salmon off the Oregon Coast is not known and varies greatly from year to year (PFMC 2013). However, adipose-fin clipped (hatchery-origin) Chinook salmon represent a minority of the Chinook salmon harvested in commercial and sport fisheries along the Oregon Coast (PFMC 2013).

Of the hatchery Chinook salmon caught along the Oregon Coast, the majority of hatchery fish in the catch are Central Valley California and Klamath fall Chinook salmon because their ocean abundance is the greatest (Figure 24; PFMC 2013). Therefore, available information suggests hatchery Chinook salmon released from Oregon Coast facilities would represent a low percentage of the total abundance of Chinook salmon (and hatchery-origin Chinook) along the Oregon Coast and, therefore, a low percentage of the total availability of Chinook salmon to killer whales. Given the variety of Chinook salmon stocks from the entire West Coast that inhabit the Oregon Coast and the availability of other marine species, Alternative 4 is not expected to change the diet, survival, or distribution of southern resident killer whales

relative to the No-action Alternative because hatchery salmon and steelhead from hatcheries along the Oregon Coast are not the prominent prey base for southern resident killer whales.

Alternative 4 would reduce the number of juvenile salmon and steelhead available as a food source for Caspian terns, cormorants, and other bird populations in the project area that traditionally feed on juvenile salmon (Subsection 3.6, Wildlife). However, because Alternative 4 would reduce the total number of juvenile hatchery-origin salmon and steelhead by 50 percent, it would not be expected to change the diet, survival, or distribution of Caspian terns, cormorants, or other bird populations relative to Alternative 1 because hatchery salmon and steelhead from hatcheries along the Oregon Coast are not the prominent prey base for bird species in the region.

Habitat disruption may occur from physical damage or disruption by anglers targeting hatchery-origin salmon and steelhead. There is some potential for these activities to displace wildlife that may be in the area. Habitat impacts from fishing activities are usually localized and short-lived and are currently occurring related to ongoing fisheries in the analysis area. Additionally, fishery access points, roads, boat launches, and campsites are already present in the analysis area. Alternative 4 would reduce the number of salmon and steelhead available for harvest along the Oregon Coast relative to Alternative 1. However, fishing for other fish species (e.g., trout) would still occur in the analysis area, and there would be no change in fishery access points, roads, boat launches, and campsites in the analysis area relative to Alternative 1. Therefore, Alternative 4 would not be expected to reduce adverse impacts on wildlife from fishing activities relative to the No-action Alternative to a measureable degree. Alternative 4 would result in a negligible beneficial effect near the hatchery facility on wildlife from the reduction of the hatchery programs not having human disturbance from fishing and operations.

4.6.5. Alternative 5 – Terminate Highest Risk Hatchery Programs and Implement Hatcheyr Program Reforms

Under Alternative 5, the highest risk hatchery programs would be terminated and hatchery reforms implemented for the remaining hatchery programs. Only Nehalem Hatchery would be closed. All other hatchery facilities would remain in operation. However, some would produce less fish depending upon the hatchery. Consequently, fewer salmon and steelhead (juvenile and adult) would be available as a food source for predators and scavengers that use salmon as a food source, including federally-listed Steller sea lion, and southern resident killer whale (Subsection 3.6, Wildlife).

Hatchery salmon and steelhead may represent an important component of sea lion diet during specific time periods, particularly if abundance is high and concentrated, like when salmon and steelhead return to freshwater. However, because sea lions are opportunistic predators, they transition to other marine and estuarine prey species during periods when salmon and steelhead abundance is low or when other prey species are more readily accessible. Given that hatchery salmon and steelhead make up a minor component of sea lion diet throughout their life along the Oregon Coast, Alternative 5 would only lead to a very low reduction in the total number of salmon and steelhead available to sea lions, salmon, and steelhead availability would be seasonal, and sea lions would easily switch to feeding on alternative prey. The abundance of natural-origin salmon and steelhead produced from watersheds within the Oregon Coast Region and hatchery fish from areas outside the Oregon Coast would still be available under Alternative 5 for sea lions. Alternative 5 is not expected to change sea lion diet, survival, or distribution relative to the No-action Alternative.

Southern resident killer whales also feed on adult salmon and steelhead and marine fish species, but prefer Chinook salmon. Based upon available information, the time period when southern resident killer whales have been periodically observed along the Oregon Coast is from late fall through late winter. For the remainder of the year, these whales are primarily found in the Strait of Juan de Fuca and Puget Sound (Hilborn et al. 2012). If killer whales migrate to the Oregon Coast Region, a variety of salmon stocks from the entire West Coast is potentially available to them for food (Figure 24). For example, in June 2011, genetic testing of Chinook salmon caught in the commercial fishery off the Oregon Coast showed the presence of Chinook salmon originating from areas ranging from Alaska to California (Weitkamp 2010; Figure 24). Even though this is not the timeframe when killer whales are typically present along the Oregon Coast, this is when the fisheries began that year and probably reflects the composition of salmon along the Oregon Coast earlier in the year when killer whales might be present. In addition, a variety of marine species such as lingcod, greenling, sole, and herring are also available.

Under Alternative 5, three hatchery Chinook salmon programs would be eliminated (Elk fall Chinook, Nestucca spring Chinook, and Trask spring Chinook). Since killer whales prefer Chinook salmon, this hatchery production reduction of 15% in the hatchery Chinook salmon programs (see Appendix A) would be expected to cause the greatest impact on killer whales from late fall to late winter along the Oregon Coast. It is difficult to quantify how much this reduction in hatchery Chinook salmon would affect killer whales because the total abundance of salmon off the Oregon Coast is not known and varies greatly from year to year (PFMC 2013). However, adipose-fin clipped (hatchery-origin) Chinook salmon represent a

minority of the Chinook salmon harvested in commercial and sport fisheries along the Oregon Coast (PFMC 2013).

Of the hatchery Chinook salmon caught along the Oregon Coast, the majority of hatchery fish in the catch are Central Valley California and Klamath fall Chinook salmon because their ocean abundance is the greatest (Figure 24; PFMC 2013). Therefore, available information suggests hatchery Chinook salmon released from Oregon Coast facilities would represent a low percentage of the total abundance of Chinook salmon (and hatchery-origin Chinook) along the Oregon Coast and, therefore, a low percentage of the total availability of Chinook salmon to killer whales. Given the variety of Chinook salmon stocks from the entire West Coast that inhabit the Oregon Coast and the availability of other marine species, Alternative 5 is not expected to change the diet, survival, or distribution of southern resident killer whales relative to the No-action Alternative because hatchery salmon and steelhead from hatcheries along the Oregon Coast are not the prominent prey base for southern resident killer whales.

Alternative 5 would reduce the number of juvenile salmon and steelhead available as a food source for Caspian terns, cormorants, and other bird populations in the project area that traditionally feed on juvenile salmon (Subsection 3.6, Wildlife). However, because Alternative 5 would reduce the total number of juvenile hatchery-origin salmon and steelhead by only 16% compared to the No-action Alternative, it would not be expected to change the diet, survival, or distribution of Caspian terns, cormorants, or other bird population because hatchery salmon and steelhead from hatcheries along the Oregon Coast are not the prominent prey base for bird species in the region.

Habitat disruption may occur from physical damage or disruption by anglers targeting hatchery-origin salmon and steelhead. There is some potential for these activities to displace wildlife that may be in the area. Habitat impacts from fishing activities are usually localized and short-lived and are currently occurring related to ongoing fisheries in the analysis area. Additionally, fishery access points, roads, boat launches, and campsites are already present in the analysis area. Alternative 5 would reduce the number of salmon and steelhead available for harvest along the Oregon Coast relative to Alternative 1. However, fishing for other fish species (e.g., trout) would still occur in the analysis area, and there would be no change in fishery access points, roads, boat launches, and campsites in the analysis area relative to Alternative 1. Therefore, Alternative 5 would not be expected to reduce adverse impacts on wildlife from fishing activities relative to the No-action Alternative to a measureable degree. Alternative 5 would result in a negligible beneficial effect near the hatchery facility on wildlife from the reduction of the hatchery programs not having human disturbance from fishing and operations.

4.7. Effects on Socioeconomics

4.7.1. Alternative 1 (No-Action) – Do Not Approve ODFW's HGMPs for Operation of Hatchery Programs on the Oregon Coast

Under Alternative 1, 10 hatchery programs along the Oregon Coast would continue to operate as proposed in submitted HGMPs (Subsection 2.2, Alternative 2 (Proposed Action/Preferred Alternative): Approve ODFW's HGMPs for Operation of Hatchery Programs on the Oregon Coast)). There would continue to be 49 full-time jobs associated with the hatchery programs (Subsection 3.7, Socioeconomics). Additionally, these hatchery programs would continue to use local goods and services, which would contribute to personal income or jobs along the Oregon Coast.

Alternative 1 would continue to provide salmon and steelhead available for commercial and recreational harvest along the Oregon Coast. Fishing opportunities provided under Alternative 1 would continue similar to current conditions for the purchase of supplies such as fishing gear, camping equipment, consumables, and fuel at local businesses (Subsection 3.7, Socioeconomics). Additionally, anglers would continue to contribute to the economy through outfitter/guide/charter fees. Alternative 1 would maintain the $4 to $8 million spent by anglers fishing for hatchery fish along the Oregon Coast (ODFW 2010; Subsection 3.7, Socioeconomics). Applying the cost-benefit ratios from Figure 14 would value the existing hatchery programs in excess of $8 million annually. For the Oregon Coast Region, the hatchery programs provide substantial benefits (medium effect) to socioeconomics. Depending upon the specific fishery, the benefits can be high to the local economy. For example, the fishery targeting hatchery spring Chinook salmon returning to the Rogue River is very popular and represents a significant boost to the local economies of Gold Beach, Grants Pass, Medford, and Shady Cove communities.

Even though fishing-related expenditures is a low percentage of total state revenue (less than one percent), within the Oregon Coast Region, fisheries can be an important local economic contribution particularly during the seasons when spring and fall Chinook salmon, coho salmon, and winter steelhead return. Depending upon the specific fishery, the hatchery programs add an important boost (medium to high beneficial impact) to local economies within the Oregon Coast Region.

In addition to the economic benefits from having hatchery fish available to catch in ocean and freshwater fisheries, there is also possible economic losses on fisheries that target natural-origin salmon and steelhead in the populations where hatchery programs occur. As described in Subsection 4.4, Effects on

Salmon and Steelhead and Their Habitats and Subsection 4.5, Effects on Other Fish and Their Habitats, hatchery programs have negative effects on the abundance and productivity of natural-origin fish populations. Consequently, natural production is reduced in the population areas where hatchery programs occur. This translates into fewer natural-origin fish being available for fisheries. Depending upon the specific population and hatchery program, the effect of the negative impacts of hatchery fish on natural production and fisheries likely ranges from a negligible to a very low effect on the overall socioeconomics for the Oregon Coast Region.

4.7.2. Alternative 2 (Proposed Action/Preferred Alternative) – Approve ODFW's HGMPs for Operation of Hatchery Programs on the Oregon Coast

Under Alternative 2, 10 hatchery programs along the Oregon Coast would continue to operate as proposed in submitted HGMPs (Subsection 2.2, Alternative 2, Proposed Action/Preferred Alternative). There would continue to be 49 full-time jobs associated with the hatchery programs (Subsection 3.7, Socioeconomics). Additionally, these hatchery programs would continue to use local goods and services, which would contribute to personal income or jobs along the Oregon Coast as described under Alternative 1 (No-Action). Depending upon the specific fishery and circumstances, the hatchery programs would provide substantial benefits (medium to high impact) to the local economies from anglers targeting hatchery fish. For the popular fisheries targeting predominantly hatchery-origin salmon (e.g., Rogue River spring Chinook salmon), the hatchery program provides a definitive boost to the local economies of Gold Beach, Grants Pass, Medford, and Shady Cove from the purchasing of tackle, sporting goods, fishing guide services, food, and lodging purchases that facilitate their outdoor activities.

4.7.3. Alternative 3 – Terminate the Hatchery Programs on the Oregon Coast

The termination of operations at 10 hatchery facilities along the Oregon Coast would result in the loss of 49 full-time employee positions (Subsection 3.7, Socioeconomics). Additionally, the hatchery programs would no longer procure local goods and services, which contribute to personal income or jobs along the Oregon Coast. Millions of dollars in revenue to the local economies from the hatchery facilities and harvest of hatchery fish in commercial and recreational fisheries would be eliminated (Subsection 3.7, Socioeconomics).

Alternative 3 would reduce the number of salmon and steelhead available for commercial and recreational harvest along the Oregon Coast relative to Alternative 1. A loss of fishing opportunities under Alternative 3 would reduce the local purchase of supplies such as fishing gear, camping equipment,

consumables, and fuel at local businesses, which would adversely impact local businesses. While not all businesses are direct beneficiaries of fishing-related activities, many are, and many more would benefit indirectly from increased numbers of visitors drawn by the fishing opportunities and fishing industries. Additionally, fewer anglers would contribute to the economy through outfitter/guide/charter fees than under Alternative 1. While closure of the hatcheries would not result in the loss of all fishing opportunity, the closure of the hatcheries would likely mean the loss of $4 to $8 million per year from recreational fisheries targeting the hatchery fish produced from these facilities (ODFW 2010; Subsection 3.7, Socioeconomics). In addition, there would also be economic losses associated with funding and operation of the hatchery facilities and associated jobs. In addition, numerous other related jobs generated by the hatchery programs would also be lost. For the local economies of the Oregon Coast Region, Alternative 3 would be detrimental to the businesses that supply goods and services, fishing tackle, and equipment for salmon and steelhead fisheries. However, while it is not known to what degree the economy would be affected, it would likely be a substantial part of the fishing-related economy, given the large proportion of the fishery industries that are served by the recreational fisheries described in the Proposed Action.

Because fishing-related expenditures are a low percentage of total state revenue, Alternative 3 would not be expected to reduce total state revenue from recent conditions to any great extent (Subsection 3.7, Socioeconomics). In the late summer through winter, when overall tourism is down, fisheries for fall Chinook salmon, coho salmon, and winter steelhead would occur, and would generate important economic activity to support local businesses through the tourism off-season. If the hatchery programs were terminated under Alternative 3, this would be a low to medium adverse effect on the local economies dependent on revenue from fisheries in the analysis area.

4.7.4. Alternative 4 – Reduced Hatchery Production

The reduction of the hatchery programs by 50 percent along the Oregon Coast would likely result in the loss of between zero and 49 full-time employee positions (Subsection 3.7, Socioeconomics). This range of employment loss represents the range analyzed under the No-action Alternative and Alternative 3 (terminate all hatchery programs). Alternative 4 would not result in a near term reduction of 50 percent of the hatchery personnel because a minimum number of staff is required to work the hatchery facilities regardless of hatchery production. Therefore, effects on local hatchery employment under Alternative 4 is somewhere between effects analyzed under Alternative 1 and Alternative 3.

Additionally, the hatchery programs would have reduced need to procure local goods and services because fewer hatchery fish are being produced under Alternative 4, which would equate to a reduction in personal income or jobs along the Oregon Coast. The economic impact from Alternative 4 would affect the local economies of the Oregon Coast Region, and likely represent adverse impact levels assessed between Alternative 1 and Alternative 3.

Alternative 4 would reduce the number of salmon and steelhead available for commercial and recreational harvest along the Oregon Coast relative to Alternative 1. A loss of fishing opportunities under Alternative 4 would reduce the local purchase of supplies such as fishing gear, camping equipment, consumables, and fuel at local businesses, which would adversely impact local businesses. While not all businesses are direct beneficiaries of fishing-related activities, many are, and many more would benefit indirectly from increased numbers of visitors drawn by the fishing opportunities and fishing industries. Additionally, fewer anglers would contribute to the economy through outfitter/guide/charter fees than under Alternative 1.

While a reduction in the number of hatchery fish released would not result in the loss of all fishing opportunity, the reduction would likely mean the loss of $2 to $4 million per year from recreational fisheries targeting the hatchery fish produced from these facilities (50 percent reduction from the No-action Alternative) (Subsection 3.7, Socioeconomics) (ODFW 2010). In addition, there would also be economic losses associated with funding and operation of the hatchery facilities and associated jobs. Numerous other related jobs generated by the hatchery programs would also be lost.

For the local economies of the Oregon Coast Region, Alternative 4 would have a medium to high adverse impact on the businesses that supply goods and services, fishing tackle, and equipment for hatchery salmon and steelhead fisheries depending upon the local circumstances as compared to the No-action Alternative. However, while it is not known to what degree the economy would be affected for the Oregon Coast Region, Alternative 4 would likely result in a medium impact on the fishing-related economy, given the large proportion of the fishery industries that are served by the recreational fisheries described in the Proposed Action (Subsection 3.7, Socioeconomics).

Because fishing-related expenditures are a low percentage of total state revenue, Alternative 4 would not be expected to reduce total state revenue from recent conditions to any great extent (Subsection 3.7, Socioeconomics). In the late summer through winter, when overall tourism is down, fisheries for fall Chinook salmon, coho salmon, and winter steelhead would occur, and would generate important

economic activity to support local businesses through the tourism off-season. If the hatchery programs were reduced under Alternative 4, this would be a medium adverse effect on the local economies dependent on revenue from fisheries in the analysis area as compared to the No-action Alternative.

4.7.5. Alternative 5 – Terminate Highest Risk Hatchery Programs and Implement Hatchery Program Reforms

The termination of the highest risk hatchery programs and hatchery reforms of the remaining programs along the Oregon Coast would likely result in the loss of between zero and 49 full-time employee positions (Subsection 3.7, Socioeconomics). This range of employment loss represents the range analyzed under the No-action Alternative and Alternative 3 (terminate all hatchery programs). Alternative 5 would not result in a near term reduction of hatchery personnel because a minimum number of staff is required to work the hatchery facilities regardless of hatchery production. Therefore, effects on local hatchery employment under Alternative 5 is somewhere between effects analyzed under Alternative 1 and Alternative 3.

Additionally, the hatchery programs would have reduced need to procure local goods and services because fewer hatchery fish are being produced under Alternative 5, which would equate to a reduction in personal income or jobs along the Oregon Coast. The economic impact from Alternative 5 would affect the local economies of the Oregon Coast Region, and likely represent adverse impact levels assessed between Alternative 1 and Alternative 3.

Alternative 5 would reduce the number of salmon and steelhead available for commercial and recreational harvest along the Oregon Coast relative to Alternative 1. A loss of fishing opportunities under Alternative 5 would reduce the local purchase of supplies such as fishing gear, camping equipment, consumables, and fuel at local businesses, which would adversely impact local businesses. While not all businesses are direct beneficiaries of fishing-related activities, many are, and many more would benefit indirectly from increased numbers of visitors drawn by the fishing opportunities and fishing industries. Additionally, fewer anglers would contribute to the economy through outfitter/guide/charter fees than under Alternative 1.

While a reduction in the number of hatchery fish released would not result in the loss of all fishing opportunity, the reduction would likely mean the loss of $2 to $4 million per year from recreational fisheries targeting the hatchery fish produced from these facilities (50 percent reduction from the No-

action Alternative) (Subsection 3.7, Socioeconomics) (ODFW 2010). In addition, there would also be economic losses associated with funding and operation of the hatchery facilities and associated jobs. Numerous other related jobs generated by the hatchery programs would also be lost.

For the local economies of the Oregon Coast Region, Alternative 5 would have a low to medium adverse impact on the businesses that supply goods and services, fishing tackle, and equipment for hatchery salmon and steelhead fisheries depending upon the local circumstances as compared to the No-action Alternative. However, while it is not known to what degree the economy would be affected for the Oregon Coast Region, Alternative 5 would likely result in a low impact on the fishing-related economy, given the large proportion of the fishery industries that are served by the recreational fisheries described in the Proposed Action (Subsection 3.7, Socioeconomics).

Because fishing-related expenditures are a low percentage of total state revenue, Alternative 5 would not be expected to reduce total state revenue from recent conditions to any great extent (Subsection 3.7, Socioeconomics). In the late summer through winter, when overall tourism is down, fisheries for fall Chinook salmon, coho salmon, and winter steelhead would occur, and would generate important economic activity to support local businesses through the tourism off-season. If the hatchery programs were reduced under Alternative 5, this would be a low adverse effect on the local economies dependent on revenue from fisheries in the analysis area as compared to the No-action Alternative.

4.8. Effects on Environmental Justice

4.8.1. Alternative 1 (No-Action) – Do Not Approve ODFW's HGMPs for Operation of Hatchery Programs on the Oregon Coast

Ten of the 12 counties in the analysis area are environmental justice communities of concern because they meaningfully exceed thresholds for low income or minority populations (Table 12). Under Alternative 1, the following ecological, cultural, economic, and social effects on environmental justice communities would be expected in both the short and long term:

- A negligible reduction in the amount of surface and ground water around the local vicinity of the hatchery facilities, but would be of no consequence to environmental justice communities (Subsection 4.2.2, Effects on Water Quantity)

- A negligible reduction in water quality around the local vicinity of the hatchery facilities. Impacts are undetectable downstream of the hatchery facilities (Subsection 4.3.2, Effects on Water Quality)
- A medium to high beneficial impact on environmental justice communities from the purchase of goods and services to support hatchery facilities (Subsection 4.7.2, Effects on Socioeconomics)
- A medium to high beneficial impact on environmental justice communities from the employment of 49 full-time and 18 seasonal employees at the hatchery facilities (Subsection 4.7.2, Effects on Socioeconomics)
- A medium to high beneficial impact on environmental justice communities from fisheries targeting hatchery salmon and steelhead that increase the local purchase of supplies such as fishing gear, camping equipment, consumables, and fuel at local businesses; these increases would benefit environmental justice communities (Subsection 4.7.2, Effects on Socioeconomics)
- There would be a medium beneficial impact in environmental justice communities through the hiring of guide and charters to take people fishing (Subsection 4.7.2, Effects on Socioeconomics)

4.8.2. Alternative 2 (Proposed Action/Preferred Alternative) – Approve ODFW's HGMPs for Operation of Hatchery Programs on the Oregon Coast

Ten of the 12 counties in the analysis area are environmental justice communities of concern because they meaningfully exceed thresholds for low income or minority populations (Table 12). Under Alternative 2, the proposed programs would have ecological, cultural, economic, and social effects and effects on environmental justice communities identical to those described under Alternative 1 (No-Action).

- A negligible reduction in the amount of surface and ground water around the local vicinity of the hatchery facilities, but would be of no consequence to environmental justice communities (Subsection 4.2.2, Effects on Water Quantity)
- A negligible reduction in water quality around the local vicinity of the hatchery facilities. Impacts are undetectable downstream of the hatchery facilities (Subsection 4.3.2, Effects on Water Quality)
- A medium to high beneficial impact on environmental justice communities from the purchase of goods and services to support hatchery facilities (Subsection 4.7.2, Effects on Socioeconomics)
- A medium to high beneficial impact on environmental justice communities from the employment of 49 full-time and 18 seasonal employees at the hatchery facilities (Subsection 4.7.2, Effects on Socioeconomics)

- A medium to high beneficial impact on environmental justice communities from fisheries targeting hatchery salmon and steelhead that increase the local purchase of supplies such as fishing gear, camping equipment, consumables, and fuel at local businesses; these increases would benefit environmental justice communities (Subsection 4.7.2, Effects on Socioeconomics)
- There would be a medium beneficial impact in environmental justice communities through the hiring of guide and charters to take people fishing (Subsection 4.7.2, Effects on Socioeconomics)

4.8.3. Alternative 3 – Terminate Hatchery Programs on the Oregon Coast

For purposes of the current evaluation of effects on environmental justice, the analysis area includes all 12 counties along the Oregon Coast to which hatchery fish of the proposed programs would return, because residents of all these areas could be affected by decisions regarding the hatchery programs. Ten of the 12 counties in the analysis area are environmental justice communities of concern because they meaningfully exceed thresholds for low income or minority populations (Table 12). Under Alternative 3, the following ecological, cultural, economic, and social effects on environmental justice communities would be expected in both the short and long term as compared to the No-action Alternative:

- A negligible increase in the amount of surface and ground water around the local vicinity of the hatchery facilities would occur under Alternative 3. However, this would be of no beneficial consequence to environmental justice communities because of the localized area from water intake to water outfall (Subsection 4.2.2, Effects on Water Quantity)
- A negligible increase in water quality around the local vicinity of the hatchery facilities would occur in Alternative 3. However, since impacts from the hatchery facilities on water quality are negligible and localized, the benefits would be negligible. These improvements would not benefit the current 303(d) listing parameters for water quality (Subsection 4.3.2, Effects on Water Quality)
- A medium to high adverse impact on environmental justice communities from the loss of purchasing goods and services to support hatchery facilities would occur under Alternative 3 (Subsection 4.7.2, Effects on Socioeconomics)
- A medium to high adverse impact on environmental justice communities from the loss of employment of 49 full-time and 18 seasonal employees from the termination of the hatchery facilities under Alternative 3 would occur (Subsection 4.7.2, Effects on Socioeconomics)
- A medium to high adverse impact on environmental justice communities from the loss fisheries targeting hatchery salmon and steelhead that increase the local purchase of supplies such as

fishing gear, camping equipment, consumables, and fuel at local businesses in environmental justice communities would occur under Alternative 3 (Subsection 4.7.2, Effects on Socioeconomics)

- There would be a medium adverse impact in environmental justice communities from the elimination of the need to hire guides and charters to take people fishing for hatchery salmon and steelhead under Alternative 3 (Subsection 4.7.2, Effects on Socioeconomics)

4.8.4. Alternative 4 – Reduced Hatchery Production

For purposes of the current evaluation of effects on environmental justice, the action area includes all 12 counties along the Oregon Coast to which hatchery fish of the proposed programs would return, because residents of all these areas could be affected by decisions regarding the hatchery programs. Ten of the 12 counties in the analysis area are environmental justice communities of concern because they meaningfully exceed thresholds for low income or minority populations (Table 12). Under Alternative 4, the following ecological, cultural, economic, and social effects on environmental justice communities would be expected in both the short and long term as compared to the No-action Alternative:

- A negligible increase in the amount of surface and ground water around the local vicinity of the hatchery facilities would occur under Alternative 4. However, this would be of no beneficial consequence to environmental justice communities because of the localized area from water intake to water outfall (Subsection 4.2.2, Effects on Water Quantity)
- A negligible increase in water quality around the local vicinity of the hatchery facilities would occur in Alternative 4. However, since impacts from the hatchery facilities on water quality are negligible and localized, the benefits would be negligible. These improvements would not benefit the current 303(d) listing parameters for water quality (Subsection 4.3.2, Effects on Water Quality)
- A medium adverse impact on environmental justice communities from the loss of purchasing goods and services to support hatchery facilities would occur under Alternative 3 (Subsection 4.7.2, Effects on Socioeconomics)
- A medium adverse impact on environmental justice communities from the loss of employment in the range of zero to 49 full-time and zero to 18 seasonal employees from the reduction of the hatchery programs under Alternative 4 would occur (Subsection 4.7.2, Effects on Socioeconomics)

- A medium adverse impact on environmental justice communities from the loss of fisheries targeting hatchery salmon and steelhead that increase the local purchase of supplies such as fishing gear, camping equipment, consumables, and fuel at local businesses in environmental justice communities would occur under Alternative 4 (Subsection 4.7.24, Effects on Socioeconomics)
- There would be a medium adverse impact in environmental justice communities from the elimination of the need to hire guides and charters to take people fishing for hatchery salmon and steelhead under Alternative 3 (Subsection 4.7.24, Effects on Socioeconomics)

4.8.5. Alternative 5 – Terminate Highest Risk Hatchery Programs and Implement Hatcheyr Program Reforms

For purposes of the current evaluation of effects on environmental justice, the action area includes all 12 counties along the Oregon Coast to which hatchery fish of the proposed programs would return, because residents of all these areas could be affected by decisions regarding the hatchery programs. Ten of the 12 counties in the analysis area are environmental justice communities of concern because they meaningfully exceed thresholds for low income or minority populations (Table 12). Under Alternative 5, the following ecological, cultural, economic, and social effects on environmental justice communities would be expected in both the short and long term as compared to the No-action Alternative:

- A negligible increase in the amount of surface and ground water around the local vicinity of the hatchery facilities would occur under Alternative 5. However, this would be of no beneficial consequence to environmental justice communities because of the localized area from water intake to water outfall (Subsection 4.2.2, Effects on Water Quantity)
- A negligible increase in water quality around the local vicinity of the hatchery facilities would occur in Alternative 5. However, since impacts from the hatchery facilities on water quality are negligible and localized, the benefits would be negligible. These improvements would not benefit the current 303(d) listing parameters for water quality (Subsection 4.3.2, Effects on Water Quality)
- A medium adverse impact on environmental justice communities from the loss of purchasing goods and services to support hatchery facilities would occur under Alternative 3 (Subsection 4.7.2, Effects on Socioeconomics)
- A medium adverse impact on environmental justice communities from the loss of employment in the range of zero to 49 full-time and zero to 18 seasonal employees from the reduction of the

hatchery programs under Alternative 4 would occur (Subsection 4.7.2, Effects on Socioeconomics)

- A low to medium adverse impact on environmental justice communities from the loss of fisheries targeting hatchery salmon and steelhead that increase the local purchase of supplies such as fishing gear, camping equipment, consumables, and fuel at local businesses in environmental justice communities would occur under Alternative 4 (Subsection 4.7.24, Effects on Socioeconomics)
- There would be a medium adverse impact in environmental justice communities from the elimination of the need to hire guides and charters to take people fishing for hatchery salmon and steelhead under Alternative 3 (Subsection 4.7.24, Effects on Socioeconomics)

5. CUMULATIVE IMPACTS

5.1. Introduction

The National Environmental Policy Act defines cumulative effects as "the impact on the environment which 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" (40 CFR 1508.7). Council on Environmental Quality (CEQ) guidelines recognize that it is not practical to analyze the cumulative effects of an action from every conceivable perspective, but rather, the intent is to focus on those effects that are truly meaningful. In other words, if several separate actions have been taken or are intended to be taken within the same geographic area, all of the relevant actions together (cumulatively) need to be reviewed, to determine whether the actions *together* could have a significant impact on the human environment. Past, present, and reasonably foreseeable future actions include those that are Federal and non-Federal. For this FEIS analysis, they also include those that are hatchery-related (e.g., hatchery production levels) and non-hatchery related (e.g., human development).

The cumulative effects of a Proposed Action can be represented as an equation:

Proposed Action + Past Actions + Present Actions + Reasonably Foreseeable Future Actions = Cumulative Effects

The CEQ provides an 11-step process for cumulative effects analyses that is woven into the larger NEPA process and into documents supporting a Federal action (CEQ 1997) (Table 15). Other subsections of this FEIS are relevant as support for this cumulative effects analysis.

Chapter 3, Affected Environment, describes the existing conditions (or baseline, for the purposes of this chapter) for each resource and reflects the effects of past actions and present condition. Chapter 4, Environmental Consequences, evaluates the direct and indirect effects of the alternatives on each resource's baseline conditions. This chapter considers the cumulative effects of each alternative in the context of past actions, present conditions, and reasonably foreseeable future actions and conditions.

Table 15. CEQ cumulative effects analysis process and documentation within this FEIS.

		Steps in the Process	Location within this FEIS
Scoping	1	Identify the significant cumulative effects issues associated with the proposed action and define the assessment goals	Subsections 1.2, 1.3, 1.6, and 5.5
	2	Establish the geographic scope for the analysis	Subsections 1.4 and 5.1.1
	3	Establish the time frame for the analysis	Subsection 5.1.1
	4	Identify other actions affecting the resources, ecosystems, and human communities of concern	Subsection 5.4
Describing the Affected Environment	5	Characterize the resources, ecosystems, and human communities identified in scoping in terms of their response to change and capacity to withstand stresses	Chapter 3
	6	Characterize the stresses affecting these resources, ecosystems, and human communities and relations to regulatory thresholds	
	7	Define a baseline condition for the resources, ecosystems and human communities	
Determining the Environmental Consequences	8	Identify the important cause-and-effect relationships between human activities and resources, ecosystems, and human communities	Chapter 3 and Subsections 5.2 to 5.5
	9	Determine the magnitude and significance of cumulative effects	Subsection 5.6
	10	Modify or add alternatives to avoid, minimize, or mitigate significant cumulative effects	Chapter 2
	11	Monitor the cumulative impacts of the selected alternatives and apply adaptive management	Alternative 2 (Proposed Action) includes monitoring and adaptive management as described in HGMPs

5.1.1. Geographic and Temporal Scales

The cumulative effects analysis area includes the project area and the analysis area described in Subsection 1.4, Project Area and Analysis Area. This cumulative effects area was determined based on the geography,

topography, waterways, and natural interactions that occur among the ecosystems present within the Oregon Coast Region. Biological resources and human populations along the Oregon Coast cumulative effects area share a common airshed, common watershed, and common flyway. The region has a population size of less than 600,000 residents. Population size increases are projected to occur in the periphery areas of the existing towns and cities in the more habitable lowland areas.

The temporal scope of past and present actions for the affected resources encompasses actions that occurred prior to and after Oregon Coast and SONCC coho salmon ESUs became listed under the ESA. This is also the temporal context within which affected resources are described in Chapter 3, Affected Environment, whereby existing conditions are a result of prior and ongoing actions in the FEIS project area.

5.1.2. Other Programs, Plans, and Policies

Provided below are known past, present, and future actions within the Oregon Coast Region that have occurred, are occurring, or are reasonably likely to occur within the cumulative effects analysis area. Subsection 5.2, Past Actions, summarizes past actions that affected the cumulative effects analysis area; Subsection 5.3, Present Conditions, describes current overall trends for the area; and Subsection 5.4, Future Actions and Conditions, describes climate change effects, development, habitat restoration, hatchery production, and fisheries activities and objectives supported by agencies and other non-governmental organizations to restore habitat in the cumulative effects analysis area. Finally, Subsection 5.5, Cumulative Effects by Resource, describes how these past, present, and future actions affect each resource evaluated in this FEIS, and specifically focuses on the effects of alternatives, when possible.

5.2. Past Actions

Humans occupied the Oregon Coast Region for thousands of years. Before Europeans arrived in the late 1700s, most human inhabitants were hunter-gatherers associated with the Native American Tribes. They relied on sea life for food, animals for food and warm clothing, and trees for building materials. Indigenous peoples were known to use the waterways of the Oregon Coast as trading routes. Fire was used in some areas to modify the environment, to clear areas to aid hunting, to promote berry production, and to support the growth of grasses for making nets, baskets, and blankets.

In the 1800s, with the continued increase in European descendants to Oregon, trapping, logging, and fishery harvest were initiated on a large scale, which dramatically altered the landscape. The Oregon Coast Region became one of the top five producers of timber. As natural resource extraction and the number of people in the area increased, the quality of the Oregon Coast ecosystems declined. Land ownership became fragmented with many different owners and purposes (Figure 25). Most of the old-growth forest was harvested by private, state, and federal identities, and much forestland in the lowland, open areas was converted to human-dominated uses, such as agriculture and urban development in private ownership. The quantity and availability of tidal marsh and other freshwater estuarine ecosystem types declined, floodplains were altered, rivers and streams were channelized, substantial dams were constructed in some river basins, estuaries were filled, shorelines were hardened and/or modified, water and air quality declined, pollution and marine traffic increased, and habitat was lost. Additionally, some floodcontrol and hydropower developed in the 20th century (primarily in the Umpqua and Rogue Rivers), which altered stream habitat below the dam projects, eliminated historical spawning and rearing habitats, and altered the natural hydrology of the watershed.

Forest management continued to drive the local economies. Splash damming occurred in several coastal watershed as a method to get timber to local mills in the estuaries, which degraded the aquatic habitat dramatically. By the late 1980s, most of the Oregon Coast Region had been logged at least one time, with the exception of designated wilderness areas or other special designation that helped preserve the local landscape. All of the associated activities that occur with logging, like road building and building stream crossings, became extensive across the landscape. All of these activities severely affected the aquatic habitat in streams and rivers of the Oregon Coast Region. Much of the stream complexity that included large woody debris, deep pool habitat, braided channels, and intact riparian areas was lost. Streams and rivers are now much simpler, less complex, dominated by shallow riffle habitat, and exhibited warmer water temperatures than occurred historically.

Fishery harvest of salmon and steelhead and other aquatic species also increased with the increase in human population across the Oregon Coast Region. Initially, fishery harvest occurred for subsistence needs but then grew into commercial harvest in the rivers and ocean. By the 1920s, fishery harvest in freshwater had severely affected the salmon and steelhead runs from the millions of pounds harvested annually. Commercial fisheries in the rivers and bays was dramatically curtailed and eventually became illegal. The fishing fleet developed in the coastal ports to commercially harvest fish in the ocean. Commercial and recreational harvest increased throughout the 20th century until the early 1990s when

many of the salmon runs plummeted to all-time low abundances. Fishery harvest rates were dramatically reduced and still occur at much lower harvest rates than occurred historically.

The decreases in salmon and steelhead harvest from overexploitation and reduced productivity from freshwater habitat degradation initiated hatchery programs for salmon and steelhead since the late 1800s in the Oregon Coast Region in an effort to increase fishery harvest. One of the first rivers to have hatchery programs was the Rogue River. The hatchery programs increased fishery harvest in many cases, especially during the high ocean survival periods. However, many concerns arose over excessive harvest of natural-origin stocks, interbreeding between hatchery- and natural-origin fish, and competition reduced hatchery production beginning in the 1980s. Over 10 million hatchery coho salmon were released along the Oregon Coast prior to the mid-1990s (Stout et al. 2012). Those hatchery coho salmon releases were substantially curtailed due to ESA-listings in the late 1990s.

5.3. Present Conditions

As described in Subsection 5.2, Past Actions, substantial changes have occurred to the Oregon Coast terrestrial and aquatic ecosystems over the last century. Presently, the landscape continues to be managed for timber production over a broad landscape of the Oregon Coast Region given the superb growing conditions for timber. Several regulations and best management practices have been implemented and are still in effect to help recover and protect aquatic habitat, such as the Oregon State Forest Practices Act and the Northwest Forest Plan (Subsection 1.7.1, Oregon Plan for Salmon and Watersheds). Federal lands in the region have greater riparian protections and are managed to a greater extent for late-successional timber stands than what typically occurs on private timberlands in the Oregon Coast Region. In watersheds dominated by private, timberland owners, timber harvest occurs regularly on 25-35 year rotations. Over the last two decades, timber harvest has decreased overall on federal lands but increased on private lands (Stout et al. 2012). Since the Oregon Coast Region is dominated by non-federal lands, timber harvest continues to be a prominent issue for the restoration of aquatic habitat along the Oregon Coast (Meehan 1991).

Land development continues to increase prominently in the lowland areas associated with the major towns and cities throughout the region. The greatest concentration of human population, and consequently associated development, is presently found in the cities of Medford, Grants Pass, Roseburg, Central Point, Coos Bay, Newport, North Bend, and Eagle Point. Of these cities, most are found in Jackson and Josephine Counties (Rogue River Basin), which exhibited the greatest human population increases from 1980 to present. Coos County (Coos Bay and North Bend) was the only county that

decreased in residency between 1980 and present. Overall, due to the prominent forest landscape, land development to support urban growth is not as extensive as in other parts of the state (i.e., Willamette Valley), and consequently the Oregon Coast Region currently supports less than 600,000 residents. Fishery harvest of all species of fish (resident and anadromous) is managed principally by ODFW. For ESA-listed coho salmon, management is governed by NMFS and ODFW. All other salmon species are also managed under the auspices of the Magnuson-Stevens Act via NMFS. Presently, all salmon species along the Oregon Coast are governed by existing management plans that prohibit overfishing so that all of the salmon populations remain viable. Stocks of concern are managed more conservatively to rebuild these stocks to healthy abundances. Listed coho salmon are presently governed by Amendment 13 of the Pacific Salmon Plan and has been authorized under the ESA.

The existing hatchery programs along the Oregon Coast affect natural-origin salmon and steelhead and their habitat (Subsection 3.4, Salmon and Steelhead and Their Habitats). Operation of the hatchery facilities and release of hatchery fish into the natural environment has affected natural-origin salmon and steelhead through genetic introgression of hatchery fish into the natural population, increased competition and predation from hatchery fish, transfer of pathogens from hatchery fish and/or the hatchery facility to the adjacent river or stream, operation of the hatchery facility using water and discharging effluent, masking of natural population status from having hatchery fish spawning in the wild, incidental fishing effects, and nutrient input from carcasses. The extent of adverse effects depends on how the hatchery program is managed, the current status of the natural-origin populations and how affected by the hatchery program, and the condition of the habitat; among other factors.

Hatchery programs along the Oregon Coast can also provide benefits to the natural-origin populations by increasing the amount of marine-derived nutrients to the freshwater environment from having hatchery fish spawn naturally and from the outplanting of carcasses from the hatchery facility. Hatchery programs can also potentially benefit the abundance, productivity, spatial structure, and diversity of natural populations (McElhany et al. 2000). None of the current hatchery programs within the Oregon Coast Region are managed for the supplementation or restoration of natural-origin populations. All of the hatchery programs are managed solely for fishery harvest opportunities.

Hatchery programs along the Oregon Coast continue to be operated and managed by ODFW at levels specified in the current HGMPs being considered in this FEIS. Overall production levels have remained stable over the last 10 years. There were some reforms that occurred from implementation of ODFW's Management Plans under its Native Fish Conservation Policy (ODFW 2002), but production levels have

remained similar across the Oregon Coast Region overall. For ESA-listed coho salmon, total hatchery releases for the entire Oregon Coast Region is less than 350,000 smolts annually (compared to over 10,000,000 in the 1980s).

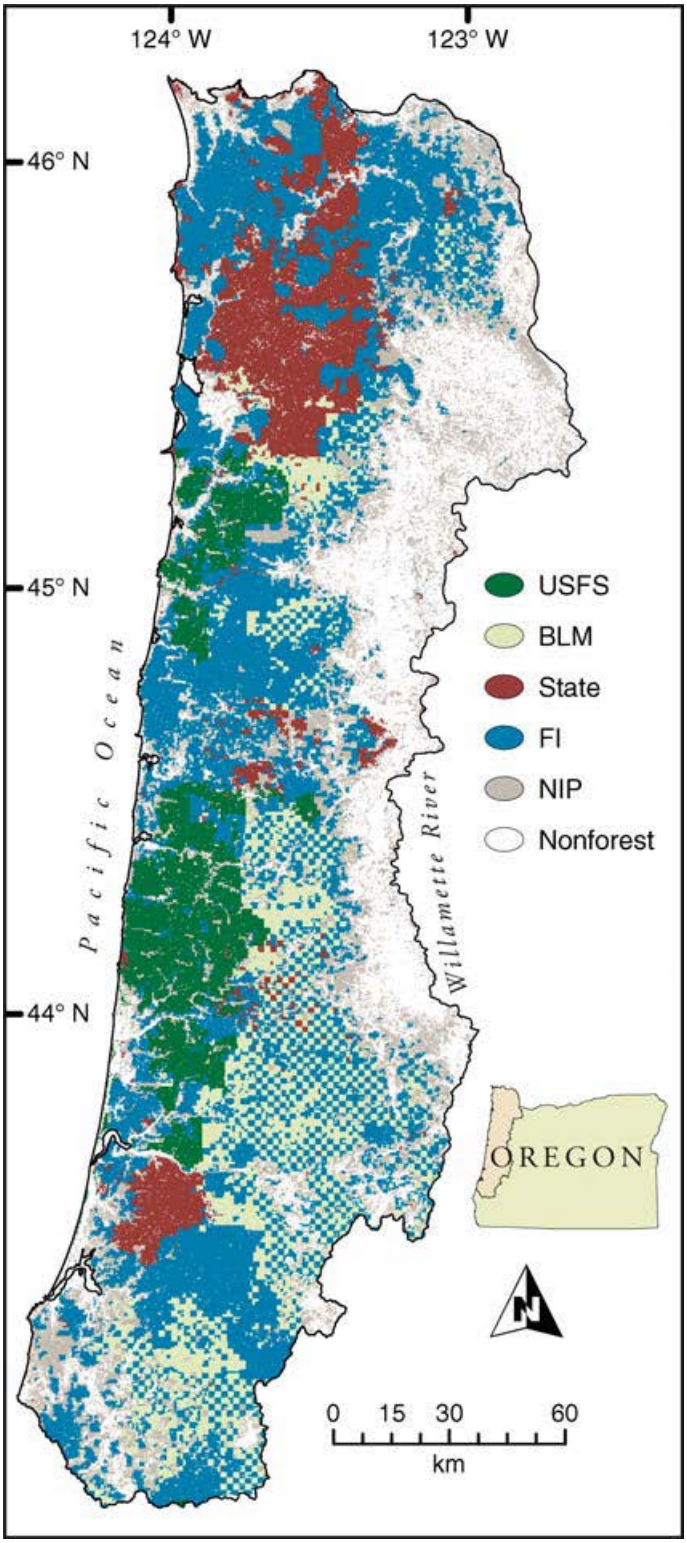


Figure 27. Map of ownership classes for forest land along the Oregon Coast (does not include the headwater areas of the Rogue and Umpqua watersheds). Figure taken from Spies et al. (2007). Abbreviations in legend are: USFS (U.S. Forest Service), BLM (Bureau of Land Management), State (state of Oregon), FI (forest industry), NIP (nonindustrial private forest and other miscellaneous owners, nonforest (other land uses).

Altogether, the stressors described above under present conditions (e.g., human development and habitat degradation, hatchery practices, and fisheries) are expected to continue under future actions and conditions as described below.

5.4. Future Actions and Conditions

Reasonably foreseeable future actions include forest management, land development, hatchery production, fisheries, habitat restoration activities, and climate change. Many plans, regulations, and laws are in place at the local, state, and federal levels within the Oregon Coast Region to continue economic benefits while minimizing and/or reducing environmental degradation (Subsection 1.7.1, Oregon Plan for Salmon and Watersheds). However, it is unclear if these plans, regulations, and laws will be successful in meeting their environmental goals and objectives. In addition, it is not possible to predict the magnitude of effects from future timber harvest, human development, and habitat restoration with certainty for several reasons: (1) the activities may not have yet been formally proposed, (2) mitigation measures specific to future actions may not have been identified for many proposed projects, and (3) there is uncertainty whether mitigation measures for these actions will be fully implemented. However, when combined with climate change, a general trend in expected cumulative effects can be estimated for each resource as described in Subsection 5.5, Cumulative Effects by Resource.

Because of the large geographic scope of this analysis, it is not feasible to conduct a detailed assessment of all project-level activities that have occurred, are occurring, or are planned in the future for the cumulative effects analysis area. Rather, this cumulative effects analysis qualitatively assesses the overall trends in cumulative effects considering past, present, and reasonably foreseeable future actions, and describes how the alternatives contribute to those trends.

5.4.1. Forest Management

The Coastal Landscape Analysis and Modeling Study (see http://www.fsl.orst.edu/clams/; accessed April 5, 2016) evaluated the ecological, economic, and social consequences of forest management policies of different landowners along the Oregon Coast mountain range (excludes the headwater areas of the Rogue and Umpqua watersheds). One aspect of this study modeled the likely ecological outcomes, under existing State Forest Practices Act and Northwest Forest Plan management policies, across the landscape in 100 years from 2006 (Spies et al. 2007). The results show substantial increases in (compared to current conditions): mature/old growth forest habitat, well-developed old growth, streamside conifers, large blocks of forestland, and timber production output from non-industrial, private timberlands. Substantial

decreases in hardwood forests, diversity of early successional forests, foothill oak woodland, and overall landscape diversity is expected to occur over the next 100 years. The 100 year projections are dependent upon land ownership. Federal lands are likely to exhibit the greatest increases in mature/old growth forest habitat, increased riparian condition and function, and habitat for ESA-listed terrestrial species like the northern spotted owl and marbled murrelet, even though this land ownership only represents approximately 25 percent of the land base. Conversely, industrial private timberlands will continue to be harvested under existing forest practices leading to less mature/old growth forests, increased early seral staged forests, and reduced riparian condition and function (Spies et al. 2007).

5.4.2. Land Development

Future human population growth is expected to continue into the foreseeable future within the Oregon Coast Region, but not to the extent as other areas along the West Coast like Central Valley in California, Willamette Valley in Oregon, and Puget Sound in Washington. This is primarily an artifact of the topography and forests of the Oregon Coast Region. Developable land is more limited in the Oregon Coast Region than in other West Coast areas because of the limited open, lowland topography. Most of the future development is projected to occur as the existing cities of Medford, Grants Pass, Roseburg, Central Point, Coos Bay, Newport, North Bend, and Eagle Point continue to expand due to population growth (Spies et al. 2007). Most of this development will occur in the Rogue and Umpqua valleys (Spies et al. 2007).

Continued population growth will result in increased demand for housing, transportation, food, water, energy, and commerce. These needs will result in changes to existing land uses because of increases in residential and commercial development and roads, increases in impervious surfaces, conversions of private agricultural and forested lands to developed uses, increases in use of non-native species and increased potential for invasive species, and redevelopment and infill of existing developed lands. The need to provide food and supplies to a growing human population in the cumulative effects analysis area will result in increases in shipping, increases in withdrawals of fresh water to meet increasing food and resource requirements, and increases in energy demands. Although the rate of urban sprawl has been decreasing in comparison to previous increases in the late 1900s (Puget Sound Regional Council 2012), development will continue to affect the natural resources in the cumulative effects analysis area.

5.4.3. Hatchery Production

It is likely that the type and extent of salmon and steelhead hatchery programs and the numbers of fish released in the analysis area will change over time. These changes are likely to reduce effects on natural-origin salmon and steelhead such as genetic effects, competition, and predation risks that are described in Subsection 3.4, Salmon and Steelhead and Their Habitats, especially for those species that are listed under the ESA. For example, effects on natural-origin salmon and steelhead would be expected to decrease over time to the extent that hatchery programs are reviewed and approved by NMFS under the ESA. Hatchery program compliance with conservation provisions of the ESA will ensure that listed species are not jeopardized, and that "take" under the ESA from salmon and steelhead hatchery programs is minimized or avoided.

Where needed, reductions in effects on listed and natural-origin salmon and steelhead may occur through changes such as refinement of times and locations of fish releases to reduce risks of competition and predation; management of overlap in hatchery-origin and natural-origin spawners to meet gene flow objectives; decreased use of isolated hatchery programs; increased use of integrated hatchery programs for conservation purposes; when available, incorporation of new research results and improved best management practices for hatchery operations; decreased production levels; or termination of programs. Similar changes would be expected for non-listed species as well, motivated by the desire to avoid species from becoming listed.

Since the existing hatchery programs are managed by ODFW, substantial increases in hatchery production is not likely in the foreseeable future for the following reasons:

- State-funded programs come primarily from fishing license sales, which has continued to decline over the last 30 years.
- Unless society's priorities and interests change back to outdoor activities like hunting and fishing in the future that increase license sales, funding for state-operated hatchery programs will continue to be limited.
- The only federal mitigation programs are in the Rogue River basin. These programs are likely to be continually funded, but will not likely increase in production because of the original mitigation obligations when William Jess and Applegate Dams were built.

5.4.4. Fisheries

It is likely that the salmon and steelhead fisheries in the analysis area will change over time. These changes are likely to reduce effects on natural-origin salmon and steelhead listed under the ESA. For example, effects on natural-origin salmon and steelhead would be expected to decrease over time to the extent that fisheries management programs continue to be reviewed and approved by NMFS under the ESA, as evidenced by the beneficial changes to programs that have thus far undergone ESA review. Fisheries management program compliance with conservation provisions of the ESA will ensure that listed species are not jeopardized and that "take" under the ESA from salmon and steelhead fisheries is minimized or avoided. Where needed, reductions in effects on listed salmon and steelhead may occur through changes in areas or timing of fisheries, or changes in types of harvest methods used.

5.4.5. Habitat Restoration

To counterbalance the human-induced changes that will affect biodiversity in the cumulative effects analysis area (Subsection 5.4.1, Forest Management and Subsection 5.4.2, Land Development), funding for habitat conservation and restoration is likely to continue into the foreseeable future because the majority of habitat restoration projects occurs from federal funding to the state of Oregon's Watershed Enhancement Board to local Watershed Councils for on-the-ground implementation of projects. As funding continues to be prioritized, emphasis on habitat restoration projects benefitting the most critical limiting factors and threats within the watershed will occur. These habitat restoration projects will continue to enhance the conservation and recovery of the watersheds.

5.4.6. Climate Change

The changing climate is becoming recognized as a long-term trend that is occurring throughout the world. Within the Pacific Northwest, Ford (2011) summarized expected climate changes in the coming years as leading to the following physical and chemical changes (certainty of occurring is in parentheses):

- Increased air temperature (high certainty)
- Increased winter precipitation (low certainty)
- Decreased summer precipitation (low certainty)
- Reduced winter and spring snowpack (high certainty)
- Reduced summer stream flow (high certainty)
- Earlier spring peak flow (high certainty)

- Increased flood frequency and intensity (moderate certainty)
- Higher summer stream temperatures (moderate certainty)
- Higher sea level (high certainty)
- Higher ocean temperatures (high certainty)
- Intensified upwelling (moderate certainty)
- Delayed spring transition (moderate certainty)
- Increased ocean acidity (high certainty)

These changes will affect human and other biological ecosystems within the cumulative effects analysis area (Ecology 2012a). Changes to biological organisms and their habitats are likely to include shifts in timing of life history events, changes in growth and development rates, changes in habitat and ecosystem structure, and rise in sea level and increased flooding (Littell et al. 2009; Johannessen and Macdonald 2009).

For the Pacific Northwest portion of the United States, Hamlet (2011) notes that climate changes will have multiple effects. Expected effects include:

- Overtaxing of storm water management systems at certain times
- Increases in sediment inputs into water bodies from roads
- Increases in landslides
- Increases in debris flows and related scouring that damages human infrastructure
- Increases in fires and related loss of life and property
- Reductions in the quantity of water available to meet multiple needs at certain times of year (e.g., for irrigated agriculture, human consumption, and habitat for fish)
- Shifts in irrigation and growing seasons
- Changes in plant, fish, and wildlife species' distributions and increased potential for invasive species
- Declines in hydropower production
- Changes in heating and energy demand
- Impacts on homes along coastal shorelines from beach erosion and rising sea levels

The most heavily affected ecosystems and human activities along the Pacific coast are likely to be near areas having high human population densities, and the continental shelves off Oregon and Washington (Halpern et al. 2009).

5.5. Cumulative Effects by Resource

Provided below is an analysis of the cumulative effects of forest management, land development, hatchery production, fisheries, habitat restoration, and climate change under the alternatives and for each resource analyzed in this FEIS. The resources for which cumulative effects are described are:

- Water quantity
- Water quality
- Salmon and Steelhead and Their Habitats
- Other Fish and Their Habitats
- Wildlife
- Socioeconomics
- Environmental justice

5.5.1. Water Quantity

Subsection 3.2, Water Quantity, describes the baseline conditions of water quantity, and Subsection 4.2, Effects on Water Quantity, evaluates the direct and indirect effects of the four alternatives of the hatchery programs within the Oregon Coast Region. All of the hatchery facilities divert water from nearby sources, pass the water through the hatchery, and then discharge the water back into the stream or river. There is typically a net gain of water at the point of discharge from the hatchery if groundwater sources are used at the hatchery. The amount of water available in the stream or river at the hatchery and local groundwater sources is the result of many years of past practices of forest management, land development, and climate change.

Future actions in the overall cumulative effects analysis area are described in Subsection 5.4, Future Actions and Conditions. This subsection considers effects that may occur as a result of the alternatives being implemented at the same time as other anticipated future actions. This subsection discusses the incremental impacts of the alternatives in addition to past, present, and reasonably foreseeable future actions (i.e., cumulative effects) on water quantity.

Successful operation of hatcheries depends upon the use of water from adjacent streams and rivers and groundwater at the hatchery facilities. The hatchery programs are subject to the amount and availability of water at the hatchery facility by all of the other prior influences and uses. The primary upstream influence on water quantity for the hatchery facilities along the Oregon Coast is forest management and climate

change. Land development and urban use are not primary influences because all of the major population areas are downstream of the hatchery facilities.

Habitat restoration could principally influence water quantity, especially if diversions are eliminated, but no projects are known to exist upstream of the hatchery facilities. Fisheries do not influence water quantity. It is uncertain how water quantity will be affected at the hatchery facilities due to federal land management being more conservative now and into the future for recovering aquatic habitat and climate change likely leading to less water being available during the low streamflow periods of the summer (surface and groundwater). Given these future conditions, it is likely water quantity in the analysis area will be the same or slightly worse than current conditions.

All of the four alternatives evaluated in Subsection 4.2, Effects on Water Quantity, resulted in negligible impacts on water quantity from the operation of the hatchery facilities. Therefore, hatchery programs are not likely to influence future conditions for water quantity downstream of the hatchery facilities. Of all of the areas evaluated along the Oregon Coast, most of the impacts on water quantity are likely to be caused from municipal and agricultural uses downstream of Cole Rivers Hatchery on the Rogue River where the highest human population areas and demand occurs near the cities of Medford, Grants Pass, Central Point, and Eagle Point. However, most of the water quantity issues are in the tributaries of the Rogue River, where diversions for agriculture and municipal uses dramatically reduce streamflows and salmonid rearing habitat. The operation of Cole Rivers hatchery in the mainstem, upper Rogue River does not affect the streamflows of the tributaries entering the Rogue River. Presently, in the mainstem Rogue River below the hatchery, there is water designated for municipal and irrigation uses that is currently unallocated. It is anticipated this unallocated water will eventually be used and withdrawn from the Rogue River as population growth continues to occur. None of the four alternatives evaluated in this FEIS related to the operation of Cole Rivers hatchery are likely to contribute to the above issues with water quantity downstream of the hatchery facility because there is no net loss of water from use at the hatchery.

In summary, cumulative effects from forest management, land development, climate change, and habitat restoration would likely impact water quantity (increased demand on limited water supplies) in the analysis area more than the direct or indirect effects that described in Subsection 4.2, Effects on Water Quantity, under all alternatives. However, implementation of the four alternatives would not affect or contribute to the overall trend in cumulative effects on water quantity within the Oregon Coast Region.

5.5.2. Water Quality

Subsection 3.3, Water Quality, describes the baseline conditions of water quality, and Subsection 4.3, Effects on Water Quality, evaluates the direct and indirect effects of the four alternatives of the hatchery programs within the Oregon Coast Region. All of the hatchery facilities divert water from nearby sources, pass the water through the hatchery, and then discharge the water back into the stream or river. The hatchery fish and operations add substances and diseases to the water within the specified limits of the NPDES permit for each hatchery.

Future actions in the overall cumulative effects analysis area are described in Subsection 5.4, Future Actions and Conditions. This subsection considers effects that may occur as a result of the alternatives being implemented at the same time as other anticipated future actions. This subsection discusses the incremental impacts of the alternatives in addition to past, present, and reasonably foreseeable future actions (i.e., cumulative effects) on water quality.

The most common substances found in the effluent of Oregon Coast hatcheries are ammonia, nitrogen, phosphorus, and antibiotics. Bacteria, parasites, and viruses can also be transmitted from the hatchery fish to the effluent. These substances and organisms are a byproduct of hatchery fish rearing and treating the fish to ensure high survival while being grown at very high densities. Most of the streams and rivers within the Oregon Coast Region have reaches that are on the EPA's 303(d) list for impaired waters. Water temperature, fecal coliform, sedimentation, dissolved oxygen are the current 303(d) listings for the Oregon Coast Region, regardless of whether there is a hatchery facility in the basin or not (Table 4). Lack of riparian shade, poor agricultural, and forestry practices are some of the causes for the current 303(d) listings. The hatchery facilities are not identified as a cause for any of the current 303(d) listings within the Oregon Coast Region.

As long as the hatchery facilities continue to operate as evaluated under the alternatives of this FEIS (Chapter 4, Environmental Consequences), the hatcheries will continue to discharge substances, viruses, and bacteria into the effluent of the hatchery facility. However, as evaluated in Subsection 4.3, Effects on Water Quality, the effects are minimal and short-lived because the effluent is diluted as it travels downstream and becomes undetectable a few hundred meters downstream (Bartholomew et al. 2013). The 303(d) list impairments for water quality are expected to continue into the foreseeable future in areas where hatchery facilities are (and are not) present (Figure 2). Future forest management on non-federal lands, land development, and climate change can be expected to further impair water quality on existing

303(d) stream reaches due to increases in water temperature, continued agricultural practices, and logging activities. However, such impairments from these activities would not be increased by hatchery operations under any alternative.

5.5.3. Salmon and Steelhead and Their Habitats

Subsection 3.2, Salmon and Steelhead, describes baseline conditions for salmon and steelhead. These conditions are the result of many years of forest management, climate change, land development, habitat restoration, hatchery production, and fisheries (Lackey et al. 2006). The expected direct and indirect effects of the alternatives on salmon and steelhead are described in Subsection 4.4, Effects on Salmon and Steelhead and Their Habitat.

Future actions are described in Subsection 5.4, Future Actions and Conditions. This subsection describes cumulative effects on salmon and steelhead that may occur as a result of implementing any of the alternatives at the same time as other future actions. This subsection discusses the incremental impacts of the alternatives in addition to past, present, and reasonably foreseeable future actions (i.e., cumulative effects) on salmon and steelhead.

Salmon and steelhead abundance naturally alternates between high and low levels on large temporal and spatial patterns that may last centuries and on more complex ecological scales than can be easily observed (Rogers et al. 2013). Cumulative effects on salmon and steelhead may be greater than the direct and indirect effects of each alternative as analyzed in Subsection 4.4, Effects on Salmon and Steelhead and Their Habitats, under all alternatives. This subsection provides brief overviews of the effects of forest management, climate changes, development, habitat restoration, hatchery production, and fisheries on salmon and steelhead.

Within the Oregon Coast Region, the effects of forest management on salmon and steelhead have been widespread across the landscape. Timber harvest, and associated activities such as road building, has resulted in decreased habitat capacity and productivity of salmon and steelhead (Meehan 1991). Some species of salmon have been more impacted by forest management than other species that spend a minimal time rearing as juvenile fish in freshwater (Meehan 1991). ESA-listed coho salmon have been impacted greatly with the most critical limiting factor/threats being overwinter survival of juvenile coho salmon (NMFS 2014; NMFS 2015). Future projections suggest salmon and steelhead and their habitat

will continue to be impacted by forest management (Spies et al. 2007). However, the magnitude and severity of those impacts varies greatly depending upon land ownership.

Private, industrial timberlands are expected to be harvested in compliance with Oregon Forest Practices Act, which are less protective of riparian and aquatic habitats than would occur from timber harvest on federal lands. The improvements to forest management implemented in the early 1990s will continue to help recover aquatic habitat from the legacy impacts of historical timber harvest (Spies et al. 2007). However, habitat capacity has been reduced significantly in most freshwater areas, and it is unknown to what extent this capacity will be restored with continual anthropogenic impacts still occurring across the landscape.

The outlook for sustaining salmon and steelhead populations over the long-term varies by watershed, with the Rogue and Umpqua watersheds being most vulnerable to human development (Subsection 5.4.2, Land Development). The watersheds, such as Tahkenitch, Siltcoos, Siuslaw, Tenmile, Cummings, Yachats, and Alsea basins, have the greatest federal land base and may be less vulnerable to human development in the future (Figure 25).

The effects of climate change on salmon and steelhead are described in general in ISAB (2007), and would vary among species and among species' life history stages. Effects of climate change may affect virtually every species and life history type of salmon and steelhead in the cumulative effects analysis area (Glick et al. 2007; Mantua et al. 2009). Cumulative effects from climate change, particularly changes in streamflow and water temperatures, would likely impact hatchery-origin and natural-origin salmon and steelhead life stages in various ways as described below and shown in Table 17. Under all alternatives, impacts on salmon and steelhead from climate change are expected to be similar, because climate change would impact fish habitat under each alternative in the same manner.

Previous and new developments (such as residential, commercial, transportation, and energy development); accidental discharges of oil, gas, and other hazardous materials; and the potential for landowner and developer noncompliance with regulations continue to affect aquatic habitat used by salmon and steelhead. Although regulatory changes for increased environmental protection (such as local critical areas ordinances), monitoring, and enforcement have helped reduce impacts of development on salmon and steelhead in freshwaters, development may continue to reduce salmon and steelhead habitat, decrease water quality, and contribute to salmon and steelhead mortality. These developments result in environmental effects such as land conversion, sedimentation, impervious surface water runoff to streams,

changes in stream flow because of increased consumptive uses, shoreline armoring effects, channelization in lower river areas, barriers to fish passage, and other types of environmental changes that would continue to affect hatchery-origin and natural-origin salmon and steelhead (Quinn 2010).

Table 16. Examples of potential impacts of climate change by salmon and steelhead life stage under all alternatives.

Life Stage	Effects
Egg	1) Increased water temperatures and decreased flows during spawning migrations for some species would increase pre-spawning mortality and reduce egg deposition. 2) Increased maintenance metabolism would lead to smaller fry. 3) Lower disease resistance may lead to lower survival. 4) Changed thermal regime during incubation may lead to lower survival. 5) Faster embryonic development would lead to earlier hatching. 6) Increased mortality for some species because of more frequent winter flood flows as snow level rises. 7) Lower flows would decrease access to or availability of spawning
Spring and Summer Rearing	1) Faster yolk utilization may lead to early emergence. 2) Smaller fry are expected to have lower survival rates. 3) Higher maintenance metabolism would lead to greater food demand. 4) Growth rates would be slower if food is limited or if temperature increases exceed optimal levels; growth could be enhanced where food is available, and temperatures do not reach stressful levels. 5) Predation risk would increase if temperatures exceed optimal levels. 6) Lower flows would decrease rearing habitat capacity. 7) Sea level rise would eliminate or diminish the rearing capacity of tidal wetland habitats for rearing salmon, and would reduce the area of estuarine beaches for spawning by forage fishes.

Life Stage	Effects
Overwinter Rearing	1) Smaller size at start of winter is expected to result in lower winter survival. 2) Mortality would increase because of more frequent flood flows as snow level rises. 3) Warmer winter temperatures would lead to higher metabolic demands, which may also contribute to lower winter survival if food is limited, or higher winter survival if growth and size are enhanced. 4) Warmer winters may increase predator activity/hunger, which can also contribute to lower winter survival.

Sources: ISAB (2007), Glick et al. (2007), Beamish et al. (2009), and Beechie et al. (2013).

The primary cause of these continuing development changes is the continued increase in human population in the cumulative effects analysis area (Subsection 5.4.2, Land Development), which also leads to fisheries management challenges associated with overfishing. Development would more likely affect species that reside in lower river areas (such as floodplains and estuaries) most directly because that is where development tends to be concentrated. Effects from development are expected to affect salmon and steelhead similarly under all alternatives because preferred development sites would not change by alternative scenario.

Restoration of habitat in the cumulative effects analysis area will improve salmon and steelhead habitat in general under all alternatives, with particular benefits to freshwater and estuarine environments considered to be important for the survival and reproduction of fish. As a result, habitat restoration would be expected to improve fish survival in local areas. However, habitat restoration alone will not substantially increase survival and abundance of salmon and steelhead. In addition, habitat restoration is dependent on continued state or federal funding, which is difficult to predict . Benefits from habitat restoration are expected to affect salmon and steelhead survival similarly under all alternatives.

The potential benefits of habitat restoration actions within the cumulative effects analysis area are difficult to quantify, but are expected to occur in localized areas where the activities occur. These actions may not fully mitigate for the impacts of climate change and development on fish and wildlife and their associated habitats. However, climate change and development will continue to occur over time and affect aquatic habitat, while habitat restoration (which is dependent on funding and is localized in areas where agencies and stakeholders' habitat restoration actions occur) is less certain under all alternatives.

The effects on natural-origin salmon and steelhead from releases of hatchery fish in the future is expected to be stable or decrease over time for a variety of reasons (Subsection 5.4.4, Hatchery Production). If natural-origin populations of salmon and steelhead recover enough to provide fishery opportunities on healthy runs, many of the existing hatchery programs may be terminated. The mitigation programs in the Rogue River are not likely to be reduced due to the ongoing impacts of Lost Creek and Applegate dams and reservoirs to downstream habitats.

In summary, to the extent aquatic habitat will continue to degrade over time under all alternatives, the abundance and productivity of natural-origin salmon and steelhead populations may continue to be reduced in the future. Hatchery-origin salmon and steelhead may be similarly affected, but likely to lesser extent.

The current impacts from the operation of the hatchery facilities and release of hatchery fish are likely to continue into the future. Since hatchery production is not likely to increase given current constraints with funding and hatchery capacity, hatchery impacts will remain constant into the future. However, if natural-origin salmon and steelhead populations continue to decrease from other factors, then hatchery impacts could increase (e.g., higher pHOS from having fewer natural-origin fish spawning in the wild).

Impacts from commercial and recreational fisheries in freshwater and in the ocean that catch hatchery fish produced from Oregon Coast hatcheries will likely remain similar to current levels into the future. The fisheries management structure is based upon the status of natural-origin salmon and steelhead, and not on the abundance of hatchery fish. Therefore, fisheries will continue to be restricted if natural-origin fish abundance decreases, and liberalized in years when abundance increases. The harvest of available hatchery fish will be within the limits established for natural-origin salmon and steelhead, and thus not likely change substantially in the future.

Although none of the alternatives would affect the overall trend in cumulative effects on salmon and steelhead, Alternative 3 and Alternative 4 could help mitigate some of the negative genetic and ecological effects on natural-origin steelhead and salmon associated with hatchery programs. That is, because under Alternative 3 hatchery programs would be terminated, and under Alternative 4 hatchery production would be reduced. However, since the existing hatchery programs overall result in low impacts on the affected species populations, reducing or eliminating these hatchery programs would not substantially affect the adverse risks facing these populations in the future due to other factors (forest management, land

development, climate change, fisheries). Substantial improvements to the status of natural-origin salmon and steelhead within the Oregon Coast Region is not likely if the current hatchery programs were reduced and/or eliminated. The status of natural-origin populations with and without the presence of hatchery programs is similar within the Oregon Coast Region. All populations have been reduced substantially from historical abundance levels.

5.5.4. Other Fish Species and Their Habitats

Subsection 3.5, Other Fish and Their Habitat, describes the baseline conditions of fish species other than salmon and steelhead. These conditions are the result of many years of forest management, climate change, land development, habitat restoration, hatchery production, and fisheries. The direct and indirect effects of the alternatives on other fish species are described in Subsection 4.5, Effects on Other Fish and Their Habitat.

Future actions in the overall cumulative effects analysis area are described in Subsection 5.4, Future Actions and Conditions. This subsection considers effects that may occur as a result of the alternatives being implemented at the same time as other anticipated future actions. This subsection discusses the incremental impacts of the alternatives in addition to past, present, and reasonably foreseeable future actions (i.e., cumulative effects) on fish species other than salmon and steelhead.

Other fish species that have a relationship to salmon and steelhead include rainbow trout, coastal cutthroat trout, sturgeon, lamprey, forage fish, groundfish, and other resident freshwater fish (Subsection 3.5, Other Fish and Their Habitats). Similar to salmon and steelhead species, these fish species require and use a diversity of habitats. However, similar to effects described above for salmon and steelhead, these other fish species may also be affected by climate change and development because of the overall potential for loss or degradation of aquatic habitat or the inability to adapt to warmer water temperatures. In addition, climate change and development may attract non-native aquatic plants that may, over time, out-compete native aquatic plants that provide important habitat to native fish (Patrick et al. 2012).

As discussed in Subsection 5.4.3, Habitat Restoration, the extent to which habitat restoration actions may mitigate impacts from climate change and development is difficult to predict. These actions may not fully mitigate for the effects of climate change and development.

As discussed in Subsection 5.4.4, Hatchery Production, changes in hatchery programs over time may affect other fish species that have a relationship to salmon and steelhead. For example, reductions in hatchery production or terminations of hatchery programs may decrease the prey base available for other fish species (like cutthroat trout) that use salmon and steelhead as a food source.

In summary, cumulative effects from forest management, climate change, development, habitat restoration, and hatchery production on other fish species would likely result in a decrease in the abundance of those fish species in the analysis area. Cumulative effects on fish species that compete, prey on, or are prey items for salmon and steelhead may be greater than the direct and indirect effects described under Subsection 4.5, Other Fish and Their Habitats. None of the alternatives would affect the overall trend in cumulative effects on other fish species because the range of production levels under the alternatives would be a small fraction of the total salmon and steelhead in the analysis area that these other fish species could compete with, prey on, or be prey items for.

5.5.5. **Wildlife**

Subsection 3.6, Wildlife, describes the baseline conditions for wildlife. These conditions represent the effects of many years of forest management, climate change, development, habitat restoration, and hatchery production. The expected direct and indirect effects of the alternatives on wildlife are described in Subsection 4.6, Effects on Wildlife.

Future actions are described in Subsection 5.4, Future Actions and Conditions. This subsection considers potential effects that may occur as a result of implementing any one of the alternatives at the same time as other anticipated actions. This subsection discusses the incremental impacts of the alternatives in addition to past, present, and reasonably foreseeable future actions (i.e., cumulative effects) on wildlife.

The cumulative effects on wildlife from the alternatives varies depending upon the specific alternative. Alternative1 and Alternative 2 are expected to provide benefits to nearly all wildlife species because hatchery fish are an important prey item for wildlife. These benefits would help offset some of the impacts expected in the future due to forest management and land development and the resultant loss in natural production of salmonids. Alternative 3 and Alternative 4, which would reduce hatchery production and the number of fish released, would result in negligible, negative impacts on wildlife species from the loss of salmon and steelhead as a potential food source. When combined with future

forest management and land development, Alternative 3 and Alternative 4 would have the greatest negative effects on wildlife.

5.5.6. Socioeconomics

Subsection 3.7, Socioeconomics, describes the baseline conditions for socioeconomics. These conditions represent the effects of many years of forest management, climate change, development, habitat restoration, and hatchery production. The expected direct and indirect effects of the alternatives on socioeconomics are described in Subsection 4.7, Effects on Socioeconomics.

Future actions are described in Subsection 5.4, Future Actions and Conditions. This subsection considers potential effects that may occur as a result of implementing any one of the alternatives at the same time as other anticipated actions. This subsection discusses the incremental impacts of the alternatives in addition to past, present, and reasonably foreseeable future actions (i.e., cumulative effects) on socioeconomic resources.

Although unquantifiable, climate change and development actions, and changes in hatchery production and fisheries may reduce the number of salmon and steelhead available for harvest over time as described in Subsection 5.5.3, Salmon and Steelhead and Their Habitats. This, in turn, may reduce angler expenditure and economic revenue relative to conditions considered in Subsection 4.7, Effects on Socioeconomics. Likewise, it may reduce the number of steelhead available to the public as a food source and may increase reliance on other consumer goods or increase travel costs to participate in other fisheries.

The potential benefits of habitat restoration actions within the cumulative effects analysis area are difficult to quantify. These actions may not fully mitigate for the impacts of climate change and development.

As discussed in Subsection 5.4.4, Hatchery Production, and Subsection 5.4.5, Fisheries, changes in hatchery programs and fisheries may occur over time. Changes in hatchery programs may affect the socioeconomic effects from hatchery production of salmon and steelhead. For example, reductions in hatchery production or terminations of hatchery programs may decrease the number of fish available for harvest, decrease associated angler expenditures and revenues generated from fishing, and reduce the number of steelhead available to the general public.

In summary, it is likely that cumulative effects from forest management, climate change, development, and hatchery production would decrease the number of fish available for harvest and reduce angler expenditure and economic revenue relative to conditions considered in Subsection 4.7, Socioeconomics. However, none of the alternatives would affect the overall trend in cumulative effects on socioeconomics because the range of production levels under the alternatives would result in a small fraction of the total harvestable salmon and steelhead in the analysis area, and, therefore, would provide a small fraction of the overall economic benefits derived from salmon and steelhead harvest in the analysis area

5.5.7. **Environmental Justice**

Subsection 3.8, Environmental Justice, describes environmental justice communities and counties of concern in the analysis area. Environmental justice user groups and communities of concern within the cumulative effects analysis area include people that fish for salmon and steelhead and low income or minority communities. The expected direct and indirect effects of the alternatives on environmental justice are described in Subsection 4.8, Effects on Environmental Justice.

Future actions are described in Subsection 5.4, Future Actions and Conditions. This subsection considers potential effects that may occur as a result of implementing any one of the alternatives at the same time as other anticipated actions. This subsection discusses the incremental impacts of the alternatives in addition to past, present, and reasonably foreseeable future actions (i.e., cumulative effects) on environmental justice user groups and communities of concern.

Forest management, climate change and development actions, and changes in hatchery production and fisheries may reduce the number of salmon and steelhead available for harvest over time as described in Subsection 5.5.3, Salmon and Steelhead and Their Habitats. This, in turn, may reduce fishing opportunity in the analysis area relative to conditions considered in Subsection 4.8, Effects on Environmental Justice.

The potential benefits of habitat restoration actions within the cumulative effects analysis area are difficult to quantify. These actions may not fully mitigate for the impacts of climate change and development on the abundance of fish that would be available for commercial or recreational harvest.

As discussed in Subsection 5.4.3, Hatchery Production, and Subsection 5.4.4, Fisheries, changes in hatchery programs and fisheries may occur over time. Changes in hatchery programs may affect the number of salmon and steelhead available for harvest by environmental justice communities.

In summary, it is likely that cumulative effects from climate change, development, and hatchery production would decrease the number of fish available for harvest relative to conditions considered in Subsection 4.8, Effects on Environmental Justice. However, none of the alternatives would affect the overall trend in cumulative effects on environmental justice because the range of production levels under the alternatives would result in a small fraction of the total harvestable salmon and steelhead in the analysis area available to environmental justice communities.

5.6. Summary of Effects

Table 17 summarizes the combined effects of past, present, and reasonably foreseeable actions, other than the Proposed Action and alternatives (summarized above), affecting the environmental resources reviewed in this FEIS, affected by forest management, climate change, human development, habitat restoration, hatchery production, and fisheries.

Table 18 summarizes the conclusions made above on the impacts of past, present, and reasonably foreseeable actions when combined with the impacts of the Proposed Action. Definitions for effects terms are the same as described in Subsection 3, Affected Environment, and Subsection 4, Environmental Consequences. The relative magnitude and direction 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, and could be either positive or negative.
Low:	The impact would be slight, but detectable, and could be either positive or negative.
Moderate:	The impact would be readily apparent, and could be either positive or negative.
High:	The impact would be greatly positive or severely negative.

Table 17. Summary of effects of past, present, and reasonably foreseeable future actions on the affected resources evaluated in this FEIS.

Affected Resource	Past Actions	Present Actions	Reasonable Foreseeable Future Actions	Past, Present, and Reasonably Foreseeable Future Actions
Water Quantity	Negligible to low negative due to water withdrawals from human development	Negligible to low negative	Low negative	Low negative
Water Quality	Moderate	Moderate	Moderate	Moderate
Salmon and Steelhead and Their Habitat	Moderate to high negative due to human development, past fishery, hatcheries, and habitat management practices	Mixed (negligible to moderate negative, to low positive) due to ESA compliance and improved fishery, hatcheries, habitat management practices, and habitat restoration, depending on population	Mixed (moderate negative to low positive), depending on population	Mixed (moderate negative to low positive), depending on population
Other Fish and Their Habitats	Mixed (negligible to low negative, to negligible positive) depending on species, due to human development, past fishery, hatcheries,	Mixed (negligible negative to negligible positive) depending on species	Negligible to low negative depending on species	Negligible to low negative depending on species

Affected Resource	Past Actions	Present Actions	Reasonable Foreseeable Future Actions	Past, Present, and Reasonably Foreseeable Future Actions
	and habitat management practices			
Wildlife	Mixed (negligible to low negative, to low positive) due to habitat degradation and hatchery-origin salmon and steelhead as a food source	Low positive	Negligible to low positive	Low positive
Socioeconomics	Moderate positive from benefits to recreational fisheries and tribal fisheries, although some have been reduced in recent years as numbers of fish available to harvest have declined	Low positive due to declines in harvest opportunities	Low positive	Low positive
Environmental Justice	Low to moderate negative due to reductions in fish available for use by communities of concern and populations of concern such as treaty Indian tribes	Low negative to low positive	Negligible negative	Low negative

Table 18. Summary of the cumulative effects of Alternative 2, Proposed Action/Preferred Alternative.

Affected Resource	Baseline	Past, Present, and Reasonably Foreseeable Future Actions	Proposed Action	Cumulative Effects of the Proposed Action
Water Quantity	Mixed (negligible negative to negligible positive)	Low negative	Negligible negative	None
Water Quality	Moderate	Moderate	Moderate	Moderate
Salmon and Steelhead and Their Habitat	Mixed (negligible to moderate negative, to low positive) due to ESA compliance and improved fishery, hatchery, habitat management practices, and habitat restoration, depending on population	Mixed (moderate negative to low positive), depending on population	Negligible negative	None
Other Fish and Their Habitats	Mixed (negligible negative to negligible positive) depending on species	Negligible to low negative depending on species	Mixed (negligible negative to negligible positive) depending on species	None
Wildlife	Low negative	Low positive	Negligible positive	None

Affected Resource	Baseline	Past, Present, and Reasonably Foreseeable Future Actions	Proposed Action	Cumulative Effects of the Proposed Action
Socioeconomics	Moderate positive	Low positive	Moderate positive	None
Environmental Justice	Low negative to low positive	Low negative	Negligible positive	None

6. LIST OF PERSONS AND AGENCIES CONTACTED AND CONSULTED

The following were consulted during the development and assessment described herein:

- Oregon Department of Fish and Wildlife
- Coquille Indian Tribe
- U.S. Fish and Wildlife Service
- Environmental Protection Agency

The following were contacted during the planning stages of the EIS but did not participate directly in the assessment described herein:

- The Confederated Tribes of Coos, Lower Umpqua, and Siuslaw Indians
- The Confederated Tribes of Grand Ronde
- Cow Creek Band of Umpqua Tribe of Indians
- Confederated Tribes of Siletz Indians

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8. DISTRIBUTION LIST

State Agencies

Oregon Department of Environmental Quality

Oregon Department of Fish and Wildlife

Federal Agencies

Army Corps of Engineers

Bureau of Land Management

Environmental Protection Agency

Forest Service

Oregon Coast Native American Tribes

The Confederated Tribes of Coos, Lower Umpqua, and Siuslaw Indians

The Confederated Tribes of Grand Ronde

Confederated Tribes of Siletz Indians

Coquille Indian Tribe

Cow Creek Band of Umpqua Tribe of Indians

Organizations and Associations

Coastal Conservation Association

Kalamiopsis Wilderness

Native Fish Society

Northwest Sportfishing Industry Association

Trout Unlimited

Individuals

(An extensive distribution list of individuals were notified by email that contained an electronic link to the EIS.)

9. LIST OF PREPARERS

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APPENDIX A

Table 1. List of the 10 hatchery facilities and associated hatchery programs and management plans (HGMPs).

Hatchery Facility (primary)	Hatchery Program	HGMP Reference[1]
Cole Rivers Hatchery	Rogue River Spring Chinook	ODFW 2016
	Rogue River Summer Steelhead	ODFW 2016
	Rogue/Applegate River Winter Steelhead	ODFW 2016
Indian Hatchery	Indian Creek STEP Fall Chinook	ODFW 2016
Elk Hatchery	Elk River Fall Chinook	ODFW 2016
	Chetco River Fall Chinook	ODFW 2016
	Chetco River Winter Steelhead	ODFW 2016
Bandon Hatchery	Coquille River Winter Steelhead	ODFW 2016
	Coquille River Fall Chinook	ODFW 2016
	Coos River Fall Chinook	ODFW 2016
	Coos River Winter Steelhead	ODFW 2016
	Tenmile Lakes Winter Steelhead	ODFW 2016
	Tenmile Lakes Rainbow Trout	ODFW 2016
Rock Hatchery	North Umpqua River Spring Chinook	ODFW 2016
	North Umpqua River Summer Steelhead	ODFW 2016
	Calapooya Creek Fall Chinook	ODFW 2016
	Lower Umpqua River Fall Chinook	ODFW 2016
	Umpqua River Coho[3]	ODFW 2016
	South Umpqua River Winter Steelhead	ODFW 2016
	Munsel Creek Coho (STEP)	ODFW 2016
Willamette[2]	Siuslaw River Winter Steelhead	ODFW 2016
Alsea Hatchery	Alsea Hatchery/Lakes Rainbow Trout	ODFW 2016
	Alsea River Winter Steelhead	ODFW 2016
	Yaquina Bay Fall Chinook	ODFW 2016
	Siletz River Winter Steelhead	ODFW 2016
Salmon Hatchery	Siletz River Summer Steelhead	ODFW 2016
	Salmon River Fall Chinook	ODFW 2016
Cedar Hatchery	Nestucca River Summer Steelhead	ODFW 2016
	Nestucca River Spring Chinook	ODFW 2016
	Little Nestucca River Spring Chinook	ODFW 2016

	Nestucca River STEP Fall Chinook	ODFW 2016
	Nestucca River Winter Steelhead	ODFW 2016
Trask Hatchery	Wilson River Winter Steelhead	ODFW 2016
	Trask River Coho	ODFW 2016
	Trask River Fall Chinook	ODFW 2016
	Trask River Spring Chinook	ODFW 2016
	Wilson River Winter Steelhead	ODFW 2016
	Trask River Spring Chinook (Whiskey Creek STEP)	ODFW 2016
Nehalem Hatchery	North Fork Nehalem Coho	ODFW 2016
	Nehalem River Winter Steelhead (inc Necanicum)	ODFW 2016
	Yaquina Bay Spring Chinook	ODFW 2016
	Coos Bay Spring Chinook	ODFW 2016
Oregon Hatchery Research Center	Specific research projects. Varies depending upon project and funding.	ODFW 2012

[1]HGMPs are available online at: http://www.dfw.state.or.us/fish/HGMP/final.asp (accessed August 5, 2016).

[2] Willamette Hatchery is located in the Willamette Basin and not within the project area, and is used for other programs much larger than those considered here. The effects of this hatchery facility will be assessed by NMFS with other HGMPs from the Willamette Basin.

3 The Umpqua hatchery coho program is only the program where hatchery fish are part of an ESA-listed ESU. All of the other programs rear non-listed fish.

Table 2. Release timing and size at release of hatchery fish from the hatchery programs along the Oregon Coast.

Hatchery Program	Time of Release of Hatchery Fish	Hatchery Fish Size at Release (fish per pound)
Rogue River Spring Chinook	mid-Aug to mid-Oct	6.5-13
Rogue River Summer Steelhead	late April	4.5
Rogue/Applegate River Winter Steelhead	April	4
Indian Creek STEP Fall Chinook	Feb-Aug	900, 26, 10
Elk River Fall Chinook	Sept-Nov	12
Chetco River Fall Chinook	mid-Oct	12
Chetco River Winter Steelhead	late Mar-early April	6
Coquille River Winter Steelhead	late April	5.5
Coquille River Fall Chinook	May, Aug-Sept	75, 13
Coos River Fall Chinook	May	75
Coos River Winter Steelhead	late March to April	5.5
Tenmile Lakes Winter Steelhead	mid-April	6.7
Tenmile Lakes Rainbow Trout	spring/summer	> 2
North Umpqua River Spring Chinook	Oct, Feb	6-8
North Umpqua River Summer Steelhead	early March, mid April	5-6
Calapooya Creek Fall Chinook	May-June	100
Lower Umpqua River Fall Chinook	October	10
Umpqua River Coho[3]	April, June	10
South Umpqua River Winter Steelhead	Feb, April	5-6

Hatchery Program	Time of Release of Hatchery Fish	Hatchery Fish Size at Release (fish per pound)
Siuslaw River Winter Steelhead	mid-April	6
Alsea Hatchery/Lakes Rainbow Trout	spring/summer	> 2
Alsea River Winter Steelhead	April	6
Yaquina Bay Fall Chinook	mid-Sept	14
Siletz River Winter Steelhead	April	6
Siletz River Summer Steelhead	early April	6
Salmon River Fall Chinook	late Aug-early Sept	14
Nestucca River Summer Steelhead	early April	6
Nestucca River Spring Chinook	late July	12
Nestucca River STEP Fall Chinook	mid September	10
Nestucca River Winter Steelhead	April	6-7
Wilson and Kilchis River Winter Steelhead	early April	6
Trask River Coho	mid April	15
Trask River Fall Chinook	late August	19
Trask River Spring Chinook	late July	12
Wilson River Winter Steelhead	early April	6
Trask/Wilson River Spring Chinook (Whiskey Creek STEP)	late July	12
North Fork Nehalem Coho	early April	15
Nehalem River Winter Steelhead (inc Necanicum)	early April	6

Hatchery Program	Time of Release of Hatchery Fish	Hatchery Fish Size at Release (fish per pound)
Oregon Hatchery Research Center. Only specific research projects. Not a production facility. Research varies depending upon project and funding.	Depends upon research project	Depends upon research project

APPENDIX B

Responses to Comments on the Draft EIS

The draft Environmental Impact Statement (EIS) was published for public review and comment in August 2016 (81 FR 58924, August 26, 2016). The draft EIS was available for public review and comment for 60 days. Twelve public comment letters were received. These comments were used to inform, shape, and improve this final EIS.

In the following pages, each comment letter is provided with color highlights of each comment NMFS provided responses for. After each letter are NMFS' responses to the public comments.

NATIVE FISH SOCIETY

Advancing the Recovery of Native, Wild Fish in Their Homewaters

November 2, 2016

Mr. Lance Kruzic,
Sustainable Fisheries Program, NOAA Fisheries
NMFS, Oregon Coast Hatchery DEIS
2900 NW Stewart Parkway
Roseburg, Oregon 97471
Email: OregonCoastHatcheryEIS. wcr@noaa.gov

RE: Comments on the Oregon Coast Hatchery DEIS

The Native Fish Society appreciates the opportunity to review the Oregon Coast Hatchery DEIS and provide comments in the interest of improving conservation management of wild, native salmonids and continued recovery of ESA protected coho salmon exposed to ODFW operated hatchery programs. The DEIS is both long and complex, making review and comments difficult, so we appreciate having the comment period extended by several weeks. #1

REVIEW COASTAL HATCHERY DEIS 2016

Purpose of the Oregon Costal Hatchery Program and HGMPs

The DEIS on Hatchery Genetic Management Plans (HGMPs) is a standalone proposal unrelated to genetic and ecological impacts hatcheries have on wild salmonids outside the hatchery fence. HGMPs are treated in isolation from harvest impacts on wild salmonids and associated fisheries on spawner escapement and return of marine derived nutrients to watersheds from carcasses of naturally spawning wild salmon. Smith (2000) in the NMFS template for HGMPs states: "When "take" of a listed species is expected in the hatchery operation, (emphasis added) the ESA requires that a numerical estimate be quantified as best as possible." The HGMP template is confined to hatchery operations and to impacts on listed species. Impacts outside the operation of the hatchery are not included in the HGMP and on the Oregon coast the only protected species is coho salmon. So it is unclear how the proposed HGMPs in the preferred alternative will address impacts on non-listed wild salmonid species and listed coho outside the hatchery in Nature. #2

At the time the HGMP template was developed coho salmon on the Oregon coast were not listed but Smith (2000) states: "*Hatchery programs located outside of the Columbia Basin that are **not** involved in the artificial propagation or research of ESA-listed salmonid populations therefore do not have to complete Sections 8 ("Mating"), 9 ("Incubation and Rearing") and 12 ("Research") of the HGMP template* [although managers are encouraged to do so]." Therefore the HGMPs are not required to address non-listed species. Because there is no requirement for ODFW and NMFS to follow HGMP protocol for steelhead, chum, and chinook, there is no assurance that HGMPs will be binding for other species in the DEIS proposed alternative. #3

Even for coho salmon Smith (2000) says: "NMFS will evaluate each HGMP for ESA…that are designed to **minimize take and promote conservation** of the listed species that may be affected by the hatchery program. The completed HGMP must therefore indicate anticipated take levels, and **specific management measures that minimize take of listed species and protect listed ESUs**." (emphasis added)

Smith (2000) also notes that "G) Under the broad definition of ESA, "take" of listed species will include hatchery activities that lead to harassment, behavioral modification, capture, handling, tagging, bio-sampling, rearing, release, competition, predation, disease transfer, adverse genetic effects, injury, or mortality of listed fish. When "take" of a listed species is expected in the hatchery operation, the ESA requires that a numerical estimate be quantified as best as possible."

Unless "minimize take" means zero NMFS and ODFW will have to explain what minimize means in measurable terms and the monitoring program that will be used to verify it. But would this be required for take of all species not just listed coho salmon?

The track record for HGMPs for Sandy and McKenzie rivers represents that both NMFS and ODFW disregarded the impact of their hatchery programs on wild salmonids. They were sued by third parties for negligence and the court agreed, modifying releases of hatchery fish. #4

In the DEIS, NMFS says "All of the hatchery programs are managed solely for fishery harvest opportunity." (Page 3-14) The NMFS and ODFW are committed to increase hatchery product for commercial fisheries and in doing so increase the risk to wild salmonids in coastal rivers including coho salmon. #5

NMFS also confirms a hatchery bias when it states as a fact that "…hatcheries can be managed in a manner that conserves and recovers salmon and steelhead listed under the ESA." (NMFS 2000). This conclusion by NMFS ignores the weight of peer reviewed scientific studies that document hatchery salmonids have lower survival, are less diverse, and have lower reproductive success, than wild salmonids and cause genetic and ecological impacts when hatchery fish spawn naturally in rivers. #6

Review of hatchery programs by the HSRG states: "Hatcheries are by their very nature a compromise—a balancing of benefits and risks to the target population, other populations, and the natural and human environment they affect" (Paquet et al. 2011). It is obvious that NMFS and ODFW do not agree given their operation of hatcheries in the Columbia and Willamette rivers that failed federal court review. There is now another third party lawsuit on a collection of lower Columbia River hatcheries regarding excessive releases of hatchery chinook and the straying problem they create. At each turn, when the federal court reviews HGMPs the NMFS and ODFW fail to be in compliance with recommendations by the HSRG and criteria proposed by NMFS in Smith (2000).

Paquet et al (2011) also cautioned the NMFS and ODFW among other fishery agencies to pay attention to the latest scientific review of hatcheries: "Hatchery strays on the spawning grounds pose a risk. For conservation programs the demographic benefits of hatchery fish on the spawning grounds must outweigh the risks. HSRG conservation solutions that shift spawning dynamics from conditions of high hatchery influence to conditions of low hatchery influence are designed to provide the greatest benefits for wild stocks." When NFS sued ODFW and NMFS on a seventy percent stray rate for hatchery chinook in Sandy River it was opposed until the federal court agreed that the government was not in compliance with the HGMP and cut the releases of hatchery fish.

"The fitness assumptions (Paquet et al. 2011) used in AHA result in a 50% loss of natural productivity when the contribution of hatchery fish is high (pHOS > 10%) for several generations. On the other hand, when the hatchery contribution is low (e.g., pHOS < 5%) over several generations, the natural productivity approaches that of a locally adapted natural population." By following this scientific direction the HSRG (Paquet 2011) admits that hatchery fish impact the fitness of natural populations even at recommended low stray rates.

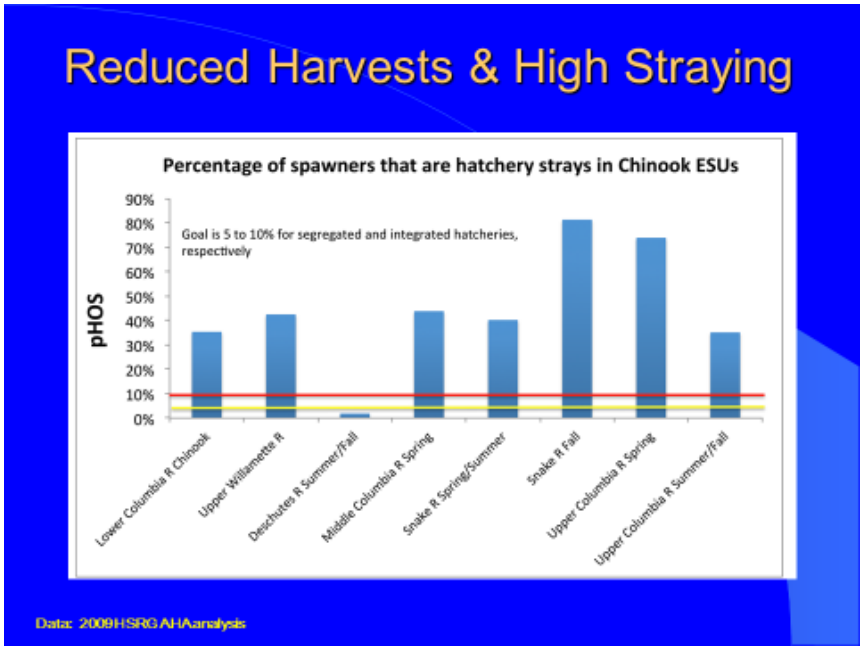
The ISAB (2016) recommends "additional empirical assessments are needed to verify their adequacy for protecting the fitness of natural populations." In their Critical Uncertainty report to the Power Planning and Conservation Council there is uncertainty "about the genetic or epigenetic changes that occur in cultured populations, and the impacts of such changes on the fitness of natural populations."

Hatcheries are a "compromise " that affects the reproductive success of wild salmonids even when stray rates are less than 5%, causing genetic and ecological impacts on wild salmonid populations exposed to hatchery strays, competition, and predator attraction.

Most wild native salmonid populations have declined to less than 5% or their historic abundance. The impact of hatchery strays on vulnerable small wild populations can be even more compromising than the HSRG recommendations point out.

A panel of scientists convened by NMFS concluded that they "found no genetic justification for allowing gene flow from non-native fish (hatchery strays) at levels as high as 5%" (Grant 1997)

"Genetic risks increase substantially when the proportion of the adult population that is hatchery fish increases over 5% "(Lynch and O'Hely 2001; Ford 2002)."



2013 ISAB presentation to the Power Council on their review of the 2009 FWP

The Columbia River is the grand experiment on using hatcheries to support fisheries and recover 109 wild salmonid populations at risk of extinction. As indicated the graphic the failure of state and federal fishery agencies to comply with 5-10 percent limit on pHOS or stray hatchery fish. The only watershed in compliance is one that has no associated hatchery program. The Columbia River salmon management and recovery program is a failure, but we know that because of the funding available to evaluate the impact of hatchery programs on watersheds and populations. On the Oregon coastal watersheds the funding and independent scientific evaluation is not available, leaving the state and federal fishery management agencies free of accountability for their policy and criteria to protect wild salmonids. For example in the ODFW final Multi-Species Management Plan (CMP 2014) efforts to assess impacts "if feasible" and monitoring will "seek to address stray rates" (page 204) suggests that the NMFS DEIS preferred alternative lacks assurance that pHOS criteria will actually be applied.

Even though hatcheries are considered a "compromise" (Paquet et al. 2011) and scientific evaluation clearly documents genetic and ecological changes in hatchery fish making them vectors in the effort to recover wild salmonids (Araki et al. 2008; Araki et al. 2009; Araki and Schmid 2010; Christie 2016, Chilcote 2013) the fishery agencies are immune to peer reviewed science. They continue to ignore it in their focus on producing hatchery fish for harvest and using inadequate mitigation measures. A recent review of the fish and wildlife program by the ISAB\ISRP (2016) recommended fishery management "focus on sustainability with strategies to protect diversity and resilience, and to build adaptability."

It is not clear that the NMFS Science Center and the Protected Species Program are involved with Sustainable Fisheries Program in establishing criteria to protect listed coho and non-listed species on Oregon coastal streams and HGMPs. The result is hatcheries and associated fisheries do not have comprehensive internal review that would help to refocus management suggested by the ISAB\ISRP (2016). As it now stands the Columbia River salmon recovery program for wild salmonids is compromised by harvest and hatchery policy actions. Therefore it is unreasonable to expect correction of this problem by adopting the proposed alternative in the NMFS DEIS for Oregon coastal coho and other wild salmonids. #7

The DEIS describes numerous negative impacts of artificial propagation on wild, native salmonids. Salmonids are a public resource and are to be managed for the public interest by state and federal government agencies. Negative impacts of hatcheries primarily result from serving the economic interests of commercial and sport fisheries at the expense of and risk to wild salmonid productivity, diversity, distribution, and abundance. This is a historical problem associated with salmonid management of over 100 years. The DEIS does not discuss this historic issue or propose changes in institutional organization to establish an effective conservation program to protect wild salmonids and listed coho salmon. The DEIS has assumed that the status quo is the objective of fishery management and that hatcheries and associated fisheries are to continue along the historic path. Changes in hatchery management through HGMPs are unproven as an effective conservation measure yet are assumed to contribute to a trend toward conservation. #8

Since hatcheries and associated fisheries represent a known risk to wild native salmonids the logical outcome of the DEIS for threatened coho salmon and for wild steelhead, chinook, chum and cutthroat is continued depletion and extinction in the Oregon coastal rivers. The public interest will not be served even though the public has periodically taken legal action though initiative petitions and the courts to change the institutional management of salmonids.

The only alternative that would improve conservation is to manage salmonids on a river specific basis by species and race. This includes a spawner abundance objective for salmonids in each watershed, regulation of fisheries to achieve that escapement objective, and manage hatcheries to not interfere using measurable conservation criteria applied to each watershed salmonid population.

The preferred alternative in the DEIS would only continue the aggregated management of salmon as if locally adapted breeding populations by watershed were not important. This institutional impediment to conservation means increased risk to wild salmonids is the only logical outcome.

Habitats that sustain the freshwater and estuary productivity of wild salmonids have not been adequately addressed by state and federal land and water managers. Rather than promote habitat protection the fishery managers use habitat issues to justify hatchery production and argue for more hatchery funding to support fisheries and in doing so to grow agency budgets. Fishery agencies have also opposed protection and conservation of wild salmonids. The fight to list coho salmon as a federal protected species is a good example of that resistance by fishery institutions and state and federal government to maintain the status quo, using public funded hatchery programs to replace natural production of wild salmonids in Oregon coastal watersheds. #9

Knudsen (2000) asked an important question. "What would production be like if escapements were of historic magnitude, i.e., about ten or more times greater than today's? Since it is unlikely that freshwater habitat quality has been reduced 90% coastwide, as escapements have, ideal contemporary escapement goals probably lie somewhere between those observed today and ten times as much." #10

SPECIFIC REVIEW OF THE DEIS-NEPA

Evaluation of Alternatives

The alternatives provided are not adequate to evaluate the effect of the hatchery HGMPs on threatened coho and other species. For example, alternatives 1 (No Action) proposes to adopt the HGMPs proposed by ODFW without evaluation regarding their impact on listed and non-listed salmonids. This would allow ODFW to continue operating hatcheries as they have been without any evaluation. Alternative 2 (Preferred) is equal in all respects to alternative 1 because it would allow HGMPs to function as they have been by ODFW. In other words these two alternatives (1) and (2) are the same and lack NMFS evaluation for impacts on the environment. In the DEIS the NMFS has abdicated its responsibility to approve, modify or deny the HGMPs and show evidence that this responsibility has been carried out based on scientific evidence. Consequently the public is provided no information to compare and therefore respond to these two alternatives since they are the same in their effect on the environment. #11

Alternative 3 (stopping all hatchery releases) is not recommended by NMFS because it would harm commercial and recreational fisheries. Since the HGMPs and associated hatcheries are the primary concern of ODFW and the exclusive concern of the Sustainable Fisheries Program of NMFS administrative organization, it is logical that the primary concern would be fisheries rather than species protection. A balanced evaluation that would also include the Protected (Species) Resources Program of NMFS organization and science center review is needed to evaluate the effect on ESA threatened coho salmon and other natural salmonid populations by closing some or all hatcheries. It is through a comprehensive evaluation by NMFS involving both sustainable fisheries, science, and species protection programs that an adequate assessment of alternative 3 is possible. Alternative 3 reveals the bias of NMFS (2000) to perpetuate the status quo management of salmonids on the Oregon coast to provide product for the market economy rather than balancing that with species protection. "NMFS believes hatcheries can be managed in a manner that conserves and recovers salmon and steelhead listed under the ESA" (NMFS 2000). This belief is not supported by the best available science (Chilcote et al 2013; Araki 2009; Araki et al. 2008; Araki and Schmidt 2010; Buhle 2009; Kostow et al. 2003; #12

McLean et al. 2004; Naish et al 2008; Nickelson 2003; Oosterhout et al 2005; Reisenbitcher and McIntyre 1977; Reisenbichler and Rubin 1999; Seamons 2012; Scheuerell et al 2015;Theriault 2011; Utter 1998. Christie et al. 2014, 2016).

Consequently, alternative 3 fails to evaluate the benefits of closing hatcheries for both fisheries and conservation. Alternative 3 is cast in an unfavorable light by the DEIS because it would damage commercial interests, thus perpetuating the 150 year record of management for salmonids that has caused severe decline in abundance and increased risk to wild salmonids in the Northwest.

Alternative 4 (Reduce hatchery production by 50%) is not permitted but can be evaluated by NMFS. In other words, NMFS is constrained by its own rules to make adjustments in hatchery program releases to protect threatened species and other salmonids under 4(d) regulations. Consequently, this alternative is not actually real and cannot be selected due to NMFS lack of authority and its primary concern about impacts to industrial fisheries (commercial and sport). #13

Based on our review of alternatives 1-4 we conclude that the draft EIS is substantially flawed and cannot meet the requirements of the National Environmental Policy Act.

Issues that are not adequately addressed by HGMPs in the NEPA DEIS

In reviewing the HGMPs where the focus is on hatchery operations to reduce or eliminate take under rules of the ESA, it is unclear how take related to hatchery fish impacts on the environment once they are released from the hatchery. It is my understanding that the HGMPs must also address impacts related to fish once released. #14

On the Oregon coast hatcheries and HGMPs are managed to supply fish for harvest. Hatcheries and harvest are two sides of the same coin, but the hatchery fish once released from the captive environment into natural streams and related harvest have an impact on listed, candidate and non-listed species. These impacts relate to ecological and genetic impacts, nutrient enrichment of streams by naturally spawning salmonids, stray rates, residual hatchery fish that do not migrate, and habitat management.

Therefore I would like to know exactly how the HGMPs are to effectively protect candidate, listed and non- listed salmonids following release from hatcheries. This is not adequately addressed in the EIS DEIS document. I address each of those problems below.

pHOS

(Page 4-24) As long as pHOS continues to be low (<10 percent) population wide, it is expected there will be reduced productivity from naturally-spawning hatchery fish interbreeding with natural-origin coho salmon. However, there are 26 other independent populations where no hatchery coho salmon programs exist. In total, only four out of a total of 69 independent and dependent coho populations would be affected genetically by the hatchery coho salmon programs released into these populations. #15

Comment:
NMFS and ODFW rely on the unevaluated theory of pHOS. The ISAB said, “This is an interim standard that should be reviewed and updated as better information becomes available. How the HSRG management

guidelines, or variations of them, affect the reproductive fitness of natural populations has not been assessed." (ISAB\ISRP 2016)

There is no substantiated evidence that 10% pHOS or less actually protects ESA threatened Oregon Coastal Coho Salmon and other wild salmonids from genetic and ecological impacts from hatchery programs. Therefore, it is scientifically inappropriate to rely on any pHOS level as protective of threatened species and other wild naturally reproducing species such as steelhead, chinook, chum and cutthroat trout.

Furthermore, NMFS and ODFW assume, inappropriately, that the biological effects of hatchery releases are confined to the watershed in which they are released. Therefore not all hatchery strays are evaluated in the DEIS. There are intentional strays when fish are transferred among watersheds and unintentional strays that do not return to the hatchery and spawn in the release stream or adjacent streams. All naturally spawning stray hatchery fish can have genetic and ecological impacts on wild conspecifics within hatchery dominated streams and streams that do not have hatchery releases. Complete evaluation of strays and their origin should be required in the DEIS to determine their impact on naturally spawning wild salmonids. Following this evaluation effective measures to reduce hatchery strays would be required by the DEIS for all species to prevent non-listed salmonids from potential ESA listing, and promote recovery of listed coho and steelhead a candidate species. #16

Hatchery Strays

Comment:

Stay hatchery fish of all species released into a watershed produce strays that contribute genetic and ecological impacts in streams with no releases and in areas of a watershed that hatchery salmonids stray into. Since this stray effect is not addressed nor quantified, the DEIS and NEPA is not sufficient. #17

The DEIS states: "Along the Oregon Coast, **most** natural populations currently have low percentage of hatchery fish on the spawning grounds (e.g., 0 to 10 percent). Therefore, managers are able to evaluate the true status of the natural population because hatchery influence is relatively minor." (Page 3-15) The operative word in this quote is "most" which suggests stray rates are higher for some species such as steelhead and fall chinook.

"Recipient population straying estimates for winter steelhead have been limited. One exception was Schroeder et al. (2001), who estimated that hatchery winter steelhead strays made up 4–43 % of several winter steelhead populations in coastal Oregon rivers." (Keefer and Caudill 2013)

Hatchery salmonids stray more because "…reduced stimuli in hatchery fish have been associated with lower hormone levels (Dittman and Quinn 1996; McCormick et al. 2003) as well as lower olfactory activity and reduced brain development (Marchetti and Nevitt 2003) compared to wild fish. For these reasons—and probably others—hatchery fish are widely believed to have reduced imprinting relative to wild fish." (Keefer and Caudill 2013)

"The weight of evidence indicates that human activities- including many common fisheries, river management, and propagation practices- increase anadromous salmonid straying rates. There are certainly no universally 'appropriate' straying rates that can be used as management targets." (Keefer and Caudill 2013) This

conclusion supports the conclusion of the ISAB\ISRP (2016) regarding pHOS of 10% for hatchery strays is an unverified theory.

Some examples of Stay Hatchery Fish that are a function of HGMPs

River	Stray Hatchery Fish	Intentional Stray*	Hatchery Strays**
Wilson	Summer Steelhead	x	
Siletz	Summer Steelhead	x	
Elk R	Fall Chinook		x
Sixes R	Fall Chinook		x
Salmon R	Fall Chinook		x
Salmon R	Coho		x
Rogue R	Spring Chinook		x
Necanicum R	Winter Steelhead	x	
Nestucca R	Summer Steelhead	x	
Chetco	Winter steelhead		x
NF Umpqua	Summer Steelhead		x
Yaquina	Spring chinook	x	
Coos	Spring chinook	x	
Rock Creek	Summer steelhead		x
Rock Creek	Spring chinook		x

* Intentional Strays are the product of fishery management associated with stock transfers
** Hatchery Strays are strays from a hatchery program operating in a watershed

The DEIS states: "ODFW has recently completed their Coastal Multi-Species Conservation and Management Plan (CMP) for the Oregon Coast Region. The current hatchery programs reflect the decisions under this management plan. The Best Management Practices (BMPs) used by ODFW for hatchery management would also continue as described in the submitted HGMPs."

While the NMFS DEIS has confidence in the ODFW's CMP this plan confesses hatchery salmonids do stray but ODFW has not "assessed" stray rates to determine "exact rates." These facts would undermine the assurance in the DEIS that HGMPs would function to protect wild salmonids in coastal rivers and that pHOS criteria are implemented as required. In fact funding may limit these actions as ODFW states in the CMP: "New management and monitoring efforts will require new funding. All new actions and projects will be contingent on available funding and staff." Even though NMFS knows that ODFW has initiated an advisory group to assess funding options to support management commitments, the DEIS represents actions that would take place in the preferred alternative that lack funding.

"Hatchery Fish have the potential to cause either genetic or ecological…impacts on any population with which they spatially and temporally overlap (Araki et al. 2008; Buhle et al. 2009; Chilcote et al. 2013). However, specific effects of coastal hatchery programs have not been systematically assessed. Information exists that hatchery winter steelhead stray onto spawning grounds in some locations, although exact rates are

difficult to assess, and this information has not yet been analyzed." (ODFW 2014 Coastal Multi-species Conservation and Management Plan)

Even though ODFW admits in the CMP that "exact stray rates" have not been determined information in Table A-III: 4. (page 175) identifies "Stray rate targets for hatchery fish on natural spawning grounds (pHOS)." Even though some of those targets are excessive, they are still unconfirmed management targets. The NMFS DEIS is based on facts not in evidence.

There was no independent scientific review other than that provided by NFS that pointed out problems with this management plan (CMP) as a conservation plan for non-listed steelhead, chinook, chum, and cutthroat trout. Coho salmon were not included in the CMP evaluation.

Marine Derived Nutrients from Salmonids

(Page 3-19) "The proposed action includes the benefit of marine-derived nutrients into the freshwater environment from hatchery fish returns. #18

(Page 3-19) "More than 80 percent of the marine-derived nutrients available to the freshwater environment have come from natural-origin salmon and steelhead carcasses in the project area."

(Page 3-19) "In 2012, more than 16,336 hatchery fish carcasses were outplanted within the Oregon Coast Region (ODFW 2013d)."

"Hatchery fish that are not harvested or collected at hatchery facilities can spawn in the wild and contribute marine derived nutrients to the environment.

Comment:

While the DEIS asserts that natural spawning hatchery fish have a value by depositing marine derived nutrients into coastal streams, benefiting productivity of wild salmonids, it also states a number of associated risks such as "genetic introgression, increased competition, predation from hatchery fish, transfer of pathogens, discharging effluent, masking of natural population status."

The DEIS does not discuss the relative value of naturally spawning hatchery fish nutrient benefit and associated risks to wild salmonids. Since "more than 80 percent of marine derived nutrients come from naturally spawning wild salmonids," the contribution hatchery salmonids is relatively minor compared to the risks. The DEIS also fails to discuss the greater benefits of naturally spawning wild salmonids that range from gravel cleaning, riparian vegetation growth, stream productivity, seasonal food resources that benefit wild life, and terrestrial insect production.

The DEIS states that only those fish not harvested provide a nutrient benefit to streams. Nutrient enrichment of streams from naturally spawning hatchery fish is driven by harvest not by any biological objective for nutrient enrichment for each stream. The DEIS does not establish nutrient enrichment objective by river. The risks associated with harvest and hatchery impacts on wild salmonids that provide the greater nutrient contribution to streams are not addressed.

However, NMFS (2008) did address nutrient enrichment of streams from naturally spawning coho salmon. "Coho salmon are an important contributor to stream nutrient supply, and Bilby et al. (2001) estimated the density of coho salmon carcasses that would maximize nutritional benefit to juvenile coho salmon at

approximately 120 carcasses per km of spawning habitat. Given about 6,900 km (4,300 miles) of spawning habitat in the range of the ESU, this translates to an escapement of about 830,000 spawners to saturate the stream nutrient supply."

Bilby (2001) also said: "Restoration of freshwater habitat in the region will require that the role Pacific salmon play in maintaining the health of freshwater habitats be considered in establishing harvest levels and escapement goals for these fishes."

Establishing escapement goals for wild salmonids which provide the highest proportion of marine derived nutrients to coastal streams is needed for all species due to their "The important contribution these fishes make to the productivity of the habitats where they spawn and rear." (Bilby 2001).

In the proposed alternative the DEIS attempts to make a positive case for marine derived nutrient delivery from naturally spawning hatchery fish and from hatchery carcasses dumped into streams. However, the risks associated with naturally spawning hatchery fish on wild salmonids that provide over 80 percent of these nutrients are ignored. The DEIS does not set an escapement objective for wild fish into each coastal stream to supply needed nutrients from naturally spawning salmonids. Relying on the HGMPs to supply nutrients to streams increases risk to wild salmonids and therefore is incompetent.

A nutrient enrichment target from naturally spawning salmonids is needed to improve productivity for listed coho salmon, candidate steelhead, and non-listed salmonids. Harvest would be managed to deliver nutrient targets by watersheds.

Escapement

Escapement in the DEIS is defined: "Adult salmon and steelhead that survive fisheries and natural mortality, and return to spawn. **Run size:** The number of adult salmon or steelhead (i.e., harvest plus escapement) returning to their natal areas. #19

Both definitions treat escapement generally without reference to watersheds or spawner abundance goals by locally adapted population. These definitions are derived from a management framework based on species abundance and aggregated harvest. The DEIS definition of escapement is inconsistent with conservation and recovery of depleted wild salmonids established by NMFS (McElhany et al. 2000) for viable salmon populations (VSP) using criteria for abundance, productivity, spatial structure, and diversity of natural origin (wild) salmonids. These criteria are used to evaluate the biological status of independent populations by watershed. Wild salmonids are at greater risk when there is a conflict between management definitions use by state and federal fishery agencies. Management of salmonids using VSP criteria is necessary to recover depleted populations of salmonid by watershed and to prevent low risk populations becoming depleted and protected through the Endangered Species Act. So the definition for biological escapement management must be consistent with VSP criteria for natural origin (wild) salmonids by watershed including protected coho salmon.

Coho Salmon Example
The hatchery reforms due to ESA-listing in the late 1990s which substantially curtailed hatchery releases of coho salmon in the Oregon Coast ESU substantially reduced the impacts of hatchery fish on natural-origin coho salmon populations. Buhle et al. (2009) evaluated the reduction of hatchery coho salmon releases in the ESU and concluded there was an approximately 20 percent increase in productivity from the reductions in pHOS. Productivity increased by another seven percent from the reductions in ecological impacts associated with hatchery coho salmon smolt releases interacting with natural-origin coho salmon. Therefore, approximately 27

percent of the improvements to the status of coho salmon in the Oregon Coast ESU could be attributed to the hatchery reform actions taken since ESA listing (Buhle et al. 2009). (Page 3-21)

In evaluating salmonid escapement management Knudsen (2000) said: "Over 44% of 9,430 identified populations or 2,925 populations for which there is information are not monitored for escapements. It remains obvious that both escapement data collection methods and the programs to collect high quality escapement information are deficient. To achieve overall sustainability, it is always preferable to identify likely spawning aggregations as the smallest unit…then to develop management plans for protecting abundance and genetic diversity based on that knowledge." The smallest unit would be defined at the watershed scale.

Knudsen (2000) recommends sound management of salmonids would "…ensure that escapements are sufficient to perpetuate maximum biomass production and biodiversity. We cannot count on repairing only one damaged aspect of salmon runs (e.g. degraded habitat) to fix the problem, but must work on all fronts simultaneously. Ultimately, though, both productivity and biodiversity depend on sufficient escapement of spawners to fully utilize the available freshwater habitat, fertilize the systems with carcasses, and optimize genetic diversity."

Harvest has to be regulated to return spawner abundance (escapement) by species and race to each stream. This would support nutrient enrichment, genetic diversity, productivity and spatial structure for each species in order to achieve recovery coho salmon, candidate steelhead and prevent depletion of non-listed salmonids. Each stream and its populations of native, wild salmonids becomes a management unit based on measurable criteria that define its health and productivity.

Residual hatchery smolts become resident competitors

"The potential for hatchery fish to negatively impact wild fish has been identified as a concern for dwindling stocks of naturally produced anadromous salmonids in the Pacific Northwest. (McMichael 1999) #20

"…when hatchery steelhead become residuals, thus increasing local densities of salmonids for extended periods, the growth of sympatric wild rainbow trout growth is likely to decrease. A reduction in size, due to slower growth during the summer, could decrease overwinter survival , resulting in decreased population size. (McMichael 1997)

"Hatchery steelhead displaced wild *O. mykiss* in 79% of the contests observed between these groups. Our results indicate that the behavior of hatchery steelhead can pose risks to preexisting wild *O. mykiss* where the two interact. Strategies to minimize undesirable risks associated with behavior of released hatchery steelhead should be addressed if protection and restoration of wild *O. mykiss* stocks is the management goal." (McMichael et al. 1999)

Levels of residualism for 130,000 to 200,000 hatchery steelhead smolts using differing steelhead smolt residualism levels found in the scientific literature

Residualism Rates In Differing Studies	Resulting Residuals From 130,000 Smolts	Resulting Residuals From 200,000 Smolts
Werlen 2003 * @ 1.6% Keogh River	2,080	3,200

Viola/Schuck 1991		
@ 17.7%	23,010	35,040
Tucannon River		
Viola/Schuck 1992		
@ 10.3%	13,390	20,600
Tucannon River		
Viola/Schuck 1993 **		
@ 3.1%	4,030	6,200
Tucannon River		
Tipping et al. 1995 ***		
1991 @ 26.1%	33,930	52,200
1992 @ 13.8%	17,940	27,600
1993 @ 19.6%	25,480	39,200
Snow Creek		
WDG 1966 ****		
(from Royal 1972)		
@ 44%	57,200	88,000
@ 35%	45,500	70,000
Elochoman River		
Ward/Slaney 1990		
@ 42%	54,600	84,000
@ 47%	61,100	94,000
Keogh River		
McMichael et al. 2000 *****		
@ 26%	33,800	52,000
@ 39%	50,700	78,000
Teanaway River		

* Smolts acclimated in netpens in lake in upper watershed and then released in the lower Keogh at mean length of 180mm. **Smolts above 200mm considered problematic as precocious males.** Broodstock was wild.

** Smolts acclimated in lake, volitional emigration; release time 4/19-5/3, smolts released weighed **10.4 fish/kg.** Broodstock was Lyons Ferry Hatchery Stock.

*** Smolts transported from South Tacoma Hatchery to release site 4.7 km upstream of fish trap. Residuals identified as primarily smolts released below 190mm. **Smolts above 200mm were not found problematic,** although the Methods section indicates **precociously mature smolts were selected out prior to release** which in many ways invalidated the experiment which was not discussed. **Nevertheless, residualism remained comparatively high.** Broodstock was **Chambers Creek Hatchery Stock.**

**** Smolts were reared at hatchery on Beaver Creek at **7 fish per pound** and released on 4/15. Outmigrating fish were then counted at trap one mile downstream. Broodstock was **Chambers Creek origin.**

***** Smolts were transported from WDFW's Yakima Hatchery and released into Jungle Creek trying to mimic volitional releases from an acclimation pond over a 10 day period. The study occurred from 1991-94 with varied levels of residualism and precocious males each year. **Smolts released were from 179-201mm.** Broodstock from Yakima Hatchery.

Residual hatchery steelhead not only compete with wild candidate steelhead they impose ecological impact on other species such as listed coho salmon, chinook, chum and cutthroat trout. These ecological impacts include competition for available food resources, rearing space including overwinter rearing space critical to coho salmon survival, predation, and predator attraction and interbreeding with adult female steelhead.

The DEIS does not include measurable criteria in the HGMPs that decrease these ecological impacts on protected coho, candidate steelhead, and non-listed salmonids, therefore the HGMPs are deficient and should not be approved by NMFS until the problem is resolved.

Economic Evaluation

"Given the increasing body of science showing deleterious impacts of hatchery production on wild stocks, it is only reasonable that natural replacement scenarios be included (NMFS 2016) and costs to replace wild salmonids with hatchery fish rather than invest in habitat and fishery management based on escapement and productivity for wild salmonids. It is possible to provide a more durable solution for salmon decline by investing public funds in natural production and maintain fishery opportunities (Ogston et al. 2015). #21

The DEIS relies on erroneous benefit-cost analysis (Radtke et al. 2016) because it does not account for construction and maintenance cost of hatcheries headquarter administration, long term capital costs, fishery management costs related to the harvest of hatchery fish should be included in the analysis (Carter et al 2010) By leaving out those cost factors in the benefit cost analysis, the benefits are overstated by a factor of two (Radtke et al. 2016).

"NMFS should sponsor their own net economic valuation analysis to be used in the DEIS that includes all policy-related hatchery benefits and costs. The benefit side should account for not only direct fishery costs, but also…conservation benefits, plus…negatives of hatchery production, such as diminished natural production due to weakened genetics, crowding, predator concentration." (Radtke et al. 2016) Additional accounting can and should be provided for diminished nutrient return to watersheds from carcasses of naturally spawning salmon, and reduced escapement of wild salmonids that support genetic, life history, and ecological diversity for wild populations as well as a source of fish for artificial propagation.

The NEPA DEIS claims that alternatives would provide production levels that would result in a small fraction of the total harvestable salmon and steelhead in the analysis area, and would provide a small fraction of the overall economic benefits derived from harvest. This means that the risk to threatened coho salmon and other species of wild salmonids would be increased by the preferred alternative yet provides a minor economic benefit to the target user groups (page 5-26).

Economic evaluation is often manipulated by fishery agencies to put a shine on the artificial production program by focusing attention on the benefits and ignoring the costs to provide those benefits. Each hatchery program should provide a cost evaluation that includes the cost to provide a harvested salmonid as the IEAB (2002) provided. Since hatcheries are public funded, it is only reasonable to provide the public with a real

evaluation of that public investment by the fishery agencies. This cost, of course, would also be expanded to include the impact of hatchery production and associated harvest in terms of costs related to their impact on wild salmonids including the investment in salmon habitat restoration. Hatchery salmon waste habitat investments in habitat because of their reduced fitness and impacts on natural populations. Until there is a real economic evaluation of artificial production the public will be manipulated by fishery agencies to believe that benefits are real. The DEIS is misleading and incomplete until a full economic evaluation of all costs are provided for public review.

Minimize Impacts

The term "minimize" is a popular term in fisheries management. It is primarily used when describing risks of hatcheries, harvest, and mitigation affecting wild salmonids. Unless minimize means zero impact it is necessary to explain the monitoring program that is in place and explain what will be done about anticipated impacts. The DEIS does not explain how impacts to wild salmonids are to be minimized and resolved. Some examples are provided below: #22

"This plan resulted in many changes to hatchery management along the Oregon Coast that: (1) reduce or **minimize impacts on natural-origin populations…"** (1-14)

"…maintain current low levels of hatchery production in order to **minimize genetic risks of hatchery fish interbreeding with natural-origin coho salmon**, and 2) maintain current low levels of hatchery production in order to **minimize** competition and predation risks with wild fish in tributaries and estuaries. (1-14 and 15)

"…maintain current low levels of hatchery production in order to **minimize competition and predation risks with wild fish in tributaries and estuaries.** (1-14)

"…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."** (1-17)

"…**minimize the area of the stream that may be impacted by a water withdrawal** for the hatchery facility. (3-1)

"Although poorly managed hatchery programs can increase disease and pathogen transfer risks, compliance with applicable protocols for fish health can effectively **minimize this risk.** (3-15)

"…the magnitude of this benefit would be minor because the traps have been managed to **minimize delay** of fish migration and most of the watershed is not affected by hatchery traps… (4-34)

"…traps have been managed to **minimize delay** of fish migration.." (4-44)

"Modify or add alternatives to avoid, **minimize**, or mitigate significant cumulative effects." (5-2)

"…ESA will ensure that listed species are not jeopardized, and that **"take" under the ESA from salmon and steelhead hatchery programs is minimized** or avoided." (5-11)

"…"take" under the ESA from salmon and steelhead fisheries is **minimized** or avoided. Where needed, reductions in effects on listed salmon and steelhead may occur through changes in areas or timing of fisheries, or changes in types of harvest methods used." (5-12)

"These plans describe each hatchery program in detail, including fish life stages produced and potential **measures to minimize risks of negative impacts** that may affect listed coho salmon."

"**Differences between hatchery-origin and natural-origin fish are minimized**, and hatchery origin fish are integrated with the local populations included in an ESU or DPS." (xv)

NMFS Failure To Implement Hatchery Reform

The track record for NMFS's failure to address hatchery reform and protection of threatened species is well established by its actions in the Columbia River. NMFS has not complied with the ESA and the National Environmental Policy Act (NEPA) when it has funded Mitchell Act hatchery programs and, it has not implemented hatchery reform through the ESA and NEPA. NMFS has failed five times to produce a biological opinion for the federal power systems even though it has the responsibility and authority to implement the ESA and to place effective conditions on hatcheries to protect wild salmonids. #23

Given this record of noncompliance with the direction of the federal court and failure to implement the ESA to protect endangered salmonids in the Columbia, it is to be expected that hatchery reform through the current NEPA process will also fail to protect threatened coho salmon and other wild salmonid species on the Oregon Coast.

The NEPA DEIS is fatally flawed because it treats hatchery HGMPs as a standalone program. Hatchery impacts on the salmonid ecosystem by moving hatchery fish among watersheds (intentional straying impacts) and straying of hatchery fish that do not return to a hatchery place wild salmonids at risk which the NEPA DEIS fails to quantify. NMFS proposes to "minimize" these impacts but how that is accomplished is not provided. NMFS proposes to control stray rates even though impact on wild salmonids is not provided.

Hatchery salmonids and associated fisheries have genetic and ecological impacts on wild salmonids, but fishery impacts are not quantified even though the stated purpose of the NEPA DEIS is to provide hatchery fish for commercial and sport fisheries. Measurable and enforceable criteria for wild salmonid escapement by watershed and species have not been established.

In addition, the NEPA DEIS fails to establish a habitat management plan that would protect the life history diversity and productivity of Oregon coastal salmonids.

In combination the impacts of hatchery HGMPs and associated fisheries have not been evaluated for impacts

Review and Comments on Trask Hatchery Coho HGMP

Introduction:

I have selected at random two proposed hatchery HGMPs, one for coho salmon and one for steelhead, in order to evaluate the risks and impacts on native naturally spawning salmonids, listed and non-listed under the ESA. The risk factors associated with the HGMPs I have reviewed are likely risk factors associated with all HGMPs considered through this NEPA DEIS. Consequently, all proposed HGMPs would have to be modified to show that native fish (anadromous and resident) are protected before approval by NMFS. #24

"NMFS believes hatcheries can be managed in a manner that conserves and recovers salmon and steelhead listed under the ESA. Therefore the 4(d) rule provides a way to permit the 'take' of listed fish for a variety of #25

hatchery purposes." (NMFS 2000, page 10) This statement of belief is not consistent with the accumulated weight of peer reviewed scientific research and therefore establishes a bias if not a conflict of interest. Since the NMFS funds hatcheries as well as has authority to recover endangered salmonids protected by the ESA, NMFS may have a dual and conflicting mission. Rather than confine its responsibility to what it believes, NMFS should provide factual scientific information that supports its belief. If there is factual information supporting NMFS's belief then the permitting process under the 4(d) rule could be appropriately based on science and conflict of interest could be resolved. This would then provide a scientifically sound basis for permitting HGMPs proposed in the NEPA DEIS.

It is an error of evaluation when HGMPs are evaluated in isolation. The purpose of most hatcheries is to provide an economic product for fisheries; hatcheries and harvest are connected in their related impact on the natural ecosystem including wild salmonids and recovery of protected species. In order to confirm the value and solve risks of hatchery\harvest programs must be integrated into a salmonid management plan focused on sustaining productivity and biological diversity wild native fish. Since salmon are locally adapted to their natal rivers each watershed should have measurable criteria to ensure conservation, by species and race, of wild salmonids. The following provides some of the elements for a coherent science based wild salmonid management plan by watershed which need to be considered in any HGMP evaluation.

Establish a Wild Salmonid Management Framework

#26

Premise of Management:

Salmonids are locally adapted and continuing to adapt to the ecological conditions of their natal streams. In addition, populations may express an adaptive structure within watersheds in response to variation and changes in ecological conditions. Management that is a departure from this fact increases risk, causing decline and extinction of native wild salmonids.

Establish an ecological based management framework:

Based on the ecological function of salmonids and watersheds establish an ecological management program for each watershed/subbasin and related migration and estuary habitats that protects and restores genetic and life history diversity of naturally spawning and rearing wild salmonids; establish objectives for abundance, productivity, distribution and diversity for each species and race of native wild fish.

Baselines:

Establish an historic abundance estimate by species and watershed/subbasin.

Establish a genetic and life history diversity benchmark by species and watershed/subbasin.

Identify historic utilization/distribution for each watershed by salmonids to guide reconnecting salmon and habitats.

Habitat and salmonid life history:

Identify and maintain system-wide habitat use by life stage for each species by watershed.

Water quantity and quality is managed to maintain optimum productivity.

Water temperature is maintained within limits that optimize juvenile and adult growth and survival requirements.

Artificial fish passage barriers are removed to provide access to the entire watershed for juvenile and adult salmonids.

Natural barriers are not altered to provide or improve passage of adult salmonids.

In each watershed/subbasin establish a habitat protection and management agreement to support the life history requirements and productivity of wild native salmonids among government agencies, private landowners, counties and towns.

Spawner Abundance Targets:

Establish spawner abundance objectives by species and race for each watershed based on estimate of habitat carrying capacity.

Establish an egg deposition target for each species and watershed for wild salmonids.

Establish nutrient enrichment objectives for each watershed from carcasses of naturally spawning salmonids and achieve them annually.

Harvest Management:

Harvest is regulated to achieve spawner abundance objectives by species and race for each watershed and subbasin. Objectives for spawning timing and size/age of adult spawners are included. Nutrient enrichment of watersheds from salmonid carcasses is achieved. Egg deposition targets by species are achieved. Subbasin fisheries for trout and adults are regulated to support optimum reproduction in each watershed.

Hatchery Management:

Naturally spawning hatchery fish are excluded from wild salmonid spawning areas.

Ecological impacts of hatchery fish on wild fish are identified and controlled.

A stock transfer policy is adopted so that fish and eggs are not transferred among watersheds.

Since hatcheries are used to produce a product for the market economy – commercial and sport fisheries – their purpose is distinctly different from conservation and recovery management for wild salmonids. Integrated evaluation of hatchery\harvest impacts on wild naturally produced salmonids is necessary to define risks and values associated with management for both commodity and conservation purposes. The HGMP protocol as defined (Smith 2006) is primarily confined to hatchery operations not their ecological and genetic influence on native wild species once released.

Trask Hatchery Coho Salmon HGMP

(Page 1-3) **1.6) Type of program.**

Isolated Harvest – The intent of this propagation program is for harvest augmentation and is not intended to produce fish to spawn in the wild or interbreed with natural populations. This program is currently operated as a segregated hatchery program. #27

As described within this HGMP, ODFW proposes to establish a new Tillamook Bay basin broodstock using wild Coho Salmon once approved by NOAA. Future production would include some level of integration of wild adults into the broodstock. **Issue: The shift to native broodstock is a complete change in the HGMP, directly affecting wild salmon, and should be evaluated in a separate HGMP rather than be treated as an add-on without NMFS review and public comment.**

Identified HGMP Risk Issues influencing conservation and recovery of coho salmon:

The following risk factors are identified in the Trask Hatchery HGMP and some were included as risk factors but not identified. The HGMP should evaluate these risks and show how they will be resolved.

(1-3) Estimate of incidental mortality rate on wild Coho Salmon.

(1-5) Temporal distribution of Trask Hatchery adult Coho Salmon returns and broodstock collected.

(1-5) Standard 2.2 Releases of Trask Hatchery Coho smolts will **minimize impacts** to naturally produced salmonids through control of hatchery release numbers, and **by minimizing** spatial and temporal overlap with natural populations. **When the term "minimize" is used in the HGMP and is not equal to zero impact, the HGMP needs to identify a monitoring plan setting specific criteria to address and resolve risks.**

(1-5) Number of Trask Hatchery Coho smolts released will not exceed basin smolt production capacities.

(1-5) Temporal distribution of wild Coho Salmon smolt migration from Tillamook Basin smolt traps (Little North Fork Wilson River EF Trask).

(1-5) Dates of Trask Hatchery Coho smolts releases.

(1-5) Location of Trask Hatchery Coho smolts released.

(1-5) Standard 2.3 Trask Hatchery and Depoe Bay coho smolts will be volitionally released as yearlings. Any fish remaining after the volitional period, will be crowded out of Trask Hatchery. **What use volitional release and end up force releasing fish that do not migrate on their own? What is the impact of non-migrant smolts in the natural ecosystem?**

(1-5) Beginning and ending dates of Trask Hatchery coho release.

(1-5) Estimated proportion of Trask Hatchery coho leaving volitionally.

(1-5) Standard 2.4 All Trask Hatchery coho smolts will be acclimated and released on station. Any fry or fingerlings in excess of needs for the Trask smolt program may be released into standing water bodies without natural coho production, or may be destroyed.

(1-6) Location of Trask Hatchery Coho smolts acclimation and release.

(1-6) Genetics, Standard 3.1 Hatchery Coho Salmon will not exceed the stray rate identified in the Coastal Coho Conservation Plan (2007) for the Tillamook Basin naturally spawning coho population abundance. **The stray rate standard is not stated or justified by scientific criteria. Standards should not be referenced but stated and a link provided to the reference.**

(1-6) Estimated abundance of naturally spawning Coho Salmon in Tillamook Basin. **Issue: The abundance is estimated not counted.**

(1-6) Estimated abundance of naturally spawning Coho Salmon in the Tillamook Basin that are of hatchery origin, based on marks and/or tags. **Issue: relies on estimate rather than count**

(1-6) Standard 3.2 Stock 34 coho, or wild adult returns from the Tillamook Bay basin, will be used as broodstock. **Issue: the shift from segregated to integrated hatchery stock will take place after NMFS approves the HGMP so this shift will not be formally reviewed in the HGMP but needs to be.**

(1-6) Location of broodstock collection unknown risk

(1-6) Fin clips on hatchery fish collected for brood, or unmarked adults. **Issue: both fin marks and CWT should be used to track strays in Trask and other rivers.**

(1-6) Standard 3.3 Stock 34 coho broodstock will be spawned following appropriate mating and spawning protocols to maintain genetic diversity of the population. **Issue: protocols need to be stated. Do not ignore scientific information showing captive breeding can change genetic characteristics in one generation.**

(1-6) Number and ratio of males and females spawned. **Issue: the ratio should be stated.**

(1-6) Matings will follow procedures as outlined and appropriate for the stock size, in the Hatchery Management Policy, Fish Health Management Policy, IHOT fish health document, or as directed by the ODFW staff geneticist. **Issue: links need to be provided to references.**

(1-7) Standard 4.5 Naturally produced steelhead, Chinook Salmon, Coho Salmon, Chum Salmon, and Cutthroat Trout that enter the Trask Hatchery adult traps are handled and released (except fish retained for brood) in a manner that **minimizes** stress, injury, mortality, and delay in migration. **Issue: When the term "minimize" is used in the HGMP and is not equal to zero impact, the HGMP needs to identify monitoring that would be used and what will be done so that minimize is defined using measurable criteria.**

(1-7) Number of unmarked adult steelhead, Chinook Salmon, Coho Salmon, Chum Salmon, and Cutthroat Trout collected and released alive (or retained for brood) from the Trask Hatchery traps. **Issue: This risk needs to be documented each year and associated mortality evaluated.**

(1-7) Number of unmarked adult steelhead, Chinook, coho, chum, and cutthroat mortalities at Trask Hatchery during operation of the hatchery adult traps. **Issue: This risk needs to be documented annually. Another issue related to traps is forced spawning below traps by wild salmonids. This impact should also be documented since they fish are prevented from spawning in upstream natal habitat.**

(1-7) Standard 4.6 Releases of hatchery coho smolts will limit predation impacts to naturally produced salmonids through control of hatchery release numbers and by **minimizing** spatial and temporal overlap with naturally produced salmonid juveniles. **Issue does not include predator attraction in river and estuary. When the term "minimize" is used in the HGMP and is not equal to zero impact, the HGMP needs to identify monitoring that would be used and what will be done so that minimize is defined using measurable criteria.**

(1-7) Dates, location and sizes of Trask Hatchery coho releases. **Issue: This risk should be included in research to identify problems and lower risk to a level that protects natural origin salmonids.**

(1-7) Temporal and size distribution of wild coho smolt migration from Little North Fork Wilson and EF Trask LCM smolt traps.

5. Socio-Economic Effectiveness

(1-7) Standard 5.1 Estimated harvest benefits will equal or exceed hatchery production costs for Trask Hatchery coho, based on the benefit-cost model in ODFW (1999), or an updated version of that model. **Issue: economic benefits and costs to provide those benefits is needed (See Radtke et al. 2016 letter to ODFW and IEAB 2002 Power Council web page. Smolt to adult recruitment for each hatchery release needs to be determined so that the cost to produce salmon that are harvested is determined. This would provide a Benefit\Cost evaluation based on cost to provide a harvest benefit which is the stated purpose of the hatchery program.**

(1-8) 1.11.1 ODFW proposes to establish a new program using wild coho adults. A maximum of 110 adults (55 females and 55 males) would be needed for broodstock to meet full production goals. **Issue: impact on wild spawner population genetic change and interbreeding, straying and homogenizing wild coho by hatchery program. Research should be required to evaluate impact to wild coho and measureable criteria developed to reduce those impacts that protect wild coho and contribute to recovery.**

(1-8) 1.12 Catch estimate represents landed catch and does not include an estimate of non-landed coho mortality in chinook only fisheries. **Issue: mortality of wild coho is not fully estimated including wild release encounters needed to harvest a hatchery fish in ocean and river fisheries. Research should be conducted to determine the level of risk and recommend methods to reduce it.**

(1-9) average 9% hatchery fish on the spawning grounds (Range 3% to 14%). Therefore the existing program design of 100,000 smolt releases appears to be in compliance with the Native Fish Conservation Policy and the Coastal Coho Conservation Plan stray rate limits. **Issue compliance with NFCP needs to be determined and ability to control excessive stray rates needs to be tested. Using averages is not justified. This information would be provided annually.**

(1-11) 1.15 Watersheds targeted by hatchery program: The Trask River Basin within the Tillamook Bay Basin is the release site and desired return site for Trask Hatchery coho released on station. Hatchery coho from these releases are expected to return to the Trask Hatchery site. **Issue: evaluation of stray hatchery coho is needed and reported annually.**

The North Fork Depoe Creek Basin within the Depoe Bay Basin is the release site and desired return site for all Depoe Bay STEP coho released under this program. Coho Salmon from these releases are expected to return to the NF Depoe Bay Creek site. **Issue evaluation of stray hatchery coho is needed based on measurable criteria and reported annually.**

(1-11) 1.12 Alternative 1 Increase Releases of Stock 34 : impacts from stock-34 hatchery coho on naturally rearing species would potentially increase. **Issue: The costs and potential benefits are noted but the cost to determine the impact of increased interbreeding of hatchery (stock 34) on wild coho is not mentioned. It should be added and this alternative would have to develop a monitoring and evaluation plan along with funding support. The purpose of this plan is to determine the risk to ESA listed coho salmon and compliance with NMFS PVA criteria.**

(1-11) Alternative 4 Incorporate wild coho into hatchery broodstock: Use of unmarked, wild adults would replace the current broodstock. Alternatively, a wild brood program could be phased in during years of sufficient abundance while maintaining a portion of the releases from the existing program. Use of naturally produced adults from the Tillamook Bay basin may increase potential straying of returning adults within the basin. This alternative is being proposed in this HGMP for implementation. **Issue: Low performance of domesticated hatchery coho would be replaced with wild coho broodstock to increase contribution to fisheries at the risk of increased strays and interbreeding with wild coho. A monitoring and evaluation plan recommended for Alternative I would apply here as well.**

(1-12) Alternative 5 Install a hard weir at Trask Hatchery: **Issue The description is negative and does not include passage options already in use that require no handling of fish at Warm Springs Hatchery and the boat slip at a weir on the NF Santiam.**

(1-12) **Alternative 6** – Develop a new broodstock from wild, naturally produced fish from the Trask River. *Description and Implications* - It is unknown if sufficient numbers of naturally produced fish would be available to meet genetic needs without excessive impact to natural populations in the Trask basin. The consumptive coho sport fishery in the Tillamook basin would be maintained. Interactions of hatchery coho with naturally produced fish may result in negative impacts to wild coho populations. **Issue: This includes risks associated with mining wild coho for eggs, genetic and ecological impacts on wild coho, and replacement of wild coho with hatchery product. The monitoring and evaluation plan recommended for Alternative 1 would apply here too.**

(2-1) Tillamook coho complex: There is an estimated 250 miles of spawning habitat available to the Coho Salmon of this complex. **Issue: According to research on marine derived nutrient derived for coho salmon of 120 carcasses per km (Bilby et al. 2001). Using this recommendation would mean the spawner goal for the Tillamook coho complex is 48,280 spawners to achieve needed nutrient enrichment from coho salmon carcasses.**

The DEIS estimates that "The critical population level of Coho Salmon for the Tillamook Complex is 1,000 adult spawners. However, this complex is not considered to be viable because high-quality habitat is estimated to be present in only 12 miles of stream, below the 15-mile threshold needed to support a viable population." (2.2.2) Status of ESA-listed salmonid population(s) affected by the program.) Using the Bilby et al. 2001 formula for minimum coho carcasses the spawner level should be 2,400 coho spawners. This is more than twice the minimum adult spawner estimate in the DEIS. **Issue: A better approach would be to use the Bilby formula for wild coho spawner escapement, increase nutrient enrichment, invest in restoring additional three miles of high-quality habitat, manage fisheries to secure needed escapement of wild coho as a recovery action to increase the minimum critical population level.**

The Tillamook historically was one of the most productive salmon areas on the Oregon coast. "The abundance of wild Coho Salmon spawners in the Tillamook Complex has ranged from about 1,300 to 20,000 and has averaged about 8,500 since 2003" (table 2.2). The Tillamook Complex is now producing, on average, more wild coho salmon than estimated for high-quality habitat. This would suggest that the estimate of high quality habitat is low or a combination of high and low quality habitat is more productive than recognized. **A well-managed wild coho population would set the intrinsic productivity for the Tillamook Complex at more than 20,000 spawners. This would be even higher when spawners removed by the fishery are included in the estimated intrinsic productivity. The Tillamook Complex should not be managed for minimum escapement (critical population level) but for its intrinsic productivity and for the nutrient enrichment target recommended by Bilby (2001).**

Truncated Data Contributes to Shifting Baselines:

Another problem with Table 2.2 is the limited years of data (2003-2015). The ODFW has collected historic estimates for coho salmon, an important commercial species, since 1892 (Mullan 1981) Confining the data on wild coho from 2003- 2015 promotes the problem of shifting baselines. According to Mullan (1981) the "In-basin commercial coho harvest" for Tillamook Bay ranged from a low of 23,000 fish to 70,000 fish. The average catch from 1923 to 1940 was 43.6 thousand fish. In 1923 a poundage fee was imposed and the data quality improved. In 1940 the bay was closed to commercial harvest. During this time the Tillamook Complex salmon habitat was damaged by splash dams, logging and forest fires, so the habitat was likely of lower productivity than it is today. This may mean that the Tillamook Complex is more productive than recognized and management should "…ensure that escapements are sufficient to perpetuate maximum biomass production and biodiversity (Knudsen 2000).

Knudsen (2000) also says, "We cannot count on repairing only one damaged aspect of salmon runs (e.g. degraded habitat) to fix the problem, but must work on all fronts simultaneously. Ultimately, though, both productivity and biodiversity depend on sufficient escapement of spawners to fully utilize the available freshwater habitat, fertilize the systems with carcasses, and optimize genetic diversity."

There is absolutely no justification by ODFW to overlook this and other relevant scientific evaluation data in constructing its HGMPs protocols.

(2-6) No data is available for progeny of naturally spawning hatchery coho rearing in the wild.

(2.7) The HGMP states: The potential for take of a listed stock during this trapping is low and would consist of migrational delay, capture, handling, and release during the operational period. Trapping and handling devices and methods may lead to injury of listed fish through descaling, delayed migration timing and spawning, and delayed mortality as a result of injury or increased susceptibility to predation. Any unmarked fish collected during this trapping, if not retained for brood, are immediately released back into Gold Creek or Trask River. Any take would be incidental take.

Comment: Using weirs can also result in displaced spawning. That is, the wild fish held below a weir may spawn and in doing so the eggs and juveniles may be in less suitable habitat and can be more vulnerable to mortality. Fish spawning below a weir is not spawning in natal habitats and are likely to have low reproductive success. This problem has been identified on the Sandy River where wild spring chinook are spawning below weirs rather than reaching their natal spawning areas.

The take may be defined as incidental, yet it is a purpose of management to protect wild threatened coho salmon. Leaving it as an incidental take without an evaluation of potential or real impact on a threatened species is an inappropriate response in the HGMP that is designed to control risk to wild coho and support recovery. The impact should be documented in annual operation reports numerically, and mitigation actions to address impacts stated. There should be an evaluation as to the competence of the mitigation action for protection of wild coho.

Summary for risk factors identified in the HGMP:

To be complete the HGMP should include a section that addresses how the identified risks are to be evaluated, monitored and resolved including the funding available to accomplish required work. In the Oregon Coastal Multi-Species Plan (CMP) there are numerous statements by ODFW about funding being a limiting factor on what actions are actually carried out. Therefore funding limitations related to resolving risks identified in the HGMP must be available so it is possible to determine which risks will be addressed and resolved. This information should be included in a requirement for an annual report documenting actions taken to address risks showing which risks were resolved and those that remain to be resolved. This information is not typically found in annual hatchery operation plans. The lack of funding to resolve risks is not an acceptable excuse and would mean the HGMP is not functioning as agreed to with NMFS. NMFS should develop a response to address the failure of the HGMP. NMFS and the public would then have an annual update about risks resolution or failure to do so. This reporting should be required for all HGMPs proposed by ODFW for the Oregon Coast.

Siletz Winter Steelhead HGMP Concerns:

- The program takes wild steelhead to propagate its hatchery fish via a brood-stock program with an allowance of taking up to ½ of the encountered wild winter steelhead, but no more than 40 pairs, at the Siletz falls trap for this purpose, effectively removing them from spawning in the wild. The actual population size of Siletz winter steelhead is currently unknown. The overall goal of the program is to take no more than 10% of the overall wild winter steelhead population. (Section 1.5/1.7/1.9/1.10/1.11/6.2.2/7.4.1). The goal for taking wild brood stock without knowing the run size is a risk to the wild population. #28
- Release of 50,000 smolts creates competition for limited resources with wild smolts as they migrate to the ocean (Section 1.7). Potential for increasing predator attraction that affect wild salmonids in the river and estuary.
- Stray rates are greater than 10% as outlined in Standard 4, Impacts to wild fish: "Limit hatchery fish to 10 percent or less of the fish spawning in natural habitats of the Siletz and neighboring basins, except in the immediate area (within 1 mile) around the release site(s)." The HGMP provides that, "Estimates of the total number of hatchery winter steelhead that strayed to all natural spawning areas in the Siletz Basin are not available. Therefore, data for the "Spawning Grounds" column (Table 1-2) is not available. Data on stray rates is available for three trap sites within the Siletz Basin that are removed from the smolt release site. These traps are on Schooner Creek, Mill Creek and Siletz Falls. The average hatchery stray rate (all stocks of hatchery fish) seen at these traps has ranged from 45 to 93 percent (1998- 2007). The stray rate for just the stock 33W from 1998 through 2007 has ranged from 40 to 70 percent at Mill Creek, and from 34 to 65 percent at Siletz Falls. Both of these sites are removed from the release site, although the Siletz Falls site is on the mainstem and may not represent levels seen in tributaries. The stock 33W has been seen in five different years (1998-2007) ranging 1-5 fish in the Schooner Creek trap; the only other site in the Siletz Basin used as a monitoring site. Very few fish of this stock have been recorded in sites outside of the Siletz Basin, which includes several adult traps in neighboring basins." "A key issue related to this hatchery program is the overall abundance of hatchery steelhead spawning in natural habitats occupied by wild winter steelhead in the Siletz Basin. Observations in tributaries of the Siletz River indicate a substantial proportion of hatchery spawners in winter steelhead habitats. Some of these hatchery spawners are thought to be Siletz hatchery winter steelhead. These fish have an adipose and left maxillary fin clip. However, other hatchery programs in near by coastal basins also release winter steelhead with the same mark so it is uncertain to what extent hatchery Siletz winter steelhead stray. There is also concern that large numbers of hatchery steelhead smolts released in the Siletz Basin may create competition with wild fish or attract predators which could also affect wild fish." (Section 1.9/1.10/1.12/1.16)
- The HGMP assumes that there are no genotypic or phenotypic differences between brood stock and wild fish so pose no threat to the wild population (Section 6.2.4).
- It is possible that by selecting wild fish at the Siletz falls for the brood stock program there is an increased propensity for the hatchery progeny to stray as those fish encountered at the falls are straying from the lower river as wild winter steelhead are not passed above the falls (Section 7.2)

Summary:

Our comments address risks to ESA listed coho salmon and to candidate steelhead along other native, wild salmonids in Oregon coastal rivers relative to the DEIS. This means that the hatchery HGMPs fail to protect ESA listed coho and will contribute to the take of this species. The HGMPs are not being operated or proposed to be operated consistent with the best available science regarding genetic and ecological impacts on wild salmonids. We have evaluated the alternatives provided in the DEIS and show that they are not adequate to

protect threatened coho and other species. The NMFS needs to conduct an evaluation of the Oregon coastal hatchery programs with full involvement of the Protected Species Program and the Science Center that would establish measurable criteria for operation of each hatchery program HGMP on the environment. #29

Sincerely,

Bill Bakke, Founder and Director of Conservation and Science

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NMFS Responses to Comments from Native Fish Society, letter dated November 2, 2016.

Letter #	Comment #	NMFS Response
1	1	Noted.
1	2	Disagree. The EIS evaluates the genetic and ecological effects of the hatchery programs specified in the submtted HGMPs. Effects are evaluated, as the comments states "outside the hatchery fence." Harvest and other cumulative impacts are considered.
1	3	It is not clear what the comment means by "binding for other species." NEPA requires the agency to consider its impacts on the human environment, including species of fish or wildlife that are not listed as threatened or endangered. However, NEPA is a procedural statute, and the agency action is strictly an exercise of NMFS' authority under the Endangered Species Act, which is separate from the management of unlisted fish species.
1	4	Disagree, and furthermore NMFS was not a party to the McKenzie River hatchery litigation.
1	5	The hatchery programs are managed solely for harvest opportunity and are not intended to provide conservation benefits to the natural population from intentional supplementation, etc. Hatchery programs in other areas are managed for supplementation, but none in the Oregon Coast region. NMFS does not agree with the remainder of this comment.
1	6	Disagree. Most of the comment is based upon Columbia River hatchery management. NMFS agrees has frequently stated that hatchery programs pose risks to natural populations that must be evaluated, as they were in the EIS and will be in the associated Biological Opinion. The comment describes hatchery risks generally, but under ESA §4(d) NMFS' task is to analyze the particular hatchery program or set of programs in the proposed action and determine whether they cause jeopardy to a species listed as threatened or endangered. The overall trend of Pacific salmon and steelhead and the generalized risks posed by hatcheries are part of NMFS' consideration, but much more is required to analyze the particular programs.
1	7	NMFS regularly conducts reviews of hatchery and harvest policy and management for ESA-listed Oregon Coast and SONCC coho salmon, involving NMFS' Science Center and other divisions within the West Coast Region since coho salmon were petitioned for listing in the mid-1990's. NMFS' status reviews, ESA listing notices, NMFS oversight of PFMC fishery management review, ESA Fisheries Management and Evaluation Plans, ESA Technical Recovery Team work products, and the ESA Recovery Plan are just some examples, along with the EIS and the associated biological opinion, both of which rely on the best available science from all sources. For the latest review on the role of hatcheries and harvest on ESA-listed coho salmon along the Oregon Coast region, refer to the Recovery Plans developed by NMFS' Protected Species Divisions and Science Centers.

1	8	Noted. The DEIS specifies all of the natural populations affected by hatchery programs and all of the natural populations not affected by hatchery programs. For ESA-listed coho salmon, the vast majority of natural populations are not affected by hatchery programs. The remaining populations have relatively small hatchery programs and the EIS discloses the genetic and ecological effects of hatcheries on those natural populations, which includes accounting for past impacts. As described in NMFS' ESA Recovery Plans, where natural populations without hatchery programs are depressed, it is due to a variety of limiting factors/threats (e.g. freshwater habitat).
1	9	Noted. Disagree. See response 1-8.
1	10	Noted.
1	11	Disagree. The EIS evaluates in detail a range of alternatives from the proposed action (implement existing hatchery programs) to terminating all hatchery programs along the Oregon Coast. This informs the public on the extent of impacts hatchery programs are having on the human environment. The EIS includes an alternative (#3) which shows what conditions would be if no hatchery programs were in place.
1	12	Noted. See response 1-7.
1	13	Disagree. The comment misunderstands the purpose of NEPA, which is to evaluate a range of alternatives so that an agency can make a fully informed decision, even if it means looking at alternatives that are technically outside its authority if doing so will contribute to an informed decision.
1	14	Noted. The purpose of the HGMPs is to evaluate program impacts on, in this case, ESA-listed coho salmon. The HGMPs are not required to evaluate impacts on non-listed salmon and steelhead along the Oregon Coast. The EIS, however, evaluates impacts of the programs on affected resources, including non-listed salmon and steelhead. This assessment is found in sections 3.4 and 4.4 of the EIS.
1	15	Noted. The final draft of the EIS provides additional information related to pHOS, pNOB, and PNI that help inform the genetic impacts of hatcheries on natural populations. These metrics are recommended by HSRG. Moreover, NMFS is required by NEPA to employ the best available science, even if NMFS would prefer that more information was available.
1	16	Disagree, the EIS does not rely on assumptions or on a limited view of where effects occur, but rather it reviews effects throughout the coast region. There are only a few cases where hatchery fish are transferred among population areas and thus inter-population straying by returning hatchery fish is an issue. These particular programs have been evaluated in the EIS related to these possible effects.
1	17	Noted. See response 1-16.
1	18	Noted. NMFS describes the benefit of hatchery fish carcasses using the best available science.
1	19	Noted. The ESA Recovery Plan describes the VSP viability and delisting criteria for SONCC and Oregon Coast coho salmon. For non-listed salmon and steelhead, ODFW's CMP provides the VSP viability criteria, since they are the fish managers with jurisdication of those stocks along the Oregon Coast. This information was included in our evaluations in the EIS.

1	20	Noted. The HGMPs describe the residual rates for hatchery steelhead. In general, residual rates for these steelhead programs are low because smolts are released when they are ready to emigrate. The effects of residual hatchery steelhead were evaluated in the stream reaches where they interact with natural-origin salmon and steelhead along the Oregon Coast region.
1	21	Noted. The EIS provides a socio-economic assessment of the benefits and risks of hatchery programs using the best available information for the Oregon Coast region. Several revisions were made to the final EIS based upon public comments.
1	22	Noted. There have been, and will continue to be, many different management reforms to help reduce and minimize the effects of the proposed hatchery programs. Minimize does not infer zero impact, but that impacts are reduced to the lowest levels possible with the specified program (hatchery release numbers, collection of broodstock, etc.).
1	23	Noted. See response 1-6 and 1-7. The EIS considers the broad impacts of hatcheries through the species status and cumulative impacts sections. The proposed action is not a region-wide hatchery strategy but a response under ESA §4(d) regulations to a set of programs.
1	24	Noted.
1	25	Noted. NMFS does not fund any hatchery production on the Oregon Coast. Regardless of the commenter's issue with one particular sentence, the EIS evaluates the programs identified in the proposed action using the best available science and considering the effects of hatcheries both locally and regionally.
1	26	Noted. The proposed action is the review of certain hatchery programs in accordance with NMFS regulations at 50 CFR 223.203. The comment's policy suggestions are noted.
1	27	Noted. Comments discussed among NMFS and ODFW with appropriate changes made to the HGMP. Changes were made in the HGMP to allow up to 100% wild coho into the broodstock when specific criteria are met, corrections to factual errors. No changes were made specifically to the EIS in response to these comments on the Trask coho HGMP.
1	28	Noted. Comments discussed among NMFS and ODFW. No changes made to the HGMP or EIS.
1	29	Noted. See response 1-7.

DOUGLAS COUNTY
BOARD OF COMMISSIONERS

CHRIS BOICE SUSAN MORGAN TIM FREEMAN

1036 SE Douglas Ave., Room 217 • Roseburg, Oregon 97470

October 20, 2016

Mr. Lance Kruzic
NMFS Sustainable Fisheries Division, West Coast Region
2900 Stewart Parkway
Roseburg OR 97471

RE: OREGON COAST HATCHERY DEIS

Dear Mr. Kruzic,

The Douglas County Commissioners appreciate this opportunity to provide comments to the draft Environmental Impact Statement (DEIS) that assesses the impacts of various alternatives for operating salmon, steelhead and trout hatcheries along the Oregon Coast. #1

We also appreciate the opportunity to provide very important information and updates related specifically to the Umpqua River Basin Coho Salmon Program's Hatchery and Genetic Management Plan (HGMP) that was submitted by Oregon Department of Fish and Wildlife (ODFW). #2

Please do not hesitate to contact us if you have questions or require further information.

Once again, we greatly appreciate the opportunity to provide comments for your consideration.

Sincerely,

DOUGLAS COUNTY BOARD OF COMMISSIONERS

Tim Freeman, Chairman

Chris Boice

Susan Morgan

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COMMENTS OF

DOUGLAS COUNTY, OREGON

on the

NATIONAL MARINE FISHERIES SERVICE'S
DRAFT ENVIRONMENTAL IMPACT STATEMENT TO
ANALYZE IMPACTS OF NOAA'S NATIONAL MARINE FISHERIES SERVICE
PROPOSED APPROVAL OF THE CONTINUED OPERATION OF 10 HATCHERY
FACILITIES FOR TROUT, SALMON, AND STEELHEAD ALONG THE OREGON
COAST, AS DESCRIBED IN OREGON DEPARTMENT OF FISH AND WILDLIFE
HATCHERY AND GENETIC MANAGEMENT PLANS PURSUANT TO
SECTION 4(d) of the ENDANGERED SPECIES ACT

Federal Register August 26, 2016 (Vol. 81, No. 166)

David Loomis, (BS Fisheries Sci.)
Ronald Yockim (BA, MA, JD)

October 20, 2016

Douglas County appreciates this opportunity to provide comments to the draft Environmental Impact Statement (DEIS) that assesses the impacts of various alternatives for operating salmon, steelhead, and trout hatcheries along the Oregon Coast. Douglas County is also providing very important information and updates related specifically to the Umpqua River Basin Coho Salmon Program's Hatchery and Genetic Management Plan (HGMP) that was submitted by Oregon Department of Fish and Wildlife (ODFW). This HGMP for the Cow Creek and South Umpqua Coho (stock-18) Program is a required element under Douglas County's Federal Energy Regulatory Commission (FERC) license for the Galesville Hydroelectric Project No. 7161. #3

1. Draft Environmental Impact Statement for Oregon Coast Hatchery Programs

Douglas County has reviewed the four alternatives evaluated by NOAA Fisheries in the DEIS regarding the effects of operating hatcheries along the Oregon Coast and it strongly supports the preferred Alternative 2 which approves the current operations of all of the fish hatcheries according to the new HGMP's developed by ODFW. This support is however contingent on acceptance by ODFW and NOAA Fisheries of Douglas County's recommended changes to the Umpqua Basin HGMP for the Cow Creek/South Umpqua Coho Program. Douglas County does not support any of the other DEIS alternatives that reduce or eliminate hatchery fish production along the Oregon Coast. #4 #5

Douglas County has closely monitored the coho hatchery program on the Umpqua system and concurs with the NOAA Fisheries conclusion that due to hatchery reforms that have been implemented on the Oregon coast, hatchery program impacts are not a primary or secondary limiting factor or threat for the coho salmon population along the Oregon Coast (DEIS P. 1-15). Our analysis validates that this is not only true for the entire Oregon coast but particularly true for the Umpqua River system. #6

As noted in prior comments of Douglas County relative to the coho status reviews, the conclusion that the abundance of coho has decreased substantially over the last century with is not consistent with recent analysis. We recognize this statement is a quote from Stout et al, however, we caution that the studies that are the foundation of the referenced statement, are in error in that they over estimated historical abundance. #7

2. ODFW's Umpqua River Basin Coho Salmon (Stock-18) HGMP (August 24, 2016)

Douglas County recently identified some significant errors in the Cow Creek (Stock 18) HGMP that ODFW submitted to NOAA Fisheries' in August 2016. When these errors were brought to the ODFW and NOAA Fisheries staff, both staffs agreed that edits to the HGMP are needed to correct inadvertent errors related to: 1) actual brood stock numbers for the coho hatchery program; and, 2) that placement of hatchery adult and juvenile coho does not occur in Galesville Reservoir. #8

Based upon the ODFW records, the actual number of fish collected for brood stock should be 62 not the 84 that is listed in some of the statements and tables in the HGMP. This number should be corrected at: Section 1.11.1 page 11; Table 2.2.3c page 28; and Section 6.3 page 47. There may be other locations wherein the HGMP should be corrected on this point.

Similarly, the HGMP should be corrected to reflect that placement of hatchery adults and/or juveniles do not occur in Galesville Reservoir. These corrections should be made at: Section 2.2.3 (2) page 24; Table 2.2.3c footnote c page 28; and Section 7.2 (2) page 48. #9

In assessing the Umpqua River Basin Coho Salmon Program for the Cow Creek (Stock 18) it is important to recognize that this program is undertaken and funded under Douglas County's FERC major license to construct, operate, and maintain the Galesville Hydroelectric Project No. 7161 issued on June 29, 1984. This program is to mitigate for elimination of access by anadromous fish, including coho salmon, to 28 miles of upper Cow Creek. Mitigation was adopted in that anadromous populations above the dam were eliminated and due to the limited numbers impacted, no fish passage facilities were required (See FERC Project No. 7161.) The predicted numbers of wild adult coho production that was lost above the dam was estimated at 400 total fish. Of these, at the time of the license issuance, 300 coho were considered harvested and the remaining 100 were considered to return as spawners. #10

Based on predicted hatchery returns from the FERC required mitigation of "a rearing pond of juvenile coho" that was constructed at Rock Creek Hatchery on the North Umpqua, ODFW and the County produce: (a) several thousand hatchery coho adults annually to provide harvest opportunities in the ocean and in-river fisheries; and, (b) high numbers of hatchery coho that return to Cow Creek to provide a significant net benefit relative to spawner escapement.

The mitigation numbers were arrived at under the assumption that 70% of the adult coho resulting from the hatchery produced smolt would be harvested. However, with the more recent reduction in coho harvest rates for both wild and hatchery coho populations in the Umpqua Basin over the past 30 years, instead of roughly 70% of the adult coho hatchery production from the Galesville project smolt releases being harvested by fisheries, as a result of the current regulations and ESA-take

limitations we are finding that 70% or more of the hatchery fish returns are in fact not harvested and are returning to the Umpqua Basin as spawner escapement or hatchery brood. While most of these hatchery returns are to upper Cow Creek, we are finding that basin-wide spawning surveys and Winchester Dam counts on the lower North Umpqua are indicating that these hatchery fish do "stray" at relatively high numbers, especially during years of higher survival rates. This straying has become more pronounced with the recent high survival and with the more limited fisheries opportunities as a result of recent regulatory changes in coho targeted fisheries.

Another item that is not addressed in the HGMP is the enhanced coho survival resulting from Galesville project reservoir releases that have resulted in increased average flows in 60 miles of mainstem Cow Creek during the critical low flow, high temperature summer period for juvenile fish rearing. These flows are maintaining water temperatures below 68 degrees F. The mean inflow averages (1930-2015) for Cow Creek at the project are 36 cfs (June), 17 cfs (July), 11 cfs (August), 11 cfs (September), 21 cfs (October) and 19 cfs (season average). During these same periods the net flow increase from the Galesville Reservoir water release averages (1986-2015) 20 cfs (June), 39 cfs (July), 49 cfs (August), 48 cfs (September), 47 cfs (October) and 41 cfs (season average). #11

It is notable in the recent 2016 low flow period, total flow releases from the Galesville project have averaged roughly 70 cfs since July. This represents an average net flow increase of over 60 cfs in stream habitat conditions during the critical juvenile rearing period for coho salmon. These significant flow increases clearly demonstrate the additional mitigation provided by Douglas County's operation of the Galesville project to enhance stream habitat quantity and quality for wild coho production in Cow Creek and the ESU-listed Oregon Coastal Coho ESU populations in the Umpqua Basin.

Douglas County recommends that the DEIS be modified to clarify and/or correct the coho management information to properly reflect the current program for coho hatchery production related to: 1) the goals of the County's FERC license agreement with state and federal agencies; 2) the current harvest and escapement levels; and, 3) the proven history of significant increases of juvenile coho rearing habitat in Cow Creek. #12

Douglas County notes that the current statement in the HGMP relative to the release program is not factually correct. We note under **Type of Program:**

> *"The South Umpqua Coho Salmon program is a harvest/mitigation program and fits the NOAA definition of an isolated harvest program. Hatchery smolts are raised to produce fish for ocean and freshwater harvest as mitigation for natural production lost in Cow Creek above Galesville Dam on the South Umpqua."*

While this statement is correct, the error occurs when the HGMP further states the **Purpose (Goal) of the program** is:

> *"the coho salmon 60,000 smolt release program (stock -18) is required for harvest mitigation for ongoing habitat loss above Galesville Dam on Cow Creek.....The goal is to provide a freshwater*

harvest of 1,000 to 3,000 adult coho salmon. Freshwater harvest on these hatchery fish during the last couple of years has averaged 1,160."

The statement conflates the Douglas County FERC license mitigation goal with the larger population goal of ODFW. Under the FERC license, the goal is to mitigate for loss of harvest of 300 adult salmon and escapement of 100 spawners. The 1,000 to 3,000 adult coho reference above is not to mitigate for habitat loss above Galesville Dam. The HGMP stated harvest goal was determined by ODFW and is independent of the mitigation that was developed during the FERC process by FERC, NOAA Fisheries and Douglas County. Douglas County notes the HGMP statement *"Of particular interest for this HGMP is the listing of the Cow Creek hatchery stock."* We agree with the ODFW/NOAA Fisheries' statement that this is an "isolated harvest" program. Recognizing that there are concerns as to adverse effects of this hatchery program on both the ESA-listed wild populations and ESA-listed hatchery stock, Douglas County is recommending that this issue be addressed through a new alternative in the HGMP that acclimates a portion of the hatchery coho production to other locations in the Umpqua Basin. #13

Douglas County has and will continue to meet the mitigation requirements of our FERC license, and continue to work closely with all agencies to support achievement of science-based fisheries management goals for ESA-listed species and other species in the Umpqua Basin.

Douglas County's Recommendation for Umpqua River Basin Coho Salmon Program HGMP:

Subject to the above comments, Douglas County recommends and endorses the Alternative 2 (Section 1.16.2) in the Umpqua River Basin Coho Salmon Program HGMP (August 24, 2016). It is our position that this alternative would provide for the current level of hatchery production in the basin and allows for acclimation of some of the coho salmon smolts in a lower portion of the Umpqua Basin. Based on our prior experience in managing the salmonid populations in this basin, our analysis indicates this program would reduce the interaction between hatchery and wild fish in Cow Creek. Given the significant increases in juvenile coho stream habitat quantity and quality in the Cow Creek Basin and the overall increase in productivity and sustainability to ESA-listed wild coho in both the South Umpqua population as well as overall Umpqua population, it is our position that this program would not only reduce hatchery wild interaction but also provide more harvest opportunities to ocean and freshwater fisheries through higher average survival rates from smolt-to-adult, and increase homing to a proven and already available acclimation site. Since all of the coho smolts are spawned and reared for over a year at Rock Creek Hatchery, located on Rock Creek, a tributary to the North Umpqua River at RM 36 of the Umpqua Basin, acclimating them at different sites in the system would not be a significant cost. Currently 50% of the smolts are transferred to upper Cow Creek and acclimated for three weeks prior to release below Galesville Dam. The remaining 50% of smolts are transferred to upper Cow Creek and directly released below the dam during the peak outmigration time. Recent studies of hatchery returns to the trap facility at the dam have indicated that there is successful homing back to this acclimation site. Further, recent studies suggest adult returns from the acclimated smolt release group have higher success of homing and/or survival to this specific location. Winchester Dam (RM 7) counts on the lower North Umpqua River also show there is "homing" to the Rock Creek hatchery from the juvenile rearing at this facility even though genetically these hatchery fish may be predisposed to return to the upper #14 #15

Cow Creek Basin. A direct release of coho smolts from Rock Creek hatchery would be a cost-saving measure for ODFW as the "acclimation site" is already established and hauling cost would be decreased. Alternate release sites would reduce the amount of time and space wherein naturally-occurring coho interact with naturally occurring coho.

ODFW already has three current trapping facilities on the North Umpqua that could be operated to capture, transfer, recycle, or remove live hatchery fish; or use fish for carcass placement projects or foodbank programs. All of these facilities are located above sections of the North Umpqua River that has an open fishery season on returning hatchery coho salmon during the peak upstream migration period (October-November). During this same period, the South Umpqua River is closed to all fishing and no hatchery fish are harvested. The North Umpqua fisheries below Winchester Dam and below Rock Creek are very popular and both have excellent public access for several anglers, including County and BLM parks. Hence, overall harvest rates on returning hatchery coho to the North Umpqua would be much higher compared to the current harvest rates on hatchery coho returning to the South Umpqua.

ODFW currently has many volunteers that assist with the trapping program at Galesville, which requires driving nearly 200 miles on several occasions. These same volunteers already assist ODFW at Rock Creek hatchery on a regular basis and would be available to help with trapping operations closer to the immediate Roseburg area.

Douglas County believes there are opportunities under this or similar recommendations for acclimation and release of coho smolts other than below Galesville Dam that would still meet the mitigation agreement with ODFW. We are willing to work closely with interested agencies to ensure the hatchery program overall goals under the current FERC license requirements and conditions are not significantly modified. #16

We are providing the following more specific comments to the HGMP to help clarify the Coho Salmon (stock-18) Hatchery Program that is funded by Douglas County under the FERC license order Project No. 7161 as part of the mitigation of lost anadromous fish habitat in upper Cow Creek above Galesville Dam in the South Umpqua Basin. Douglas County is very supportive of hatchery programs that provide harvest opportunities for both ocean and freshwater fisheries. We will also continue to work closely with agencies and interested parties to increase the viability and sustainability of our wild fish populations, especially the currently Oregon Coast ESA-listed coho salmon that has shown significant populations' recovery in the past decades. #17

Specific Comments to HGMP (Section, Page)

1.4, page 3. Douglas County funds an average (past 10-year) of $29,200 annually for the coho hatchery program. 2016 funds were $32,000. #18

1.6 and 1.7. page 6. As noted in earlier comments, the type and goals of the program stated in the HGMP provided by ODFW are not the same requirements of the FERC license mitigation agreement. We believe there are some biological concerns related to the hatchery stock genetic and ecological #19

interactions with ESA-listed wild coho in the Cow Creek subbasin especially given the most recent (5 to 10 years) changes to the program.

1.8 page 6. The FERC mitigation requirement is not specifically stated as 60,000 coho smolts. The agreement states "a hatchery pond of juvenile coho". ODFW has recommended the 60,000 release level and location each year. Douglas County has provided the required fish rearing funds to Rock Creek hatchery and the trapping facility at Galesville annually. #20

1.8 page 6. Since ODFW decided to discontinue all of the other hatchery coho smolt releases in the Umpqua Basin in 2008 that were funded by their agency, we agree that the "program meets the dual role of meeting mitigation needs and is the only program providing fish for a popular fishery." The cost of rearing hatchery coho smolts has continued to increase and is much higher than the comparable inflation rate since 1986. The County supports sustainable fisheries and would like to see the highest level of opportunities that can be provided from hatchery programs, given funding sources are limited. #21

1.9 (14), page 9. Performance standard 14 includes "Adults collected represent the spectrum of the run and timing of hatchery adult returns to Galesville Dam overlaps wild coho returns." Douglas County provides the fish collection facility below Galesville Dam for ODFW to operate the trapping of coho adults annually. In recent years, ODFW has not continuously operated the trap throughout the entire normal run-timing of wild coho in Cow Creek. For example, one year all of the brood fish were taken during only a couple days of trapping. We understand the limitations of ODFW staff and time, and it should be noted that the County have always made the trapping facility available to ODFW at any time requested during the October-January period. Also, with the further reduction of brood numbers taken for the hatchery program and only a 10% inclusion of wild fish (compared to 30% or more in earlier years), Douglas County has increased concerns for the continued conservation of the genetic and life history diversity of both the ESA-listed hatchery stock and the ESA-listed wild coho within the Cow Creek/South Umpqua population and the Umpqua Basin. #22

1.9 (15) page 10. "Juvenile coho salmon will be released to maximize program benefits and minimize risk to wild populations." We strongly support this performance standard related to ecological impacts. As previously mentioned, we are concerned that the harvest levels and escapement levels are considerably different than during the time of the FERC License mitigation goals. Recent scientific data analysis suggests the current HGMP goals by ODFW most likely do not maximize the program benefits with regards to harvest opportunities, or wild fish natural production from increased rearing habitat in Cow Creek; and at this time does not minimize the risk to wild populations through even more limited trapping and removal of hatchery fish from spawning areas and decreased brood collection operations. From 1994 to 2001, the hatchery stray rate for Cow Creek ranged from 14% to 76%, with an average of 44%. In 2005, ODFW discontinued the spawning survey estimates that provided separate wild and hatchery spawner numbers for Cow Creek and combined these estimates into the much larger South Umpqua Basin estimates. The more recent hatchery spawner percentages provided by ODFW are obviously much lower given the overall miles of spawner miles in the South Umpqua (including Cow Creek) and with all of the smolt releases only in upper Cow Creek at the base of Galesville Dam. Annual trap returns indicate that most years well over 80% of the adult returns to the upper Cow Creek area are #23

hatchery fish. Most trapped hatchery fish are currently released back into upper Cow Creek or not trapped at all. There is a very high likelihood that the progeny (fry) of these primarily hatchery spawners survive more successfully in the very good rearing habitat in the mainstem Cow Creek section below the dam that is a direct result of the augmented flows from the project, compared to the limited summer habitat in the tributaries.

ODFW closes the South Umpqua Basin to the harvest of all fish from mid-September to November 30 to protect fall chinook spawners. The mainstem Umpqua and North Umpqua rivers remain open to coho harvest during these peak potential harvest times occurring for in-river fisheries. Winchester Dam counts indicate there are hatchery coho from the Cow Creek releases that already return to the North Umpqua because of the location of Rock Creek hatchery where they are reared for more than a year. It would be helpful for ODFW to include the Winchester coho counts in the HGMP to show the numbers of hatchery fish (now only Cow Creek releases since 2008) that "stray" into the North Umpqua and at the same time provide a much higher opportunity for anglers to harvest these hatchery fish. #24

1.12 page 12. As previously mentioned, it would be helpful to include the Winchester Dam counts and also complete the full-season of trapping coho to provide the estimated smolt-to-survival rates, adult production levels, and escapement levels for this hatchery program. The HGMP states the goal is to mitigate for loss of habitat above Galesville Dam and provide adult coho for harvest. These numbers would give a more accurate indication of what is actually occurring currently relative to what is required by the FERC license and what are the current ODFW goals. #25

1.14. page 13. Douglas County will continue to meet the FERC license requirements regarding releasing hatchery smolts through 2034 in cooperation with ODFW. We will discuss with ODFW on an annual basis, or more often if needed, to reach agreement with the numbers and locations of coho juvenile releases to satisfy the mitigation agreement for loss of 400 coho production above the dam and provide harvest opportunities for adult coho in the ocean and freshwater fisheries. #26

1.16. page 14. Douglas County has an obligation under the FERC license to meet the mitigation goals of the hatchery program for the loss of habitat due to no fish passage at Galesville Dam since 1986. If ODFW considers the current hatchery program is not meeting the highest mitigation goals for the loss of habitat of wild coho and other species above the dam and/or the best harvest management levels from the hatchery smolt releases, Douglas County would consider alternatives that are within the overall primary and secondary functions of the Project as stated in the FERC license. #27

1.16.2 page 15. Douglas County is willing to consider alternatives that would meet the overall primary and secondary functions of the Galesville Project based on recommendations from ODFW. We believe there are some different alternatives that meet the mitigation goals for the loss of habitat above the dam that would include increased harvest of hatchery coho and further increase the production of wild coho below the dam in Cow Creek. We support the Alternative 2 to acclimate a portion of the hatchery coho releases in a different location in the Umpqua Basin, and specifically recommend Rock Creek hatchery as the best location. #28

3.5(a) page 34. Douglas County strongly agrees that viable habitat now exists below Galesville Dam and hatchery-origin coho salmon could breed with other hatchery fish or with wild fish, resulting in genetic introgression. We respectfully disagree that this hatchery influence is minimal to the current potential production of the overall Cow Creek population and the goals of the Galesville Project for mitigation of the loss of habitat above the dam and the maximum fishery benefits from the hatchery adult returns. #29

3.5(b) page 35. Our broodstock collection and selection comments have been provided above. We will work closely with ODFW to avoid or minimize long-term domestication, or selection, in the hatchery brood population. #30

Sections 4-14. We have similar comments for the remaining sections in the HGMP.

We note various typographic errors in the report that we assume will be addressed in the final e.g. " Rock Hatchery" on page I, "Coos Umpqua" also on p. i. #31

SUMMARY:

Douglas County strongly supports the preferred Alternative 2 evaluated by NOAA Fisheries in the DEIS that approves the current operations of all of the fish hatcheries according to the new HGMP's developed by ODFW. This support is contingent on the acceptance of Douglas County's recommended changes to the Umpqua Basin HGMP for the Cow Creek/South Umpqua Coho Program. Douglas County does not support any of the other alternatives considered in the DEIS that reduce or eliminate hatchery fish production along the Oregon Coast for any of the other species currently reared and released at the ODFW hatcheries.

Douglas County strongly encourages ODFW to modify our Galesville Project's current mitigation hatchery coho program in the Umpqua Basin HGMP to include acclimation of a portion of the hatchery coho smolts to reduce the interaction between hatchery and wild fish in Cow Creek and the Umpqua Basin. We also suggest an acclimation site located at Rock Creek Hatchery would increase the harvest rates for hatchery coho returns and provide more biological and economic benefits from the County-funded mitigation program under our FERC license that doesn't expire until 2034. This recommendation is similar to the Alternative 2 for the current hatchery coho program in ODFW's most recent updated HGMP submitted to NOAA Fisheries as part of the NEPA process. We do not support the Alternative 1 in the HGMP that would eliminate the coho salmon hatchery program in the Umpqua. #32

Our information, concerns and recommendations are provided to help ODFW and NOAA Fisheries review and approve the current best management practices for the Umpqua Basin's Cow Creek Coho Salmon Hatchery Program with regards to the ESA-listed hatchery stock, the ESA-listed wild coho populations, and the overall functions of Douglas County's Galesville Project. There is over 30 years of information and history about the tremendous benefits of the overall project to fisheries and other resources in the Umpqua Basin. We recognize ODFW's hatchery program goals have changed over this period and the ESA-listing of Oregon Coast coho has provided collaborative recovery goals for all stakeholders. We have learned more and more from scientific studies that help managers and funders #33

modify hatchery programs, especially concerning potential adverse impacts to wild fish; yet we recognize our valuable fisheries rely more and more on hatchery fish for harvest opportunities. We believe the next 20 years will be even more successful in mitigating and enhancing fisheries resources through established and new partnerships both directly and indirectly related to the Galesville Project.

We especially appreciate the opportunity to provide specific comments to this updated HGMP as this was not the case with ODFW's update in 2011 and again in 2014. These hatchery coho releases are part of Douglas County's mitigation program for our Galesville Project on Cow Creek and we have a continued vested interest to work closely with ODFW throughout the remaining FERC license term. ODFW District staff biologists have recently been very open and willing to discuss the County's concerns and possible alternatives that meet current management goals that are mutually beneficial to everyone involved in Umpqua Basin fisheries and fish populations. Douglas County is committed to working together with agencies and interested parties into the foreseeable future, and hope our comments offer a good understanding of how important these resources are to our local communities for their future economic well-being and the continued ecological health of our watersheds. #34

NMFS Responses to Comments from Douglas County, letter dated October 20, 2016.

Letter #	Comment #	NMFS Response
2	1	Noted.
2	2	Noted.
2	3	Noted.
2	4	Noted.
2	5	For the purposes of NEPA, the comment is noted. Procedurally, changes to the HGMP would have to be implemented by the program operator and submitted to NMFS for review. However, the ESA §4(d) review process includes the opportunity for public comment on the contents of the HGMPs, and we will direct these comments to the operator accordingly.
2	6	Noted.
2	7	Noted.
2	8	Noted. As ODFW, NMFS, and Douglas County have discussed, changes made to the S.Umpqua coho HGMP to correct errors cited in this letter.
2	9	As ODFW, NMFS, and Douglas County have discussed, there were modifications made to the S.Umpqua coho HGMP. However, NMFS requested ODFW allow for the potential use of surplus juvenile coho salmon to be used in Galesville reservoir exclusively for trout fisheries in the event of surplus production.
2	10	Noted. NMFS reviews and evaluates the submitted HGMP under the ESA. In the case of the coho HGMP, ODFW proposes a release of 60,000 smolts annually. We are evaluating that release number.
2	11	Noted.
2	12	Noted. Clarifications made by ODFW in the HGMP.
2	13	Noted.
2	14	Noted.
2	15	Noted. This comment was discussed among ODFW, NMFS, and Douglas County. Due to other biological concerns (hatchery coho salmon strays in the North Umpqua), ODFW and NMFS agreed to keep the releases as proposed in the HGMP.
2	16	See response 2-15.
2	17	Noted.
2	18	Noted.
2	19	Noted. Clarifications made by ODFW in the HGMP.
2	20	Noted. NMFS reviews and evaluates the submitted HGMP under the ESA. In the case of the coho HGMP, ODFW proposes a release of 60,000 smolts annually. We are evaluating that release number.
2	21	Noted.
2	22	Noted. Further clarifications were made after discussion among ODFW, NMFS, and Douglas County.
2	23	Noted.
2	24	Noted. This is evaluated under the ESA.

2	25	Noted.
2	26	Noted.
2	27	Noted.
2	28	Noted.
2	29	Noted.
2	30	Noted.
2	31	Noted.
2	32	See response 2-15.
2	33	Noted.
2	34	Noted.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue, Suite 900
Seattle, WA 98101-3140

OFFICE OF
ENVIRONMENTAL REVIEW
AND ASSESSMENT

October 25, 2016

Mr. Lance Kruzic
NMFS, Oregon Coast Hatchery DEIS
2900 NW Stewart Parkway
Roseburg, Oregon 97471

Dear Mr. Kruzic:

The U.S. Environmental Protection Agency has reviewed the August 2016 Draft Environmental Impact Statement (DEIS) to Analyze Impacts of the National Marine Fisheries Service (NMFS) Proposed Approval of the Continued Operation of 10 Hatchery Facilities for Trout, Salmon, and Steelhead Along the Oregon Coast, as Described in Oregon Department of Fish and Wildlife (ODFW) Hatchery and Genetic Management Plans (HGMP) Pursuant to Section 4(d) of the Endangered Species Act (ESA) (EPA Region 10 Project Number: 16-0007-NOA). #1

Project Summary

The DEIS assesses environmental impacts associated with the NMFS's review and approval of HGMPs submitted by the ODFW for hatchery programs along the Oregon Coast. There are four alternatives: Alternative 1 (No-action) - "status quo", Alternative 2 (Proposed Action/Preferred Alternative) – hatchery programs operated as described in the HGMPs, Alternative 3 (Terminate Hatchery Programs on the Oregon Coast), and, Alternative 4 (Reduced Hatchery Production). #2

EPA Review

Our review was conducted in accordance with the EPA's responsibilities under the National Environmental Policy Act and Section 309 of the Clean Air Act. Section 309 directs the EPA to review and comment in writing on the environmental impacts associated with all major federal actions. Our review of the DEIS prepared for the proposed action considers expected environmental impacts and the adequacy of the EIS in meeting procedural and public disclosure requirements of the NEPA. We are rating the DEIS "EC-2," Environmental Concerns – Insufficient Information. Rationale for the rating is given below and a copy of our rating system is attached. #3

Environmental Concerns

We are rating the DEIS "Environmental Concerns" because there are environmental impacts that should be avoided in order to fully protect the environment. We are concerned about potential adverse impacts to salmon and steelhead, including: short- and long-term risks associated with genetic effects, competition and predation, facility effects, masking of natural population status from hatchery fish spawning, incidental fishing effects, and transfer of pathogens from hatchery fish and/or the hatchery facility to the adjacent river or stream.[1] We are also concerned potential adverse impacts to water quality #4

[1] DEIS, p. 4-34

from hatchery operations will expose aquatic organisms to higher concentrations of chemicals, viruses, parasites, and bacteria within the outfall plume immediately below the hatchery facilities.[2] #5

Insufficient Information

We are rating the DEIS "Insufficient Information" because the DEIS does not include an alternative focused on maximizing hatchery improvements, while holding production levels constant - as suggested in our 2016 scoping comments. We believe that a non-production level alternative, such as the eliminated "Attaining Hatchery Program Goals by Alternative Actions and Reforms", would provide a viable alternative to the Proposed Action, would meet the project's purpose and need, and appears to be more achievable given NMFS' authority. #6

While the DEIS's Proposed Action does not include new or additional protections for hatchery related adverse effects, we understand that NMFS' review and approval of hatchery programs under the ESA will have the influence - over time - of decreasing effects on natural-origin salmon and steelhead and other resources. NMFS' Recovery Plans for Oregon Coast Salmon and ODFW's 2014 *Coastal Multi-Species Conservation and Management Plan* are examples of how the overall ESA and salmon conservation framework addresses risk to salmon and steelhead, including from hatcheries. #7

Recommendation

To address our environmental and information concerns, we recommend that the FEIS describe the entities and processes which consider and carry out suggestions for hatchery improvements (e.g., those included in section 1.16 of the HGMPs). As appropriate and to the extent possible, we recommend that NMFS take the submitted HGMP section 1.16 improvements into consideration for this project's FEIS, Record of Decision, Evaluation and Recommendation Determination, and 4(d) rule approval letter. #8

Thank you for this opportunity to provide comments and if you have any questions, please contact me at (206) 553-1601 or littleton.christine@epa.gov, or Erik Peterson of my staff at (206) 553-6382 or peterson.erik@epa.gov. #9

Sincerely,

Christine B. Littleton

Christine B. Littleton, Manager
Office of Environmental Review and Assessment

Enclosure:

1. U.S. Environmental Protection Agency Rating System For Draft Environmental Impact Statements

[2] DEIS, p. 4-11

U.S. Environmental Protection Agency Rating System for Draft Environmental Impact Statements Definitions and Follow-Up Action*

Environmental Impact of the Action

LO – Lack of Objections

The U.S. Environmental Protection Agency (EPA) review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

EC – Environmental Concerns

EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce these impacts.

EO – Environmental Objections

EPA review has identified significant environmental impacts that should be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no-action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

EU – Environmentally Unsatisfactory

EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potential unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the Council on Environmental Quality (CEQ).

Adequacy of the Impact Statement

Category 1 – Adequate

EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis of data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

Category 2 – Insufficient Information

The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses or discussion should be included in the final EIS.

Category 3 – Inadequate

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the National Environmental Policy Act and or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

* From EPA Manual 1640 Policy and Procedures for the Review of Federal Actions Impacting the Environment. February, 1987.

NMFS Responses to Comments from the U.S. Environmental Protection Agency, letter dated October 25, 2016.

Letter #	Comment #	NMFS Response
3	1	Noted.
3	2	Noted.
3	3	Noted.
3	4	Noted.
3	5	Noted. The EIS evaluates the effects on water quantity and water quality from the operation of the hatchery facilities.
3	6	Noted. Per this comment, NMFS included an alternative that included the implementation of hatchery reforms identified in section 1.16 of the HGMPs. This is now Alternative 5 in the FEIS.
3	7	Noted.
3	8	See response 3-6.
3	9	Noted.

Coastal Hatcheries Draft Environmental Impact Statement

Draft comments prepared by Wayne Hoffman on behalf of the MidCoast Watersheds Council

We find this draft Environmental Impact Statement (DEIS) to be grossly inadequate and insufficient to meet the requirements of the National Environmental Protection Act (NEPA). We find that the information presented in support of the proposed action is in numerous cases incorrect, and that much relevant information has been omitted. We also find that some of the analyses performed to support the proposed action are weak, incomplete, and inadequate to the task, and ignore relevant information that would tend to lead to other conclusions. We also find this DEIS does not adequately protect threatened OC Coho and SONCC Coho from take. Specifically, we find that it does not protect OC Coho and SONCC Coho from competition and other deleterious interactions with hatchery-raised salmon smolts, nor from competition with stray adult hatchery salmon. It also does not adequately protect OC Coho and SONCC Coho from disease outbreaks originating in hatcheries. In these comments we will document our concerns about the inadequacies of this DEIS.

#1

#2

I. We find it puzzling and disappointing that this DEIS NOAA does not make reference to the report issued in 1998 by Oregon's Independent Multidisciplinary Science Team (IMST) titled "Review of the Hatchery Measures in the Oregon Plan for Salmon and Watersheds." This report concluded that the description of Oregon coastal hatcheries and practices in the Oregon Plan was inadequate in several respects. First, hatcheries were in general not meeting their objectives, and the Oregon Plan did not adequately address effectiveness. Second, the Oregon Plan did recognize that hatchery management does impact wild populations, but in relying on stray rates, does not adequately assess the degree of impact. Third, the Oregon Plan does not prescribe adequate monitoring of hatchery programs. Fourth, the hatchery programs need fundamental change on order to support recovery of wild stocks. It appears that the DEIS has not fully acknowledged these problems with Oregon's coastal hatchery programs. Modifications to the programs described in ODFW's HGMPs do address some of the issues raised, but it appears that neither ODFW, nor NOAA as evidenced by this DEIS, sees a need to fully implement the recommendations of this report. At a minimum, the DEIS needs to acknowledge this report and its recommendations, and either demonstrate that the programs currently address all of them, or provide explicit rationales for not needing to addressing them.

#3

II. The choice of alternatives to evaluate is deeply flawed. It is required that EISes include a "No Action" alternative, which in this case NOAA takes to mean they do not issue decisions on the submitted HGMPS for the 10 hatcheries and 42 programs under consideration, so that ODFW can continue to operate as they have been under submitted but not approved HGMPs, without formal approval. The "Preferred Alternative" is to approve *en bloc* the

#4

program as described in all the submitted HGMPs. The other alternatives examined are (3) to close all the hatcheries, and (4) to cut all hatchery releases by 50%.

a. The first problem here is that we think NOAA has the statutory responsibility to approve, demand modifications to, or deny the submitted HGMPs, so the "No Action" alternative is not really an option. #5

b. The second problem is that the "No Action Alternative" and "Preferred Alternative" are essentially the same. The distinctions are only administrative, thus amount to a distinction without a difference. Under both, hatchery programs would continue to be operated according to the submitted HGMPs. In the longer term there might be differences in how ODFW would need to proceed if it wanted to change some hatchery practices, and NOAA likely would have to follow different procedures in Section 7 consultations, but on-the-ground differences appear to be nil. #6

c. The third problem is that Alternative 4 is a nonsense alternative. It is not an approach that any rational hatchery system manager would consider. It is economically wasteful, and not sensitive to the issues of hatchery/wild interactions. #7

d. The fourth and most important problem is that all the alternatives treat all the hatcheries and all the programs equally. The alternatives do not acknowledge that different hatcheries and different programs are not equal in their risks to wild salmonid stocks. What is needed is an alternative or set of alternatives that evaluate the hatcheries and programs separately or at least in groups, according to their differences in risk. Thus programs that are currently meeting the <10% stray rate criterion could be treated differently than programs that are seriously in violation of it. Multiple Winter Steelhead programs are chronically out of compliance in stray rates, and the DEIS needs to require different treatment for these. Facilities that have more serious water quality problems in their effluent could be treated differently than ones that are currently cleaner. The DEIS claims in effect that the different hatcheries have the same risks for transmitting disease to wild fish, and that this risk is negligible beyond a small and uniform "mixing zone" below the hatchery discharge, which is "estimated" without considering the differences in river flow. It is not reasonable that a "mixing zone" for Cole River hatchery, on the very large Rogue River would be the same as that at Elk River, where at times nearly the whole flow of the river goes through the hatchery. We can go on and on, but the bottom line is the different hatcheries and programs need to be evaluated on their own merits, and the riskier ones need to be shut down or modified, while the least risky may be approved as is. #8

III. Hatchery-specific alternatives that were proposed in public feedback earlier in the DEIS development were discarded. For example, alternatives to discontinue all Coho hatchery #9

programs, and the Coos Bay Chinook Salmon program were mentioned, but NOAA chose not to evaluate them. This decision was justified by claiming (P. 2-4) "This alternative would result in reductions in socioeconomics, in that harvest capability would be reduced and the income generated by that harvest would be reduced; the likely effects on both harvest and financial benefits would likely be similar to the effects of Alternative 4, Reduced Hatchery Production," and "consideration of the elimination of the hatchery coho salmon and the largest hatchery salmon programs does not provide additional insight on impacts compared to Alternative 4." This is of course not true. First, while the coastwide reduction in harvest might be fairly similar to Alternative 4, the distribution of that reduction would be very different, with very different effects on local communities. Second, the primary reasons for crafting this discarded alternative in the first place was to manage "the largest genetic and ecological impacts on the only ESA-listed fish species, Coho salmon, and, therefore, their elimination would provide the largest reductions in those impacts." The decision not to analyze this alternative means the effectiveness of it in managing genetic and ecological impacts on Coho remains un-analyzed (or at least unreported). The analysis of Alternative 4 does not in any way address the genetic and ecological issues that led to these potential alternatives. The choice to develop a DEIS that chooses not to analyze acknowledged differential impacts does not meet the requirements of NEPA nor of the ESA.

IV. The analyses of "ecological interactions" are inadequate because they consider only interactions of recently-released juveniles (pre-smolts and smolts) with wild juveniles. Returning adult hatchery fish do have the potential to interact with wild adults in a variety of ways (e.g., aggressive interactions during courtship, digging up pre-existing redds) but these are omitted from the analyses. #10

V. The DEIS contains multiple incorrect descriptions of wild salmonid stock distributions on the Oregon Coast. For Steelhead (P. 3-27) the DEIS lacks an accurate description of current distribution, particularly for summer-run fish. The DEIS states correctly that natural runs of summer-run Steelhead are limited to the Siletz, north Umpqua, and Rogue rivers. However, the DEIS fails to mention here that ODFW is releasing hatchery Summer-run Steelhead in multiple north-coast basins. The 2016 Oregon Angling Regulations allow summer targeting and retention of hatchery steelhead in at least the Siletz, Nestucca, Tillamook, and Nehalem basins. This omission is important because of the potential of these released smolts to compete with, prey on, or attract predators to naturally-reared salmonids, and the potential for adverse interactions of adults in spawning areas. Also, (P.3-25) "Independent populations of spring Chinook salmon occur only in the Rogue and Umpqua Basins, which drain the Cascade Mountains. Smaller, remnant runs of spring Chinook salmon occasionally occur in the coast range basins of the Siletz, Tillamook, Nestucca, Coquille, and Alsea Rivers." These statements are categorically untrue. The Siletz and Alsea runs are small but quite persistent. To my knowledge, there have been no years with none found in one of these rivers since annual monitoring was begun. These errors are important, as they allow NOAA to disregard real risks to sensitive stocks. #11

VI. The DEIS also misstates the distributions and life histories of other fish inhabiting the Coast Range. This is particularly evident in Table 7: (Pp.3-31 to 3-34). This table is full of misinformation, and needs to be edited by someone with detailed knowledge of Oregon coastal fish distribution and biology. For example, Western Brook Lamprey are not parasitic; Large-scale Suckers do not occur on the coast north of the Siuslaw basin, and from there south, their taxonomy is different from what is presented; and American Shad are more widely distributed than indicated. #12

VII. The DEIS consistently under-reports the incidence of hatchery stray adults on spawning habitat. For example, (P. 3-26) "Most of the fall Chinook salmon populations have zero hatchery-origin fall Chinook salmon on the spawning grounds." ODFW spawn surveys and creel surveys document annual presence of fin-clipped Chinook in most populations. Straying happens, and needs to be acknowledged. For Winter Steelhead, (P. 3-27) "The percentage of hatchery winter steelhead on the spawning grounds ranges from approximately five percent in southern Oregon to a high of 22 percent in the mid-coast region of the Oregon Coast (Jacobsen et al. 2015)." The level of 22% is more than double the standard of 10%, so clearly needs to be addressed, rather than just rubber-stamped. Further, the DEIS ignores the fact that there are not only strays within the basins with releases, but also inter-basin strays into basins without releases. Oregon manages the Winter Steelhead fishery as primarily a catch-and-release fishery on streams without hatchery releases, but allows retention of fin-clipped fish wherever they allow Steelhead fishing, and hatchery fish are relatively common throughout. For example, the 2016 Angling Regulations specify "open for hatchery Steelhead" for Cummins Creek, Ecola Creek, Neskowin Creek, Rock Creek (Lane Co.), Sand Lake, Tenmile Creek, Yaquina River, and Yachats River, none of which currently have hatchery releases. So obviously hatchery Winter Steelhead are straying widely from the basins with hatchery releases, in numbers adequate to trigger harvest regulation. On P. 4-32, the DEIS repeats the error of under-reporting straying and its effects: "Natural spawning by hatchery steelhead is likely to be concentrated most in the areas around where the fish were released as smolts. Consequently, natural-origin fish will be most affected in these areas." This may seem logical, but in fact is contradicted by ODFW's spawning survey and trap data, at least in the Midcoast basins. Again, hatchery Winter Steelhead are straying widely throughout the basins with releases, and are encountered with regularity in basins without releases. The situation in the Siletz with Summer Steelhead is even more problematic. The core spawning areas for Siletz Summer Steelhead are above a waterfall (Siletz Falls) with a fish ladder and trap. Hatchery steelhead caught in the trap are removed from the river or recycled downstream. Hatchery smolts are released downstream as well. These actions were believed to exclude the hatchery Summer Steelhead from the core natural spawning areas. However, extensive snorkel surveys in summer 2015 found high percentages of fin-clipped fish above the falls, indicating that it is not an effective barrier, and that the population is being subjected to high risk of adverse genetic effects. #13

VIII. The "Wildlife" section is inadequate because it omits documentation or analysis of the most direct interactions between wildlife and hatchery operations: wildlife as predators of juvenile fish in the hatchery, and control efforts to prevent these depredations. In addition, Table 8 should be edited by a competent mammalogist: e.g. despite popular misconceptions, beavers are not fish predators. #14

IX. The Socioeconomic analyses contain enough questionable statements to cast doubt on their overall conclusions. For example, on P. 3-38 an ODFW study (2014a) report is being misused. The numbers quoted in the DEIS allege that ODFW claimed 100% of the angling effort "in the bays and rivers of the Oregon Coast ESU" targeted salmonids. This is of course not true: significant angler effort is directed to fishing for American Shad, Striped Bass, and Smallmouth Bass, particularly in the Umpqua basin, for Herring in multiple estuaries, for surfperch in some, etc. This error may not be central to the conclusions in regard to the environmental impacts of the hatchery operations, but it is a measure of the lack of care evident in preparation of this document, and does not inspire confidence in the overall effort. In addition, (P. 3-39) the DEIS states "All of the Oregon Coastal hatcheries have an economic benefit:cost ratio greater than one (ODFW 2010)." Given the multiple sources of uncertainty in these analyses, this statement should be qualified, e.g. as "ODFW has estimated that all of the Coastal Hatcheries have…". A particular bias in these analyses is over-attribution of sports equipment purchases and travel. Thus, camping equipment intended for multiple use is likely to appear in these analyses as if its purchase were solely for the trip under investigation, and full cost of multipurpose trips tend to be attributed to fishing. This inflates the numerator leading to gross overestimates of expenditures per fish and per year. #15

X. The "Environmental Justice" section is a mishmash of inappropriate analyses and obfuscation that appears to be designed to hide rather than deal with the real Environmental Justice issues associated with the hatchery programs. This section may have been #16

> "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,"

(P. 3-43) but it largely misses the point of Environmental Justice concerns. According to Table 10, Curry County is a "community of concern" for American Indians (2.0 % of the population) but Douglas County, with a much larger American Indian population is not, because its percentage is "only" 1.9%? Not to worry though – when a few thousand more retirees from California move to Brookings, the status will be "resolved" by dilution without having to do anything of relevance to or for the American Indians in Curry County. In reality, government programs such as this hatchery program can affect minorities and

disadvantaged people as individuals, whether or not they are living in recognizable communities. The effects of harvest regulations on subsistence fishing can be pernicious, for example, whether or not the victims are clustered in ways that show up on geographic analyses of census data.

To actually address "Environmental Justice" the DEIS needs to answer a series of questions about potential and real impacts of hatchery practices on minority and low-income communities. These would begin with the following non-comprehensive list:

1. Do ODFW harvest regulations differentially affect minority and low-income communities? And if so, do the hatchery programs play a role in this differential treatment?
2. Do the siting and operations of hatcheries and hatchery releases affect minority and low-income communities?
3. Are license policies, bag limits, and fee structures discriminatory with respect to minorities and/or income levels? And if so, do the hatchery programs play a role in this differential treatment?

Clearly the answer to the first question is yes: Numerous harvest rules promote harvest from boats over harvest from the banks (hence harvest by well-to-do anglers over lower-income anglers). They also promote interests of guide boat operators over interests of non-guided anglers. Ownership of boats and use of guide services are related to economic status. Discriminatory rules include "party-fishing" rules that allow individuals in a boat that have harvested their limit to continue fishing "for" their companions (not allowed for bank fishing), and the relatively new "two rod rule," among others. As to whether hatchery operations contribute to this "Environmental Injustice," it appears that the changes in hatchery programs in the "Coastal Multi-Species Conservation and Management Plan" tend to shift releases away from streams with more bank/wading opportunities to streams with heavier boat use. Additional Environmental Justice effects likely can be found with further analysis.

The answer to the second question might be no, but it still needs to be fully analyzed, and on a scale much smaller than counties.

The answer to the third appears to be yes. Historically, fishing was a subsistence activity for many Oregonians, and particularly for tribal members and rural economically-disadvantaged residents. The structure of current harvest regulations tends to favor well-to-do "trophy anglers" over subsistence fishers. In particular, reductions in annual bag limits, including stream-specific annual limits, make subsistence fishing difficult. Do the hatchery programs contribute to this policy of favoring "trophy fishing" over subsistence fishing? The answer is not clear without further analysis, but NOAA also needs to ask itself what other support they may be providing to these unjust practices.

XI. The analyses of risks of disease transmission from hatcheries to wild populations are flawed and inadequate because they are primarily based on analyses done at Willamette Basin hatcheries which are mostly located on much larger streams than most of the coastal hatcheries. Further, the DEIS appears to misrepresent these studies. From P. 4-11, #17

> "Bartholomew (2013) found hatchery-related disease and pathogen transmission and outbreak in effluent of Willamette River hatchery facilities to be localized, with greatest mortality occurring at the hatchery and no mortality of fish observed in the receiving waters 400 feet downstream from the hatchery. Therefore, the potential adverse impacts are expected to be temporary and confined exclusively to the small area directly at the hatchery outfall. No impacts are expected on critical habitat and EFH as the effluent dilutes downstream (see Chapter 3, Affected Environment)."

This passage has several problems. First, the citation Bartholemew (2013) appears to be to a grant progress report, not a peer-reviewed publication. Exploration of the actual publications on this subject from Dr. Bartholemew's program seem to indicate that this DEIS has overstated their findings. It appears that surveillance was mainly in the facilities and in the first 400 feet of receiving waters. Second, the statement that "the potential adverse impacts are expected to be temporary and confined exclusively to the small area directly at the hatchery outfall" does not follow from the research findings, and I doubt that Dr. Bartholemew would endorse it. The normal progression of an epizootic involves the infection of some individuals, and sequential infection of others they encounter as they move about (or drift downstream). So if a few wild fish were infected just below the outfall, they likely would move downstream as they became debilitated, hence their mortality is not so likely to be seen in the first 400 feet (the experiments used caged sentinel fish), and their role as secondary vectors of infection cannot be discounted. Third, as noted above, the Willamette hatcheries studied are on much larger streams than several of the coastal hatcheries, so assumption of the same dilution rate is disingenuous.

XII. The description of "Effects on Salmon and Steelhead and Their Habitats" (P.4-13) is inadequate in several respects.

a. The DEIS lists 3 effects hatchery releases can have on salmon and steelhead: genetic effects from interbreeding, competition with and predation on wild fish, and infection with diseases. At least two additional important effects are omitted. The fourth effect is stimulation of predators by mass hatchery releases to concentrate their efforts on juvenile salmonids and thus increase predation levels on juvenile wild salmonids. The concepts of search image and prey switching are well studied in predator-prey ecology, and substantial information exists to indicate this is happening with salmonid smolts. Effects are not necessarily limited to conspecifics, as mass releases of one species can #18

stimulate additional predation on other species. The fifth effect is ecological interaction by straying adult hatchery fish in wild spawning habitat. Straying adult hatchery fish can have ecological as well as genetic effects in spawning habitat, e.g. through aggressive competition and by excavating on top of existing redds. Again, effects may not be limited to conspecifics. Straying hatchery Winter Steelhead might excavate redds on top of existing Coho redds, for example.

b. Further, Table 12 (Pp. 4-15 to 4-16) purports to rate the risks of interaction between hatchery and natural-origin salmonids. There are multiple problems with the information presented. #19

i. First, the table only provides a single rating per river, even for basins with multiple hatchery programs, indicating that NOAA is not sensitive to potential differences in risk to different species within a basin.
ii. Second, the methodology for determining ratings is not explained. Is it just based on percent of each species' habitat traversed by downstream migrant hatchery fish? Given that the different species of wild salmonids in the system will have different ranges (miles of occupied stream), how are the effects on different species combined?
iii. Third, some of the ratings are counterintuitive, given documented stray rates. For example, the Salmon River is given a "Low" risk rating despite year after year Chinook stray rates far out of compliance (ODFW has promised some changes in hatchery infrastructure and operations to reduce this problem, but these have not yet been proven effective). As a second example, the interaction risk for the Siletz is ranked "Low" despite recent (2015) information that ODFW's procedures to keep hatchery Summer Steelhead from reaching the main spawning areas are ineffective, and stray rates are far out of compliance for this sensitive stock.
iv. Fourth, other ratings are hard to understand, given other aspects of hatchery situations and operations. For example, according to information presented elsewhere in the DEIS, the Elk River hatchery affects a relatively long reach of river, and during summer minimum flows, may use most of the flow in the river at this point. This raises the specter of impaired passage past the facility because of lack of flow, so a "low" ranking is difficult to understand.
v. Fifth, the table only includes the basins with hatchery releases, implying by omission that those are the only basins with potential interactions. In reality, stray hatchery fish (particularly steelhead) appear in most if not all basins, with or without releases.
vi. Sixth, and perhaps most important, this section of the report does not explain how the 15 basin ratings (high, medium, and low risk) are used to evaluate the 4 alternatives. The table lists three basins with "High" risk and four with "Medium" risk out of the 15 basins included. How many basins with "high" risk

would there have to be, to change NOAA's preference for Alternative 2? It is difficult to understand how three high-risk basins and four medium-risk basins out of 15 can be consistent with the choice of Alternative 2 as the "Preferred Alternative?" Would four high-risk basins change this outcome? Five? Eight? On page 4-33 the DEIS states that under the preferred Alternative 2,

> "The hatchery programs would continue to pose short- and long-term adverse risks associated with genetic effects, competition and predation, facility effects, masking of natural population status from hatchery fish spawning, incidental fishing effects, and transfer of pathogens from hatchery fish and/or the hatchery facility to the adjacent river or stream. The hatchery programs would continue to provide some benefits to salmon and steelhead from hatchery fish carcasses and nutrient cycling in the ecosystem."

This clearly illustrates how unsatisfactory the choices of alternatives to evaluate in the DEIS were. The appropriate way to evaluate the hatchery programs would be to evaluate alternatives that differentiated among hatcheries and programs. Programs that contribute the most to increased risk should be held to a higher standard than those that do not. It is possible that the riskiest programs are also the ones that contribute the most socioeconomic benefit, potentially justifying acceptance of the risk, but the DEIS does not partition the socioeconomic benefit among the programs, so that case cannot be made with the information provided. More likely, the 42 programs include a few "dogs" that are more risky, but contribute less socioeconomic benefit, and should not be tolerated. The DEIS is inadequate in that it presents neither the information to evaluate this possibility, nor the analytical framework (meaningful alternatives) to support such analyses.

c. The figures (Figures 13 – 20, Pp. 4-16 to 4-23) and explanatory text on P. 4-25 highlighting the portions of the basins extending from hatchery release sites down to the ocean are labeled "Geographic extent of the interaction area…" which is disingenuous and misleading, because straying adult hatchery fish certainly do not restrict themselves to the mapped portions of these basins, and interactions between straying adult hatchery and wild fish can and do occur throughout the accessible habitat in all the basins. Again, interactions between hatchery and wild adults can be ecological as well as genetic. In addition, by only mapping the basins with releases, the DEIS is again ignoring straying among basins. #20

In summary, we find this draft Environmental Impact Statement deficient in numerous respects, and inadequate to meet the requirements of NEPA and the ESA. We recommend that NOAA revise this draft to include analyses of more realistic alternatives, including alternatives that would treat higher-risk #21

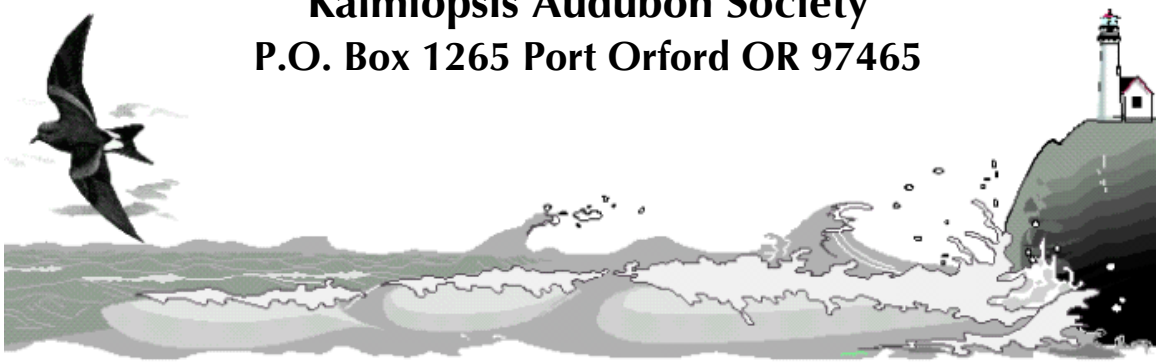
hatcheries and programs differently than lower-risk ones. We also recommend that NOAA undertake a peer-review process to verify the information sources upon which the analyses are based. At a minimum, the distributions of the various fish stocks need to be accurately described. We also recommend that NOAA conduct more complete analyses of the effects of the hatchery programs, to include the various real and potential interactions and sources of risk delineated above, including influences on predator behavior and ecological interactions of straying hatchery adults. We also recommend that NOAA strengthen their analyses of disease risk to take into account differences in stream sizes (flow volumes) at the hatchery locations Finally we strongly recommend that NOAA take the issue of Environmental Justice seriously, and not just treat it as a statutory requirement requiring lip service. Instead NOAA needs to conduct a thoughtful analysis of potential environmental injustices at the scale of vulnerable communities (not counties), and addressing these communities' real-world interactions with fishing opportunities and hatchery programs.

NMFS Responses to Comments from Wayne Hoffman on behalf of the MidCoast Watershed Council.

Letter #	Comment #	NMFS Response
4	1	Noted. NMFS appreciates the constructive feedback.
4	2	Noted. NEPA is a procedural statute, and it requires NMFS to thoroughly evaluate the impacts on ESA-listed coho salmon from the proposed hatchery programs in an EIS (in this case). It does not prescribe specific outcomes such as emphasizing salmon protection. However, the review of the HGMPs under section 4(d) of the Endangered Species Act requires NMFS to determine that standards are met to limit risk to ESA-listed species.
4	3	Noted. In preparing this EIS we are required to employ the best available science, including the most up-to-date information on a subject. The report cited in this comment is outdated (1998). The hatchery coho salmon programs in the HGMPs would be significantly reduced from the levels assessed in this 1998 report.
4	4	Noted.
4	5	Noted. NEPA requires agencies to examine a reasonable range of alternatives in order to fully inform the decisionmaker of the environmental consequences of the action, even if some of those alternatives might not comport with the agency's purpose and need. The commenter is correct that NMFS' action is to make a yes-or-no call on the adequacy of the HGMPs, but limiting the alternatives to approval and denial of the action would not comprise a true range in the spirit of NEPA. Note that the Council on Environmental Quality advises agencies to review all "reasonable" alternatives, even if they are outside the agency's authority. Council on Environmental Quality, Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations, 46 Fed Reg 18,026 (March 23, 1981).
4	6	Noted. The No-action Alternative is the agency's best estimate of what is likely to occur in the absence of federal action. Note that alternative 3 includes a shutdown of hatchery programs.
4	7	Disagree. Alternative 4 is a reasonable alternative as part of the range of alternatives to be reviewed.
4	8	Noted. In the final EIS, an additional alternative 5 was evaluated that includes terminating the highest risk hatchery programs and implementing more hatchery reforms on the remaining programs.
4	9	In response to this and similar comments, NMFS included Alternative 5 in the FEIS that specifically evaluated the termination of the highest risk hatchery programs to natural salmon and steelhead populations based upon available information on pHOS, identified management goals, etc. Also see response 4-8.
4	10	Noted. In the FEIS, NMFS provides further information on pHOS in all salmon and steelhead populations, which provides the best indication of potential density dependent effects of adult hatchery fish spawning. In general, the overall densities of salmon and steelhead spawning in the Oregon Coast region is far lower than densities typically associated with redd superimposition, etc. pHOS provides the best measure of this interaction and for most populations pHOS is low. See FEIS Chapters 3 and 4.

4	11	Noted. NMFS believes our characterization of the status and distribution of salmon and steelhead along the Oregon Coast in the EIS is correct. We added additional information on spring Chinook in the Siletz, Tillamook, Nestucca, Coquille, and Alseas rivers to show the populations occur annually but in low numbers in the FEIS.
4	12	Noted. NMFS believes our characterization is correct in Table 7.
4	13	Noted. The EIS acknowledges and assesses all of the best available information on straying of hatchery fish throughout the Oregon Coast region. Straying does occur with every hatchery program, but 100% collection of all returning hatchery fish does not occur. We have updated pHOS information for all of the hatchery programs and their natural populations in section 3.4 of the final EIS. Please refer to this new information.
4	14	Noted. The comment misunderstands Section 4.6, Effects on Wildlife, which describes the effects of the proposed action on wildlife, not the effects of wildlife on fish. Effects to fish which are attributable to the proposed action are covered in sections 4.4 and 4.5.
4	15	Noted. Disagree. NMFS believes it accurately reported the results from socioeconomic studies. The EIS does not state ODFW reported 100% of the angling effort was for salmon.
4	16	Noted. The comment appears to focus on the environmental justice impacts of state actions, rather than the effects on environmental justice of the proposed action. The ongoing environmental justice effects are incorporated into the "affected environment" section, which for environmental justice is section 3.8.
4	17	Noted. Bartholomew (2013) results are directly applicable to hatcheries as applied in the Oregon Coast EIS, and therefore is part of the best available science.
4	18	Noted. This effect was considered under predation effects of hatchery fish on natural salmon and steelhead. See sections 3.4 and 4.4 of the final EIS. For ecological impacts of adult hatchery fish, see response 4-10.
4	19	Noted. Based upon this comment, the final EIS was revised to include additional quantitative metrics on ecological interactions between hatchery and natural salmon and steelhead.
4	20	Noted. However, interbasin straying of hatchery fish among the rivers along the Oregon Coast can occur, but available information shows it to be low. See the hatchery coho pHOS dataset in the EIS (Table 7).
4	21	Noted.

Kalmiopsis Audubon Society
P.O. Box 1265 Port Orford OR 97465



November 8, 2016

Lance Kruzic
National Marine Fisheries Service
Sustainable Fisheries Division
2900 NW Stewart Parkway
Roseburg, OR 97471

Submitted to: *lance.kruzic@noaa.gov*

Re: Draft Environmental Impact Statement to Analyze Impacts of NOAA 's National Marine Fisheries Service Proposed Approval of the Continued Operation of 10 Hatchery Facilities for Trout, Salmon, and Steelhead Along the Oregon Coast, as Described in Oregon Department of Fish and Wildlife Hatchery and Genetic Management Plans Pursuant to Section 4(d) of the Endangered Species Act

Dear Mr. Kruzic:

I am writing on behalf of the Kalmiopsis Audubon Society based in Curry County, Oregon. Our group has more than 300 members who are concerned about habitat for birds, fish and wildlife in Southwest Oregon. Our organization has participated as a stakeholder in two of ODFW's fishery management planning processes and so we've become informed and concerned about how hatchery fish interact with and impact populations of naturally produced wild fish. We appreciate that NOAA is investigating the impacts of hatchery operations on threatened SONCC coho and also on the environment more generally through this NEPA process and are grateful for the opportunity to provide comments. #1

I. GENERAL COMMENTS

We are concerned about the approach of this Draft Environmental Impact Statement (DEIS) to allow considerable incidental take for hatchery operations. Although allowed under the Endangered Species Act, sec. 4 d, this approach fundamentally prioritizes the production of hatchery fish over the recovery of imperiled SONCC coho. This tradeoff deserves more careful #2

scrutiny not solely in the purview of hatchery fish production but expressly in the context of imperiled species recovery and especially recognizing predicted future changes to aquatic habitat associated with climate change.

It is crucially important for fish management agencies to take a proactive approach as we look to the future and see a high likelihood of predicted climate change factors, such as reduced summer stream flows and flashiness, which could have serious impacts on fish habitat at critical life stages and especially on very low populations. Our native salmon runs need as much resilience as possible to face these looming threats –and resilience includes a genetic aspect that must be taken into consideration. Wild salmon genetically adapted to their specific natal rivers will have the greatest genetic adaptability to endure a wide range of predicted environmental stresses that will likely ensue with climate change. #3

We are also very concerned that the framework of this DEIS analysis, which posits just four alternatives —two of which are clearly "strawmen,"—does not allow for more thoughtful consideration of problems and alternatives to address different conditions at specific hatcheries, such as the situation at Elk River, which the EIS clearly identifies as an alarming outlier to the rest of the program. The framework of this DEIS analysis makes it difficult to consider impacts to both coho, which is clearly within the NOAA fisheries purview, and also to general environmental impacts of hatcheries, because the alternatives posited primarily address coho and don't provide any possibility of reducing the specifically described environmental impacts of hatcheries. The very purpose of NEPA is to provide a venue not only to analyze environmental impacts but also to consider alternatives to reduce them. This DEIS does not actually consider credible alternatives to reduce the most damaging of the described environmental impacts; we urge you to include this analysis and to include an alternative that would more clearly reduce environmental impacts. #4

Our organization is especially concerned about declining salmon runs in the Elk River, which is local to our members and community, and so we will focus our comments on the hatchery program here. There are important considerations not only for threatened SONCC coho but also for the fall Chinook run. #5

The Elk is a congressionally designated National Wild and Scenic River, designated owing in large part to its "remarkably outstanding" fishery values, so there is a clear federal interest in its fisheries. It's important to recognize that the Elk River has one of the most intact watersheds in the Coast Range with only ~15 % of the upper watershed logged compared to >90% elsewhere in the Coast Range. With most of the upper watershed in public ownership, there have been significant investments in conservation, including not only the National Wild and Scenic River designation but also designation of 2 wilderness areas (Grassy Knob and Copper Salmon) that serve to protect the upper reaches and key tributaries. There have been multiple watershed council and local land trust restoration efforts in the basin, as well as a concerted effort by the local land trust to acquire and protect critical private inholdings in the headwaters area of the Elk. The high quality of spawning habitat available for wild salmon in Elk River makes the crisis with straying hatchery fall Chinook, described below, particularly egregious.

We are concerned that the DEIS does not provide adequate analysis regarding the impacts of Elk River hatchery operations on coho and wild fall Chinook runs.

II. IMPACTS OF ELK RIVER HATCHERY ON THREATENED SONCC COHO

According to NOAA's Final SONCC Coho Recovery plan, the Elk River population is at "high risk" of extinction and population numbers are extremely low, and yet the river has a good potential for habitat restoration, especially in the estuary where habitat for rearing is currently limited in critical ways. #6

According to the *Final SONCC Coho Recovery Plan*, hatchery operations pose a "***medium threat***" to coho viability in Elk River. (*Final SONCC Coho Recovery Plan* (2014), p. 7:11-12, 15) **The Coastal Hatchery DEIS is *incorrect* in stating that the Recovery Plan found the hatchery risk to be "*low*" for Elk River** (DEIS, 1:14). This requires a correction to the DEIS and also a more serious analysis given that a medium threat is clearly more significant than the low threat that the DEIS has apparently considered. In addition, it's worth noting that the 2014 ODFW Coastal Conservation and Management Plan (CMP) identified hatchery impacts on the Elk River fall Chinook as one of two key limiting factors for the fishery (the second being estuary conditions). #7

There are many proximate threats to SONCC coho in Elk River, including higher ranked "agricultural practices" and "channelization/diking," yet it's important to recognize that each limiting factor plays an accreting role to create cumulative impacts, so each one must be minimized or mitigated in order to reduce the overall threat and stresses to imperiled coho. The exceedingly low populations of coho in the river in most years and lack of regular monitoring makes addressing the medium-level, hatchery-related threats especially important to reduce or mitigate. #8

The hatchery's greatest impact on SONCC coho occurs in the tributary Anvil Creek, which is located directly across from the hatchery (and was the origin stream for the hatchery fall Chinook run). Straying hatchery fall Chinook are known to frequently overwhelm this stream with high rates of pHOS (percent hatchery fish on spawning grounds). In its 2014 CMP, ODFW recognized that the pHOS rates in this tributary are unacceptably high for fall Chinook. Yet these spawning grounds are also used by SONCC coho –at the same time –likely causing competition for spawning sites. In its 2016 *Hatchery Genetic and Management Plan* (HGMP), ODFW does not acknowledge the impact of hatchery fish overwhelming coho spawning habitat. To the best of my knowledge, there has been no careful analysis of how this situation, which has been occurring for decades, has impacted coho. And conditions of elevated pHOS likely happen to a lesser degree in other tributaries, such as Rock Creek, as well. We are concerned that over time, even if the impact has been small each year (in one or two tributaries), it has created a cumulative impact that NOAA must better evaluate. #9

Clearly a more careful analysis and articulation of the problem is needed and should include a closer review of field and carcass observations over time. If the threat from hatchery chinook overwhelming coho spawning in this tributary is intractable and cannot be abated, there should be a requirement for mitigation through restoration of spawning habitat elsewhere in the watershed. (I'll say more about mitigation at the end.)

To address the problem of high pHOS with fall Chinook, ODFW is using weirs in an experimental manner to block hatchery fish from important spawning tributaries. The winter of 2015-2016 was the first year that this method was tried in Anvil and Rock creeks, with poor results. The weirs blew out in the earliest part of the season and allowed a large number of hatchery

Chinook to enter the spawning grounds. The weirs did not succeed in reducing the pHOS. This year (winter 2016-2017) ODFW has constructed an experimental weir again, only on Anvil Creek, to assess the feasibility and efficacy of this approach.

In its HGMP, ODFW acknowledges that there may be incidental take of coho in relation to use of the weirs (HGMP, p. 9). Fish can be injured by the apparatus or by handling. In addition, there could be impacts if coho are detained and delayed in their spawning. #10

As ODFW assesses impacts of weirs and straying to wild Chinook, it should also evaluate impacts to coho. If threats from weir use cannot be properly abated, it should be discontinued. The HGMP should include a timeframe for evaluation of impacts on the weirs on both coho and Chinook so that incremental impacts will not continue to contribute indefinitely to cumulative impacts. #11

Water quality

In addition, NOAA should consider impacts of hatchery operations on water quality. Elk River is on the 303(d) list and is known to be impaired for temperature, especially downstream of the hatchery. The *Final SONCC Coho Recovery Plan* explicitly identifies "impaired water quality" as a "key limiting stress" for coho (p. 7:10) #12

Although the HGMP states that the Elk River hatchery meets state water quality requirements, it is also known that the hatchery outflow contributes to elevated temperatures. This is another cumulative impact that may be most significant during times of low late-summer flow when nearly one-third of the river's flow is diverted into the hatchery (Coastal Hatchery DEIS, p. 3:4).

Elevated temperatures are a limiting factor because during low flows because they reduce suitable rearing habitat in the river system. According to the *Final SONCC Coho Recovery Plan*, coho rear primarily upstream of the hatchery owing to elevated temperatures downstream (p.7:11). The plan draws the problematic conclusion that this situation may reduce the conflict for coho below the hatchery when, in fact, the reduction of suitable rearing habitat more likely has the effect of mortality or reduced productivity in the population. These impacts of the hatchery were identified in the *Final SONCC Coho Recovery Plan* but are not adequately analyzed or considered in the DEIS.

NOAA should evaluate the incremental impacts of elevated water temperature caused by the hatchery in relation to other cumulative impacts and encourage ODFW to improve water management practices and to require mitigation for lost rearing habitat.

ODFW has already installed temperature loggers to collect data to better evaluate the thermal contribution of hatchery outflow. (HGMP, p. 16) This monitoring should continue, especially given that stream temperatures could rise with reduced summer flows predicted to become more common with climate change. (The river had record warm temps this past summer).

Mitigation for temperature could take the form of requiring ODFW to plant more trees to on the hatchery's riverfront property –and beyond – to provide for better shading of the river.

Incidental take

The HGMP identifies possible incidental take associated with the hatchery's broodstock collection program for fall Chinook and indicates appropriate management responses to minimize this take. #13

However, both the HGMP and the DEIS are unclear about when and how coho will be monitored and what threshold of population decline in Elk River would warrant reducing allowable incidental take by hatchery operations. Such a "trigger" for action, and more important, the monitoring of the coho population, are key tools to avoid extirpation of this population currently persisting at alarmingly low levels.

III. IMPACTS OF ELK RIVER HATCHERY ON FALL CHINOOK

a) Background

Ironically, the hatchery program on Elk River may be having a greater impact on the very run it is seeking to augment: fall Chinook. #14

We have a unique situation where the Oregon Department of Fish and Wildlife (ODFW) has identified troubling interactions between hatchery Chinook and wild fall Chinook. In its 2014 Coastal Conservation and Management Plan (CMP), ODFW identified the Elk River's fall Chinook as a "non-viable" population. The run has the lowest productivity of the 14 fall Chinook runs assessed on the coast. According to ODFW's data, the Elk River run remained low and stable over the past several decades, but productivity has fallen low enough to warrant alarm. A recent Population Viability Analysis indicates that the Elk River fall Chinook have a 16.9 percent extinction rate over the next 100 years. (CMP, 2014) In other words, the model predicts that productivity will drop to extinction levels in 16.9 times out of 100 over the next century. This rate of extinction has been described as "alarming" because modelers typically regard a 5 percent rate of extinction as a threshold for concern.

In its 2014 CMP, ODFW attributed the troublingly low productivity of this run to both impaired rearing habitat in the estuary and "hatchery interactions," identified in the DEIS as "genetic introgression," which can clearly be considered an environmental impact of the hatchery program.

The Elk River facility has been generally characterized as "a large hatchery program on a small river." The DEIS highlights this characterization with its map on page 75, which identifies the smolt output at the Elk River hatchery as significantly larger than all other hatcheries on the Oregon coast for a stream of its size.

It's important to underscore this problematic relationship: ***Elk River's fall Chinook run has had the highest level of smolt output and also the lowest productivity*** *for many years*. As described in the DEIS (p. 5), this may be a situation in which an overwhelming run of hatchery fish is masking the true status of the wild run.

There is also an enormous discrepancy between the pHOS rates at Elk River (and Salmon River) compared to all the other coastal hatcheries. Other coastal hatcheries keep pHOS rates at 10 percent or lower (DEIS, p. 75); this is the threshold rate that was recommended by ODFW's *Native Fish Plan* (2005). However, the pHOS rates at Elk River have routinely exceeded 51

percent and have reached to even 80 percent on the prime spawning grounds, which are located in low gradient spawning gravels in a reach 2-3 miles downstream from the hatchery. The unfortunate location of the hatchery just upstream of the most significant spawning grounds has continually compounded the problem of hatchery fish straying on spawning grounds of wild fish.

Elk River fall Chinook are not a federally threatened species, and, in fact, are part of an ESU considered "healthy" by ODFW. Although ODFW has evaluated and determined an alarming extinction risk and "non-viability" for this particular fall Chinook run, ODFW's framework of management by portfolio and by ESU rather than by run constrains remedies and resources for evaluating and addressing this serious concern.

Although NOAA's purview may be limited by this current bureaucratic framework, certainly the agency has a stated policy that it is "important to identify population units within established ESUs and individually evaluate their extinction risk." (NMFS, *A Citizen's Guide to the 4(d) Rule for Threatened Salmon and Steelhead on the West Coast* (2000), pp. 7, 24) The agency surely aims to prevent individual runs from tumbling toward extinction. #15

In its Final EIS, NOAA should include a brief description of how ODFW's finding of "non-viability" relates to NOAA's "Viable Salmonid Population" concept and how the method or model that NOAA fisheries uses to delineate a "Viable Salmonid Population" differs from how ODFW has determined "non-viability" for the Elk River fall Chinook. #16

Although the NOAA DEIS fairly describes the crisis situation with fall Chinook on Elk River, its analysis of this high-risk situation as an environmental impact of the hatchery program, is inadequate. #17

To analyze the environmental impact of this run's loss of productivity on its future viability, NOAA's EIS needs to consider more specifically the findings of Chilcote et al., 2011 that "the productivity of the population will likely be reduced if significant numbers of hatchery reared fish are allowed to spawn naturally, which would further reduce the potential for the population to rebuild." (Chilcote et al., 2011, p. 520) The troubling downward curve identified by this research is especially relevant to consider. #18

The NOAA EIS should not only evaluate the environmental impact of hatchery straying at Elk River but also the efficacy of ODFW's current plan to address the problem and data gaps that must be filled to better address the problem. #19

b) Coastal Conservation and Management Plan (CMP)

With its Coastal Conservation and Management Plan (2014) (CMP), ODFW set out a series of actions to address the issue of depressed productivity with this run. It is this CMP document rather than the HGMP that best addresses this problem. #20

The key strategy of the CMP is to reduce pHOS to 30% averaged across the basin in 7 years using a variety of operational updates and changes to hatchery operations to incrementally reduce overall pHOS. The foremost tactic or action is to reduce annual smolt output from 325,000 to 275,000. This reduction commenced last year.

Actions outlined in the ODFW's
2014 Coastal Conservation and Management Plan (CMP):

- Reduce hatchery smolts from 325,000 to 275,000
- Reduce pHOS through the following steps:
  - -trap during entire return period
  - -use weirs to remove hatchery fish from Anvil and Rock Creeks if feasible improve ladder outlet for attraction
  - -explore additional attractant options; enlist help of OHRC to develop chemical attraction to increase homing into the hatchery
  - -explore options to harvest more hatchery fish
- Achieve goal of 30 percent pHOS averaged across the basin
- If pHOS target has not been met within 7 years of plan adoption, reduce hatchery production by an additional 25,000 or more
- Improve genetic diversity of broodstock by taking later and older fish
- Improve nutrient enrichment above the hatchery

We are extremely grateful that ODFW has implemented most actions recommended by the CMP with diligence, but we remain concerned that the plan's actions are not commensurate with the risk and urgency of the situation.

It's important to recognize that the CMP-recommended actions were derived from a stakeholder process and reflect the interests of stakeholders at least as much as current science.

We remain concerned that the CMP recommended actions are insufficient to restore the fall Chinook's viability in a timely manner for these reasons:

Insufficient smolt output reduction

Research conducted on Alsea River coho has shown that reductions in hatchery smolt releases (prompted by ESA listing of the Oregon Coast ESU coho) increased wild fish productivity by an estimated 27 percent (Buhle, et al., 2009).

For the Elk River wild fall Chinook, the action of reducing smolt output may have the greatest efficacy to reduce pHOS and increase productivity, but this action was constrained by the stakeholder process to a reduction of 50,000, an amount less than what ODFW recommended.

To increase productivity of Elk River fall Chinook, which is necessary to restore this run to a viable state and for the long-term sustainability of the run, this proven approach should take highest priority.

30 percent pHOS is too high

The CMP adopted a goal of reducing the pHOS rate in Elk River to 30 percent. While this is welcome movement in the right direction for pHOS rates exceeding 50%, we are concerned that 30 percent is still too high. Oregon's Native Fish Policy suggested 10 percent as an interim standard, what the DEIS calls a "benchmark status criteria." ODFW should consider the 30 percent pHOS as an interim goal and not as an endpoint.

Experimental strategy to improve homing

The state's greatest hope for lowering pHOS now rests on a new experimental strategy of additionally scenting hatchery water with a chemical attractant to increase homing to the hatchery. (The hatchery already keeps adult Chinook to scent its water to improve homing.) The Oregon Hatchery Research Center study that will explore this approach is just starting in late 2016 and may take 7 years or longer to determine if it's feasible. Of course, it's too soon to know if this approach will prove feasible or successful, and yet we are concerned that awaiting results from this lengthy study may delay other proven and needed actions. We are also concerned about the premise of the strategy owing to the configuration of prime spawning grounds downstream of rather than upstream of the hatchery.

Purpose must reflect need to safeguard wild fish broodstock

Hatchery management guidance documents, including both the Hatchery Operations Plan (HOP) and HGMP, should include the goal of protecting wild fish as part of their purpose statements. This is an action outlined in the CMP and is yet to be implemented. There is a difference between "minimizing impacts" and making sure that hatcheries recognize that it's their goal to protect wild fish even as they produce hatchery fish. For long-term sustainability of both wild populations and hatcheries, this crucial detail is necessary because hatchery staff must understand that part of their job is protecting wild fish.

Role of wild fish as fundamental broodstock must be articulated

With hatchery fish making up an overwhelming part of the Elk River fall Chinook run, it's important to articulate the contribution of wild fish to the genetic basis of the hatchery program to underscore the importance of protecting the run's wild fish. Without the wild fish population to provide higher productivity and other important traits, the long term viability of the hatchery population is also reduced.

Lack of adequate consideration of genetics related to interaction problems

There is clearly a genetic component to this significant problem of reduced productivity, yet we are concerned that ODFW has not yet adequately considered or analyzed this aspect of the problem and has not indicated any methods or research in either its CMP or HGMP that could help to better understand the problem of introgression. Might we use genetic sampling, for example, to distinguish between hatchery and wild fish? If so, can we sample spawning grounds to figure out the level of interaction and genetic introgression? Or, can we sample adult fish that naturally spawn to determine their parentage? Although the problem of exceedingly high stray rates is specific to Elk River hatchery, understanding the genetic component of this issue better would have broad applications that could help improve management of all hatcheries. Currently, there is no criterion other than pHOS to evaluate the degree to which hatchery fish are influencing wild fish. NOAA's EIS should include an evaluation of data gaps that must be filled to help fish managers better understand this critical problem.

Productivity and viability instead of pHOS

While pHOS is a measurable quantity and can serve as a proxy for productivity, we are concerned that a focus on pHOS may distract from the fundamental recovery needs, which are to increase productivity and move the fall Chinook run to a viable state. While CMP actions are intended to decrease pHOS, will they also increase productivity in order to return fall Chinook to a viable state? Are there any other metrics to corroborate increasing productivity and viability? NOAA's evaluation of ODFW's plan to address impacts of straying Chinook should evaluate this consideration.

Proven strategy of restoring estuarine habitat is largely absent

Though restoration of rearing habitat is a strategy that has been shown to increase productivity in Salmon River (Bottom, 2011), thus far this action is not part of any plan to address problems with the Elk River fall Chinook. I am aware that ODFW is currently participating in a "Coho Business Plan" planning effort that may benefit habitat restoration for both coho and Chinook, once it gets beyond the paperwork phase. However, ODFW should consider mitigating for the depressed productivity caused by its hatchery operations in Elk River by taking actions that can increase productivity of the run.

Crucial mark-recapture study delay

To identify and evaluate extinction risk of the Elk fall Chinook, ODFW currently uses pHOS as a proxy for productivity, with productivity as a key factor in models that determine viability and extinction rate. However, all evaluation rests on data derived from carcass counts and coded wire tagging. While data from Elk River fisheries is widely regarded to be excellent owing to longstanding record and capacity for complete run reconstruction, the model used to evaluate productivity has not been recalibrated for decades, leading us to worry about the reliability of the current assessment.

A high priority for ODFW management of fall Chinook is a mark recapture study in order to check, verify, and recalibrate the model upon which all population information is based. The current calibration is about 30 years old. This means that the alarming extinction rate could, in fact, be unreliable: the situation could be better or worse than it appears to be. Funding for this critical study has not been reliably available and so the necessary 5-year study has already been delayed. Again, we are concerned that the delay in obtaining this data will necessitate more waiting that could compel the agency to delay urgently needed actions.

Urgency

We appreciate that ODFW is now taking concrete steps that aim to address the serious hatchery straying problem at Elk Rivers, yet we remain concerned that remedies put forth will not create the needed return to viability in a reasonable time frame. We are concerned that a series of uncertain environmental stresses (drought, poor ocean conditions, flood) on top of low productivity and non-viability could push our depressed fall Chinook run to a more perilous state unless this situation is turned around.

The matter of urgency in addressing the straying problem with Elk River Chinook can only be understood when you realize how long ODFW has grappled with this issue. Questions have been raised about interactions between hatchery fish and wild fish at Elk River since the late 1980s when Nicholas and Downey (1989) concluded that wild and hatchery production systems at Elk

River were only "weakly compatible" and recommended that "hatchery management practices take extraordinary care not to reduce the productive capacity of the ecosystem."

In 2005, ODFW's *Oregon Native Fish Status Report* (Vol.2 pp. 106, 116) red flagged Elk River fall Chinook for failing to meet criteria for abundance, productivity, and independence. The report indicated productivity for fall Chinook had been below the interim criteria in every year since 1970 and that pHOS between 1970 and 2002 routinely exceeded 60 percent and at times reached 80 percent. At the time of that assessment, hatchery spawners had accounted for greater than 50 percent for more than 4 generations.

Extended, depressed productivity of Elk River's wild Fall Chinook run has been formally recognized by ODFW as a matter of concern for more than a decade, and questions have been raised for decades. We can now see that the result of inaction has been an exceptionally high risk of extinction for this run, and waiting longer to address the issue will only increase the risk.

c) Hatchery Genetic and Management Plan (HGMP)

ODFW's *Hatchery Genetic and Management Plan* (HGMP) for Elk River Hatchery is focused narrowly on the hatchery's impacts to SONCC coho to address NOAA's concern for threatened species and so does not adequately address the interactions and introgression problem with fall Chinook. I don't think ODFW regarded the HGMP as the proper venue to address this problem. #21

However, from a public perspective, having a "Hatchery Genetic and Management Plan" that addresses genetics of hatchery Chinook and impacts on coho but does not address straying problems that impact wild fall Chinook is problematic and confusing.

Clearly the Elk River hatchery should have a credible plan to follow that addresses these crucial issues so that as staffing changes through time there is an institutional memory of needs and goals through time. If the HGMP is intended to focus solely on coho and NOAA's ESA requirements, then the HGMP should more explicitly explain its focus on coho. If the HGMP's purview should include fall Chinook issues –both of breeding for hatchery fish and for maintaining wild fish—then there needs to be revision and updating to accomplish that focus.

If protecting wild fish is truly a purpose along with producing hatchery fish, both of these goals need to be addressed either in the Hatchery Operations Plan (HOP) or in the HGMP –and not only in the CMP. It should be clear to the public how the plans interrelate, and that ODFW's hatchery program addresses concerns for both SONCC coho and wild fall Chinook. #22

It's important to recognize that plans like the HGMP serve not only to guide and document agency practices but also to educate the public, including elected officials and other agencies, about agency policies and practices and current scientific thinking. The current HGMP is up to date in some sections but seems to be outdated in others, with the result of conflicting information in different sections and inconsistency with the current CMP. I will not list details because my aim is not to niggle at small errors, but rather to point out the benefit of having an accurate public plan. #23

The problem with Elk River fall chinook is significant, and elucidating it better may well serve to help NOAA and ODFW and their constituencies to better understand risks involved in over-supplementation of hatchery fish. It could also help the agency to document what has been

tried, what has worked and what has not worked over time. Public plans, such as the HGMP, serve these important needs and should reflect this purpose.

Broodstock collection

In its HGMP, ODFW identifies broodstock collection for fall Chinook as a threat to coho, but practices, as described, may be problematic for fall Chinook. #24

The HGMP (p. 26) identifies that 300 pairs of wild fish may be taken into the hatchery as broodstock. This is ~16 percent of the population of wild fish. We are concerned that this percentage is too high and would have the effect of mining the population of wild fish that are already suffering from depressed productivity.

The HGMP relies on an approach to broodstock that may be outdated –tying the level of broodstock in the hatchery population to pHOS as recommended by the Hatchery Scientific Review Group in 2005 (HGMP, p. 26). The rationale behind this approach is based on the assumption that since there is going to be a high level of pHOS, it's prudent to make sure that hatchery fish are as similar to wild fish as possible. This assumption, which lies at the heart of the Elk River hatchery's longstanding approach of mirroring natural runs, needs to be more thoughtfully analyzed.

The HGMP also needs to be updated to reflect current broodstock practices actually being followed by ODFW and the science that supports these practices. It is my understanding that current broodstock collection practices rely on taking only all unclipped fish that return to the hatchery ladder and does not include a tangle-netting component. These practices recognize that a smaller percentage of wild fish broodstock (5-10%) can adequately reduce genetic drift in hatchery fish and at the same time avoid the problem of mining genes from wild fish populations. The current broodstock collection practices also aim to bring in older fish with the aim of better mirroring the life history diversity of the wild run.

Simplistic cost benefit analysis

The HGMP's cost benefit analysis (p. 10-11) is too simplistic, fails to take a long-term view that incorporates concerns about sustainability, and perpetuates an all or nothing framework that makes it difficult for ODFW to work with stakeholders to find long term solutions to improve stewardship of runs. #25

For example *Alternative 2: Reduce Number of Hatchery Fall Chinook Smolts Released in Elk River* recognizes the "pro" or benefit of reducing risks to coho but does not recognize the potential benefit to fall Chinook of increased productivity. Moreover, it posits as a "con" that the action would "reduce hatchery Chinook available for commercial and recreational fisheries, and possibly reduce or eliminate the Port Orford terminal fishery." However, it may be that if the Elk River hatchery were to rear a smaller number of Chinook at a lower density, it would reduce stress in pens and could potentially increase health and survival of smolts released, which is currently less than 3%. The result could potentially be less of a decrease –or perhaps no decrease— in fish available for sport harvest. And if there is a boost in productivity of wild fish, as has been shown to happen in the Alsea system (Buhle et al., 2009; Kostow, 2012), then there might be more potential to catch wild fish, and it would lead to a more sustainable fishery program in the long term. Though there may be more complicated management considerations, the simplistic cost-benefit analysis needs to be updated to reflect current understanding.

Reforms listed in the HGMP do not address fundamental problems

While the proposed reform of 100 percent Ad- CWT marking directly addresses concerns raised in the HGMP, the other proposed reforms seem to be more of a general operational nature and do not directly address the fundamental problems identified with fall Chinook or coho. #26

Ideally, this section should include reforms and investments that more directly address the problems identified. This would provide the public with greater confidence that proposed actions have the potential to address significant problems.

Additional reforms/ investments could include:

- actions to mitigate for increased temperature, such as monitoring temperature and planting shade trees
- actions to mitigate for reduced spawning habitat, such as participation in efforts to restore habitat for coho spawning
- actions to mitigate for continually depressed productivity of Chinook should specifically aim to increase productivity, such as further smolt release reduction, restoration of rearing habitat to increase life history diversity, the critical mark recapture study, and further genetic study in order to better understand the problems of Elk River's fall Chinook.

This comment suggests that ODFW *could* mitigate for problems through habitat restoration. The agency claims to not have the capacity or authority to engage in this kind of work. However, if hatcheries are to be run properly, they must better account for all their "costs," including environmental externalities over the long term. In this context, mitigation for impacts could be a useful additional tool or framework to improve stewardship of threatened species and also long-term sustainability of runs like the Elk's fall chinook. Such mitigation could be accomplished through partnerships with other organizations or through direct budgeting.

d) NOAA EIS

confusing cost benefit analysis related to productivity

We are concerned that there is a discrepancy in the DEIS analysis of hatchery programs' costs and benefits particularly as related to productivity in the various alternatives. This reflects a broader confusion in fish management agencies owing to input from different branches of science (from researchers who study fish biology and ecology and those who study aquaculture), and we encourage NOAA to use this DEIS as an opportunity to help clarify this confusion –as guidance for others. It's important to clarify the benefit of increasing productivity and the risks of depressing it, and so it's a significant omission that the DEIS neglects to cite two notable recent papers that specifically examine the effects of hatchery reared fish on productivity of natural populations: #27

1) Chilcote, M.W., K.W. Goodson, and M.R. Falcy. 2011. "Reduced recruitment performance in natural populations of anadromous salmonids associated with hatchery-reared fish," *Can J. Fish. Aquatic Sci.* 68: 511-522.

2) Chilcote, M.W., K.W. Goodson, and M.R. Falcy. 2013. "Corrigendum: Reduced recruitment performance in natural populations of anadromous salmonids associated with hatchery-reared fish," *Can J. Fish. Aquatic Sci.* 70:1-3.

In this DEIS, NOAA clearly identifies that reduction of hatchery releases on the Alsea has had the effect of significantly increasing productivity for threatened coho (DEIS, p.3:21). And yet in runs, such as the Elk River, where depressed productivity is a significant problem, the cost benefit analysis does not recognize that decreasing smolt output could potentially produce a benefit in terms of increasing productivity for a run now considered by ODFW to be "non-viable." This could be a long-term benefit of increasing the sustainability of the run.

Instead, in describing the strawmen alternatives 3 and 4, the DEIS recognizes the benefits of smolt reduction only in terms of "reduction in genetic risks, reduction in competition, and reduction in predation of hatchery-origin fish on natural-origin Chinook salmon." The DEIS recognizes that smolt reduction could generally "reduce the genetic risks from hatchery Chinook salmon on natural-origin salmon …and reduce ecological interactions between natural- and hatchery-origin Chinooks" in two populations in Elk and Salmon rivers. (DEIS p. 4:45-46) #28

In addition, the cost benefit analysis indicates that reduced smolt output would reduce harvest opportunities (DEIS p.4:45-46), but there is no way to understand the degree of this potential impact and so there is no way to ascertain whether reductions in smolt release could provide benefits to productivity and lead to attaining long term sustainability that may be worth foregoing some reductions in harvest that perpetuate high and potentially consequential risk to the run. #29

For example, in the case of Elk River, where there is such a huge hatchery release, it could be that if the program reared a smaller number of fish at lower density, it could reduce stress in raceways, which could have the effect of increasing the health and survivability of released smolts –and so the number of fish returning may not be all that different for sport anglers. It could also result in an increase in productivity that could help boost populations of wild fish that could become available for harvest.

IV) CONCLUSION

NOAA's DEIS, as a meta-review of the impacts of all Oregon's coastal salmon hatchery programs on threatened coho and on the environment has the potential to provide important perspective and insights at a critical juncture. In this DEIS, NOAA has clearly aimed to tackle a complex issue with a simplified framework. However we encourage the agency to use this opportunity to help clarify science and discourse around this important issue with the aim of improving understanding, management, and stewardship. The issue of hatchery straying has a potentially high environmental impact on Oregon's coastal streams and deserves thoughtful scrutiny and evaluation. #30

The case that we've highlighted at Elk River is clearly an alarming one in Oregon's coastal hatchery program. A more robust analysis of this program in particular could help to answer questions that are critically important to protecting the Elk's cherished fall Chinook run but also for all coastal fisheries supplemented by hatchery programs. At this point, it's imperative to draw upon the best science, best practices, and best politics possible to address this concern in a timely and effective manner. #31

#32

Thank you for considering our comments aimed at conserving our unique, locally adapted Elk River salmon runs.

Sincerely

/s/ Ann Vileisis
President Kalmiopsis Audubon

/s/ Mary Wahl
CMP stakeholder delegate, Mid-South Coast Stratum
Kalmiopsis Audubon Society

Native Chinook, coho, and cutthroat in Elk River (2011), photo by Thomas Dunklin, used with permission

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NMFS Responses to Comments from the Kalmiopsis Audobon Society, letter dated November 8, 2016.

Letter #	Comment #	NMFS Response
5	1	Noted.
5	2	Noted. The DEIS does not allow or disallow incidental take of salmon and steelhead; the purpose of the DEIS is to identify and disclose impacts to the human environment on a wide range of subjects that would result from implementing the proposed action. Moreover, as described in the EIS, conservation of natural salmon and steelhead is priority along the Oregon Coast. There are many populations that do not have any hatchery programs, as shown in the EIS. Most of the natural salmon and steelhead populations are viable and not ESA listed.
5	3	Agree. Habitat is currently the key limiting factor/threat for natural-origin salmon and steelhead along the Oregon Coast region.
5	4	There are five alternatives evaluated in the final EIS that range from the proposed action to termination of all hatchery production along the Oregon Coast. NMFS believes this is a reasonable range of alternatives to show the effects of hatcheries on the human environment.
5	5	Noted.
5	6	Agree.
5	7	Disagree. Hatcheries are deemed a "low" threat for Elk river coho salmon. See Table 7-4 of NMFS 2014 SONCC Recovery Plan for this information.
5	8	Noted.
5	9	Noted. The issue of competition effects on SONCC coho resulting from the proposed action is discussed in sections 3.4 and 4.4 of the EIS. Our evaluation relies on the best available science to identify and disclose impacts.
5	10	Agree. See Elk River fall Chinook HGMP for incidental handling of coho salmon. The final EIS evaluates program effects in section 4.4.
5	11	See response 5-10.
5	12	Noted. The EIS evaluated effects on water quality in the Elk River from operation of the hatchery. The effluent from the hatchery does not affect the primary issue related to 303(d) listings in the Elk River which is temperature. The hatchery discharge effluent does not affect temperature in the reaches of the Elk River. Other land management factors impede temperature in the Elk River.
5	13	The EIS and ESA Biological Opinion evaluate the impacts of the broodstock collection of fall Chinook at Elk River hatchery and incidental effects on coho salmon. As described in the Elk River fall Chinook salmon HGMP, the number of coho salmon handled from this activity to low. There has only been one mortality observed from 1993-2013. The

		HGMP provides the threshold by which hatchery actions must be modified if take of coho salmon is exceeded.
5	14	ODFW's CMP evaluates the fall Chinook salmon program on the natural population. The HGMP incorporates those management goals and objectives. NMFS' EIS evaluates impacts of the program on the human environment. The ESA Biological Opinion will evaluate impacts of the program only for ESA-listed coho salmon. NMFS believes the current risks of the hatchery fall Chinook salmon program on natural-origin fall Chinook has been characterized correctly.
5	15	Agree. However, this is a NEPA review, where the purpose is to identify and disclose impacts to the environment. NMFS will conduct its review under the Endangered Species Act separately. It should be noted that the Oregon Coast and Southern Oregon Chinook ESUs were determined to be viable and not warrant listing under the ESA.
5	16	See respone 5-15. The forthcoming biological opinion will focus on the ESA implications of the action and determine whether it causes jeopardy to listed species or adverse modification of critical habitat.
5	17	Noted.
5	18	Noted. The risks of pHOS are evaluated on natural-origin salmon and steelhead populations, and in general higher pHOS leads to higher risks.
5	19	The purpose of NEPA is to disclose the environmental impacts of the proposed action, not to force substantive changes in federal or other actions.
5	20	This comment centers on ODFW's CMP. The HGMPs were made available for public review and comment, and we therefore direct these comments to ODFW's attention.
5	21	See response 5-20; we direct these comments to ODFW's attention.
5	22	Noted. See previous responses.
5	23	Noted. See previous responses.
5	24	Noted. The final EIS provides updated information on pHOS, pNOB, and PNI to help disclose the impacts of the hatchery fall Chinook program on natural-origin Chinook salmon in the Elk River.
5	25	Noted. See previous responses.
5	26	Noted.
5	27	Noted. These studies are considered part of the best available science applicable to the proposed action.
5	28	Noted.
5	29	Noted.
5	30	Noted.
5	31	Noted.
5	32	Noted.

NOAA National Marine Fisheries Service
Attn: William W Stelle, Jr. Regional Administrator

The current Draft of the Oregon Coast Hatchery Environmental Impact Statement (DEIS) is Out of Compliance with the National Environment Protection Act. (NEPA). The DEIS is grossly Inadequate and Insufficient to meet NEPA. DEIS is Out of Compliance for Native American Tribal Sustainable Fishing Rights. Each Hatchery must have individual analysis by river basin to meet NEPA & EIS. All River Basin Hatchery Analysis should be considered Independently to meet Compliance Individually. #1

There has been great liberty taken in many analyses performed to support the proposed actions.

- The analyses and proposed actions are Weak, Incomplete, Inadequate to the Tasks, and Ignore Relevant Information that would Lead the other Wrong Conclusions.
- The DEIS does Not adequately protect Threatened OC Coho and SONCC Coho.
- From Take, Competition and other Deleterious Interactions with Hatchery-Raised Salmon Smolts.
- Nor, from Competition with Stray Adult Hatchery Salmon.
- Oregon Coast Hatcheries are out of compliance to Federal Code for Allowed Stray Adult Hatchery Salmon and Steelhead.
- The DEIS does Not Protect OC Coho and SONCC Coho from Disease Outbreaks originating in Hatcheries.
- All Oregon Coast Hatcheries and this current draft of the Oregon Coast Hatchery Environmental Impact Statement are Out of Compliance of Federal Mandated Code.
- All Oregon Coast Hatcheries should be Evaluated by Each River Basin. Not All Together!

Part A

- DEIS NOAA there is No reference to 1998 by Oregon's Independent Multidisciplinary Science Team (IMST) titled "Review of the Hatchery Measures in the Oregon Plan for Salmon and Watersheds." This report concluded that the description of Oregon coastal hatcheries and practices in the Oregon Plan was inadequate in several respects. First, hatcheries were in general not meeting their objectives, and the Oregon Plan did not adequately address effectiveness. Oregon Plan did recognize that hatchery management does impact wild populations, but in relying on stray rates, does not adequately assess the degree of impact. Oregon Plan does not prescribe adequate monitoring of hatchery programs #2
- Hatchery programs need fundamental change on order to support recovery of wild stocks. DEIS has not fully acknowledged these problems with Oregon's coastal hatchery programs
- Modifications to the programs described in ODFW's HGMPs do address some of the issues ODFW, nor NOAA as evidenced by this DEIS, sees a need to fully implement the recommendations of the IMST report "Review of the Hatchery Measures in the Oregon Plan for Salmon and Watersheds."
- At a minimum, the DEIS needs to acknowledge this report and its recommendations, and either demonstrate that the programs currently address all of them, or provide explicit rationales for not needing to addressing them.

Part B

- The choice of alternatives to evaluate is deeply flawed.
-
- It is required that EISes include a "No Action" alternative, which in this case NOAA takes to mean they do not issue decisions on the submitted HGMPS for the 10 hatcheries and 42 programs under consideration. So that ODFW can continue to operate as they have been under submitted but not approved HGMPs, without formal approval. #3
- The **"Preferred Alternative"** is to approve *en bloc* the program as described in all the submitted HGMPs.

- The other alternatives examined are (3) to close all the hatcheries, and (4) to cut all hatchery releases by 50%.
-
- NOAA has the statutory mandated responsibility to approve, demand modifications to, or deny the submitted HGMPs, so the "No Action" alternative is not really an option.
- "No Action Alternative" and "Preferred Alternative" are essentially the same. The distinctions are only administrative, thus amount to a distinction without a difference.
- Under both, hatchery programs would continue to be operated according to the submitted HGMPs. In the longer term there might be differences in how ODFW would need to proceed if it wanted to change some hatchery practices, and NOAA likely would have to follow different procedures in Section 7 consultations, but on-the-ground differences appear to be nil. #4
- Alternative 4 is a nonsense alternative. It is not an approach that any rational hatchery system manager would consider. It is economically wasteful, and not sensitive to the issues of hatchery/wild interactions.
-
- Most important problem is that all the alternatives treat all the hatcheries and all the programs equally. The alternatives do not acknowledge that different hatcheries and different programs are not equal in their risks to wild salmonid stocks. <u>What is needed is an alternative or set of alternatives that evaluate the hatcheries and programs separately or at least in groups, according to their differences in risk.</u> #5
- Thus programs that are currently meeting the <10% stray rate criterion could be treated differently than programs that are seriously in violation of it.
-
- Multiple Winter Steelhead programs are chronically out of compliance in stray rates, and the DEIS needs to require different treatment for these. Facilities that have more serious water quality problems in their effluent could be treated differently than ones that are currently cleaner. #6
- The DEIS claims in effect that the different hatcheries have the same risks for transmitting disease to wild fish, and that this risk is negligible beyond a small and uniform "mixing zone" below the hatchery discharge, which is "estimated" without considering the differences in river flow. #7
- It is not reasonable that a "mixing zone" for Cole River hatchery, on the very large Rogue River would be the same as that at Elk River, where at times nearly the whole flow of the river goes through the hatchery. #8
- Bottom line is the different hatcheries and programs need to be evaluated on their own merits, and the riskier ones need to be shut down or modified, while the least risky may be approved as is. #9

Part C

- Hatchery-specific alternatives that were proposed in public feedback earlier in the DEIS development were discarded.
- For example, alternatives to discontinue all Coho hatchery programs, and the Coos Bay Chinook Salmon program were mentioned, but NOAA chose not to evaluate them. #10
- This decision was justified by claiming (P. 2-4) "This alternative would result in reductions in socioeconomics, in that harvest capability would be reduced and the income generated by that harvest would be reduced; the likely effects on both harvest and financial benefits would likely be similar to the effects of Alternative 4, Reduced Hatchery Production," and "consideration of the elimination of the hatchery coho salmon and the largest hatchery salmon programs does not provide additional insight on impacts compared to Alternative 4." This is of course Not True.
-
- First, while the coast wide reduction in harvest might be fairly similar to Alternative 4, the distribution of that reduction would be very different, with very different effects on local communities.
- Second, the primary reasons for crafting this discarded alternative in the first place was to manage "the largest genetic and ecological impacts on the only ESA-listed fish species, Coho salmon, and, therefore, <u>their elimination would provide the largest reductions in those impacts</u>." #11
- The decision not to analyze this alternative means the effectiveness of it in managing genetic and ecological impacts on Coho remains un-analyzed (or at least unreported).

- The analysis of Alternative 4 does not in any way address the genetic and ecological issues that led to these potential alternatives.
- The choice to develop a DEIS that chooses not to analyze acknowledged differential impacts does not meet the requirements of NEPA nor of the ESA.

Part D

- The analyses of "ecological interactions" are inadequate because they consider only interactions of recently-released juveniles (pre-smolts and smolts) with wild juveniles. #12
- Returning adult hatchery fish do have the potential to interact with wild adults in a variety of ways (e.g., aggressive interactions during courtship, digging up pre-existing redds) but these are omitted from the analyses.

Part E

- The DEIS contains multiple incorrect descriptions of wild salmonid stock distributions on the Oregon Coast. For Steelhead (P. 3-27) the DEIS lacks an accurate description of current distribution, particularly for summer-run fish. The DEIS states correctly that natural runs of summer-run Steelhead are limited to the Siletz, north Umpqua, and Rogue rivers.
- However, the DEIS fails to mention here that ODFW is releasing hatchery Summer-run Steelhead in multiple north-coast basins. #13
- The 2016 Oregon Angling Regulations allow summer targeting and retention of hatchery steelhead in at least the Siletz, Nestucca, Tillamook, and Nehalem basins.
- This omission is important because of the potential of these released smolts to compete with, prey on, or attract predators to naturally-reared salmonids, and the potential for adverse interactions of adults in spawning areas.
- Also, (P.3-25) "Independent populations of spring Chinook salmon occur only in the Rogue and Umpqua Basins, which drain the Cascade Mountains. Smaller, remnant runs of spring Chinook salmon occasionally occur in the coast range basins of the Siletz, Tillamook, Nestucca, Coquille, and Alsea Rivers." These statements are categorically untrue.
- The Siletz and Alsea runs are small but quite persistent. To my knowledge, there have been no years with none found in one of these rivers, since annual monitoring was begun.
- <u>These Errors are Important, as they Allow NOAA to Disregard Real Risks to Sensitive Stocks</u>.

Part F

- The DEIS also misstates the distributions and life histories of other fish inhabiting the Coast Range. This is particularly evident in Table 7: (Pp.3-31 to 3-34). This table is full of misinformation, and needs to be edited by someone with detailed knowledge of Oregon coastal fish distribution and biology. For example, Western Brook Lamprey are not parasitic; Large-scale Suckers do not occur on the coast north of the Siuslaw basin, and from there south, their taxonomy is different from what is presented; and American Shad are more widely distributed than indicated. #14

Part G

- DEIS consistently under-reports the incidence of hatchery stray adults on spawning habitat. For example, (P. 3-26) "Most of the fall Chinook salmon populations have zero hatchery-origin fall Chinook salmon on the spawning grounds." ODFW spawn surveys and creel surveys document annual presence of fin-clipped Chinook in most populations. Straying happens, and needs to be acknowledged. #15
- For Winter Steelhead, (P. 3-27) "The percentage of hatchery winter steelhead on the spawning grounds ranges from approximately five percent in southern Oregon to a high of 22 percent in the mid-coast region of the Oregon Coast (Jacobsen et al. 2015)." The level of 22% is more than double the standard of 10%, so clearly needs to be addressed, rather than just rubber-stamped.

- Further, the DEIS ignores the fact that there are not only strays within the basins with releases, but also inter-basin strays into basins without releases. Oregon manages the Winter Steelhead fishery as primarily a catch-and-release fishery on streams without hatchery releases, but allows retention of fin-clipped fish wherever they allow Steelhead fishing, and hatchery fish are relatively common throughout.
-
- For example, the 2016 Angling Regulations specify "open for hatchery Steelhead" for Cummins Creek, Ecola Creek, Neskowin Creek, Rock Creek (Lane Co.), Sand Lake, Tenmile Creek, Yaquina River, and Yachats River, none of which currently have hatchery releases. So obviously hatchery Winter Steelhead are straying widely from the basins with hatchery releases, in numbers adequate to trigger harvest regulation. On P. 4-32, the DEIS repeats the error of under-reporting straying and its effects: "Natural spawning by hatchery steelhead is likely to be concentrated most in the areas around where the fish were released as smolts.
- Consequently, natural-origin fish will be most affected in these areas." This may seem logical, but in fact is contradicted by ODFW's spawning survey and trap data, at least in the Midcoast basins.
- Again, hatchery Winter Steelhead are straying widely throughout the basins with releases, and are encountered with regularity in basins without releases.
- The situation in the Siletz with Summer Steelhead is even more problematic. The core spawning areas for Siletz Summer Steelhead are above a waterfall (Siletz Falls) with a fish ladder and trap.
- Hatchery steelhead caught in the trap are removed from the river or recycled downstream. Hatchery smolts are released downstream as well. These actions were believed to exclude the hatchery Summer Steelhead from the core natural spawning areas. However, extensive snorkel surveys in summer 2015 found high percentages of fin-clipped fish above the falls, indicating that it is not an effective barrier, and that the population is being subjected to high risk of adverse genetic effects.

Part H

- "Wildlife" section is inadequate because it omits documentation or analysis of the most direct interactions between wildlife and hatchery operations: wildlife as predators of juvenile fish in the hatchery, and control efforts to prevent these depredations. In addition, Table 8 should be edited by a competent mammalogist: e.g. despite popular misconceptions, beavers are not fish predators. #16

Part J

- Socioeconomic analyses contain enough questionable statements to cast doubt on their overall conclusions.
- For example, on P. 3-38 an ODFW study (2014a) report is being misused. The numbers quoted in the DEIS allege that ODFW claimed 100% of the angling effort "in the bays and rivers of the Oregon Coast ESU" targeted salmonids. This is of course not true: significant angler effort is directed to fishing for American Shad, Striped Bass, and Smallmouth Bass, particularly in the Umpqua basin, for Herring in multiple estuaries, for surfperch in some, etc. #17
- This error may not be central to the conclusions in regard to the environmental impacts of the hatchery operations, but it is a measure of the lack of care evident in preparation of this document, and does not inspire confidence in the overall effort. In addition, (P. 3-39) the DEIS states "All of the Oregon Coastal hatcheries have an economic benefit:cost ratio greater than one (ODFW 2010)."
- Given the multiple sources of uncertainty in these analyses, this statement should be qualified, e.g. as "ODFW has estimated that all of the Coastal Hatcheries have…".
- A particular bias in these analyses is over-attribution of sports equipment purchases and travel. Thus, camping equipment intended for multiple use is likely to appear in these analyses as if its purchase were solely for the trip under investigation, and full cost of multipurpose trips tend to be attributed to fishing. This inflates the numerator leading to gross overestimates of expenditures per fish and per year.

Part K

#18

- The “Environmental Justice” section is a mishmash of inappropriate analyses and obfuscation that appears to be designed to hide rather than deal with the real Environmental Justice issues associated with the hatchery programs. This section may have been “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,”
- (P. 3-43) but it largely misses the point of Environmental Justice concerns. According to Table 10, Curry County is a “community of concern” for American Indians (2.0 % of the population) but Douglas County, with a much larger American Indian population is not, because its percentage is “only” 1.9%?
- Not to worry though – when a few thousand more retirees from California move to Brookings, the status will be “resolved” by dilution without having to do anything of relevance to or for the American Indians in Curry County.
-
- In reality, government programs such as this hatchery program can affect minorities and disadvantaged people as individuals, whether or not they are living in recognizable communities.
- The effects of harvest regulations on subsistence fishing can be pernicious, for example, whether or not the victims are clustered in ways that show up on geographic analyses of census data.
- To actually address “Environmental Justice” the DEIS needs to answer a series of questions about potential and real impacts of hatchery practices on minority and low-income communities. These would begin with the following non-comprehensive list:
-
- **1. Do ODFW harvest regulations differentially affect minority and low-income communities? And if so, do the hatchery programs play a role in this differential treatment?**
-
- **2. Do the siting and operations of hatcheries and hatchery releases affect minority and low-income communities?**
-
- **3. Are license policies, bag limits, and fee structures discriminatory with respect to minorities and/or income levels? And if so, do the hatchery programs play a role in this differential treatment?**
-
- Clearly the answer to the <u>first question is yes</u>: Numerous harvest rules promote harvest from boats over harvest from the banks (hence harvest by well-to-do anglers over lower-income anglers).
- ODFW also promote interests of guide boat operators over interests of non-guided anglers. Ownership of boats and use of guide services are related to economic status.
- Discriminatory rules include “party-fishing” rules that allow individuals in a boat that have harvested their limit to continue fishing “for” their companions (not allowed for bank fishing), and the relatively new “two rod rule,” among others.
- As to whether hatchery operations contribute to this “Environmental Injustice,” it appears that the changes in hatchery programs in the “Coastal Multi-Species Conservation and Management Plan” tend to shift releases away from streams with more bank/wading opportunities to streams with heavier boat use.
- Additional Environmental Justice effects likely can be found with further Analysis.
- The answer to the <u>second question might be no</u>, but it still needs to be fully analyzed, and on a scale much smaller than counties. <u>Should be analyzed by River Basin.</u>
- The answer to the <u>third appears to be yes</u>. Historically, fishing was a subsistence activity for many Oregonians, and particularly for tribal members and rural economically-disadvantaged residents.
- The structure of current harvest regulations tends to favor well-to-do “trophy anglers” over subsistence fishers. In particular, reductions in annual bag limits, including stream-specific annual limits, make subsistence fishing difficult.
-
- **Do the hatchery programs contribute to this policy of favoring “trophy fishing” over subsistence fishing?**
- The answer is not clear without further analysis, but NOAA also needs to ask itself what other support they may be providing to these unjust practices.

Part L

- The analyses of risks of disease transmission from hatcheries to wild populations are flawed and inadequate because they are primarily based on analyses done at Willamette Basin hatcheries which are mostly located on much larger streams than most of the coastal hatcheries. #19
- Further, the DEIS appears to misrepresent these studies. From P. 4-11, "Bartholomew (2013) found hatchery-related disease and pathogen transmission and outbreak in effluent of Willamette River hatchery facilities to be localized, with greatest mortality occurring at the hatchery and no mortality of fish observed in the receiving waters 400 feet downstream from the hatchery.
- Therefore, the potential adverse impacts are expected to be temporary and confined exclusively to the small area directly at the hatchery outfall. No impacts are expected on critical habitat and EFH as the effluent dilutes downstream (see Chapter 3, Affected Environment)."
- This passage has several problems. First, the citation Bartholemew (2013) appears to be to a grant progress report, not a peer-reviewed publication. Exploration of the actual publications on this subject from Dr. Bartholemew's program seem to indicate that this DEIS has overstated their findings. It appears that surveillance was mainly in the facilities and in the first 400 feet of receiving waters.
- Second, the statement that "the potential adverse impacts are expected to be temporary and confined exclusively to the small area directly at the hatchery outfall" does not follow from the research findings, and I doubt that Dr. Bartholemew would endorse it.
- The normal progression of an epizootic involves the infection of some individuals, and sequential infection of others they encounter as they move about (or drift downstream).
- So, if a few wild fish were infected just below the outfall, they likely would move downstream as they became debilitated, hence their mortality is not so likely to be seen in the first 400 feet (the experiments used caged sentinel fish), and their role as secondary vectors of infection cannot be discounted.
- Third, as noted above, the Willamette hatcheries studied are on much larger streams than several of the coastal hatcheries, so assumption of the same dilution rate is disingenuous.

Part M

The description of "Effects on Salmon and Steelhead and Their Habitats" (P.4-13) is inadequate in several respects. #20

1. The **DEIS lists 3 effects hatchery releases** can have on salmon and steelhead: Genetic effects from Interbreeding, Competition with and Predation on Wild Fish, and Infection with Diseases.

- **At least two additional important effects are Omitted.**
- The **Fourth effect** is stimulation of predators by mass hatchery releases to concentrate their efforts on juvenile salmonids and thus increase predation levels on juvenile wild salmonids.
- The concepts of search image and prey switching are well studied in predator-prey ecology, and substantial information exists to indicate this is happening with salmonid smolts.
- Effects are not necessarily limited to conspecifics, as mass releases of one species can stimulate additional predation on other species.
- The **Fifth effect** is ecological interaction by straying adult hatchery fish in wild spawning habitat.
- Straying adult hatchery fish can have ecological as well as genetic effects in spawning habitat, e.g. through aggressive competition and by excavating on top of existing redds.
- Again, effects may not be limited to conspecifics. Straying hatchery Winter Steelhead might excavate redds on top of existing Coho redds, for example.

2. Further, Table 12 (Pp. 4-15 to 4-16) purports to rate the risks of interaction between hatchery and natural-origin salmonids. There are multiple problems with the information presented.

- **First**, the table only provides a single rating per river, even for basins with multiple hatchery programs, indicating that NOAA is not sensitive to potential differences in risk to different species within a basin.

- **Second**, the methodology for determining ratings is not explained. Is it just based on percent of each species' habitat traversed by downstream migrant hatchery fish? Given that the different species of wild salmonids in the system will have different ranges (miles of occupied stream), how are the effects on different species combined?
- **Third**, some of the ratings are counterintuitive, given documented stray rates. For example, the Salmon River is given a "Low" risk rating despite year after year Chinook stray rates far out of compliance (ODFW has promised some changes in hatchery infrastructure and operations to reduce this problem, but these have not yet been proven effective). As a second example, the interaction risk for the Siletz is ranked "Low" despite recent (2015) information that ODFW's procedures to keep hatchery Summer Steelhead from reaching the main spawning areas are ineffective, and stray rates are far out of compliance for this sensitive stock.
- **Fourth**, other ratings are hard to understand, given other aspects of hatchery situations and operations. For example, according to information presented elsewhere in the DEIS, the Elk River hatchery affects a relatively long reach of river, and during summer minimum flows, may use most of the flow in the river at this point. This raises the specter of impaired passage past the facility because of lack of flow, so a "low" ranking is difficult to understand.
- **Fifth**, the table only includes the basins with hatchery releases, implying by omission that those are the only basins with potential interactions. In reality, stray hatchery fish (particularly steelhead) appear in most if not all basins, with or without releases.
- **Sixth**, and perhaps most important, this section of the report does not explain how the 15 basin ratings (high, medium, and low risk) are used to evaluate the 4 alternatives. The table lists three basins with "High" risk and four with "Medium" risk out of the 15 basins included.
- **How many basins with "high" risk** would there have to be, to change NOAA's preference for Alternative 2? It is difficult to understand how three high-risk basins and four medium-risk basins out of 15 can be consistent with the choice of Alternative 2 as the "Preferred Alternative?"
- **Would four high-risk basins change this outcome? Five? Eight?** On page 4-33 the DEIS states that under the preferred Alternative 2,
- "The hatchery programs would continue to pose short- and long-term adverse risks associated with genetic effects, competition and predation, facility effects, masking of natural population status from hatchery fish spawning, incidental fishing effects, and transfer of pathogens from hatchery fish and/or the hatchery facility to the adjacent river or stream.
- The hatchery programs would continue to provide some benefits to salmon and steelhead from hatchery fish carcasses and nutrient cycling in the ecosystem."
- <u>This clearly illustrates how unsatisfactory the choices of alternatives to evaluate in the DEIS were.</u>
- The appropriate way to evaluate the hatchery programs would be to evaluate alternatives that differentiated among hatcheries and programs.
- Programs that contribute the most to increased risk should be held to a higher standard, than those that do not.
- It is possible that the riskiest programs are also the ones that contribute the most socioeconomic benefit.
- Potentially justifying acceptance of the risk. But the DEIS does not partition the socioeconomic benefit among the programs. So, that case cannot be made with the information provided.

- More likely, the 42 programs include a few "dogs" that are more risky, but contribute less socioeconomic benefit, and should not be tolerated.

3. The DEIS is inadequate in that it presents neither the information to evaluate this possibility, nor the analytical framework (meaningful alternatives) to support such analyses.

- The figures (Figures 13 – 20, Pp. 4-16 to 4-23) and explanatory text on P. 4-25 highlighting the portions of the basins extending from hatchery release sites down to the ocean are labeled "Geographic extent of the interaction area…".
- Which is disingenuous and misleading, because straying adult hatchery fish certainly do not restrict themselves to the mapped portions of these basins, and interactions between straying adult hatchery and wild fish can and do occur throughout the accessible habitat in all the basins.
- Again, interactions between hatchery and wild adults can be ecological as well as genetic. In addition, by only mapping the basins with releases, the DEIS is again ignoring straying among basins.

In summary, we find this draft Environmental Impact Statement deficient in numerous respects, and inadequate to meet the requirements of NEPA and the ESA. We recommend that NOAA revise this draft to include analyses of more realistic alternatives, including alternatives that would treat higher-risk hatcheries and programs differently than lower-risk ones. We also recommend that NOAA undertake a peer-review process to verify the information sources upon which the analyses are based. At a minimum, the distributions of the various fish stocks need to be accurately described. We also recommend that NOAA conduct more complete analyses of the effects of the hatchery programs, to include the various real and potential interactions and sources of risk delineated above, including influences on predator behavior and ecological interactions of straying hatchery adults. We also recommend that NOAA strengthen their analyses of disease risk to take into account differences in stream sizes (flow volumes) at the hatchery locations Finally we strongly recommend that NOAA take the issue of Environmental Justice seriously, and **not just treat it as a statutory requirement requiring lip service. Instead NOAA needs to conduct a thoughtful analysis of potential environmental injustices at the scale of vulnerable communities (not counties), and addressing these communities' real-world interactions with fishing opportunities and hatchery programs.** #21

I want to thank the MCWC for allowing me to use their letter format to add my own comments.

Sincerely,

Cyndi Karp

POB 506

Waldport OR 97394

541-272-2412

NMFS Responses to Comments from Cyndi Karp.

Letter #	Comment #	NMFS Response
6	1	As stated in this comment letter, the comments are the same as in letter #4. See those responses.
6	2	As stated in this comment letter, the comments are the same as in letter #4. See those responses.
6	3	As stated in this comment letter, the comments are the same as in letter #4. See those responses.
6	4	As stated in this comment letter, the comments are the same as in letter #4. See those responses.
6	5	As stated in this comment letter, the comments are the same as in letter #4. See those responses.
6	6	As stated in this comment letter, the comments are the same as in letter #4. See those responses.
6	7	As stated in this comment letter, the comments are the same as in letter #4. See those responses.
6	8	As stated in this comment letter, the comments are the same as in letter #4. See those responses.
6	9	As stated in this comment letter, the comments are the same as in letter #4. See those responses.
6	10	As stated in this comment letter, the comments are the same as in letter #4. See those responses.
6	11	As stated in this comment letter, the comments are the same as in letter #4. See those responses.
6	12	As stated in this comment letter, the comments are the same as in letter #4. See those responses.
6	13	As stated in this comment letter, the comments are the same as in letter #4. See those responses.
6	14	As stated in this comment letter, the comments are the same as in letter #4. See those responses.
6	15	As stated in this comment letter, the comments are the same as in letter #4. See those responses.
6	16	As stated in this comment letter, the comments are the same as in letter #4. See those responses.
6	17	As stated in this comment letter, the comments are the same as in letter #4. See those responses.
6	18	As stated in this comment letter, the comments are the same as in letter #4. See those responses.
6	19	As stated in this comment letter, the comments are the same as in letter #4. See those responses.
6	20	As stated in this comment letter, the comments are the same as in letter #4. See those responses.
6	21	As stated in this comment letter, the comments are the same as in letter #4. See those responses.

Siletz Winter Steelhead HGMP Concerns:

- The program takes wild steelhead to propagate its hatchery fish via a brood-stock program with an allowance of taking up to ½ of the encountered wild winter steelhead, but no more than 40 pairs, at the Siletz falls trap for this purpose, effectively removing them from spawning in the wild. The actual population size of Siletz wild winter steelhead is currently unknown. The overall goal of the program is to take no more than 10% of the overall wild winter steelhead population. How can this be implemented when there is no actual data on the wild population size? (Section 1.5/1.7/1.9/1.10/1.11/6.2.2/7.4.1). #1

- Release of 50,000 smolts creates competition for limited resources with wild smolts as they migrate to the ocean (Section 1.7). #2

- Stray rates are greater than 10% as outlined in Standard 4, Impacts to wild fish: "Limit hatchery fish to 10 percent or less of the fish spawning in natural habitats of the Siletz and neighboring basins, except in the immediate area (within 1 mile) around the release site(s)." The HGMP provides that, "Estimates of the total number of hatchery winter steelhead that strayed to all natural spawning areas in the Siletz Basin are not available. Therefore, data for the "Spawning Grounds" column (Table 1-2) is not available. Data on stray rates is available for three trap sites within the Siletz Basin that are removed from the smolt release site. These traps are on Schooner Creek, Mill Creek and Siletz Falls. The average hatchery stray rate (all stocks of hatchery fish) seen at these traps has ranged from 45 to 93 percent (1998- 2007). The stray rate for just the stock 33W from 1998 through 2007 has ranged from 40 to 70 percent at Mill Creek, and from 34 to 65 percent at Siletz Falls. Both of these sites are removed from the release site, although the Siletz Falls site is on the mainstem and may not represent levels seen in tributaries. The stock 33W has been seen in five different years (1998-2007) ranging 1-5 fish in the Schooner Creek trap; the only other site in the Siletz Basin used as a monitoring site. Very few fish of this stock have been recorded in sites outside of the Siletz Basin, which includes several adult traps in neighboring basins." "A key issue related to this hatchery program is the overall abundance of hatchery steelhead spawning in natural habitats occupied by wild winter steelhead in the Siletz Basin. Observations in tributaries of the Siletz River indicate a substantial proportion of hatchery spawners in winter steelhead habitats. Some of these hatchery spawners are thought to be Siletz hatchery winter steelhead. These fish have an adipose and left maxillary fin clip. However, other hatchery programs in near by coastal basins also release winter steelhead with the same mark so it is uncertain to what extent hatchery Siletz winter steelhead stray. There is also concern that large numbers of hatchery steelhead smolts released in the Siletz Basin may create #3

competition with wild fish or attract predators which could also affect wild fish." (Section 1.9/1.10/1.12/1.16)

- The HGMP assumes that there are no genotypic or phenotypic differences between brood stock and wild fish so pose no threat to the wild population. To make this assumption without data creates unknown risk to the genetic integrity of the Siletz wild winter population (Section 6.2.4). #4

- It is possible that by selecting wild winter steelhead at the Siletz falls Trap for the brood stock program there is an increased propensity for the hatchery progeny to stray as those fish encountered at that location are straying from the lower river as wild winter steelhead are not passed above the falls (Section 7.2). #5

Siletz Summer Steelhead HGMP Concerns:

- One of the goals of the program is to minimize interactions with wild fish (Section 1.7). Contrarily, hatchery born summer steelhead have been found to interact with wild fish and compete with them at every life stage from fry to adult (sections, 1.9/1.10/1.12/1.16) #6

    - Although the Siletz Summer Steelhead is listed as a stock of concern and the area above the Siletz Falls is managed as a summer steelhead sanctuary, hatchery summer steelhead still migrate into this area. Although it is stated no hatchery fish are passed into this area. Stray rates into this sanctuary have been found to be at 20 percent, which is greater than the 10% stray rate maximum as outlined in the HGMP. This directly reduces the genetic integrity of the wild population as hatchery fish are spawning with wild. This data was established by a private organization, not by ODFW. How can ODFW manage hatchery fish if they do not actively monitor the effects that hatchery fish are having on wild populations? Why does it take a private organization to determine this data? The HGMP assumes with only minimal changes and data that straying into this sanctuary will be no more than 5% in the future. How can they predict this without actually monitoring? #7

      Stray rates within the Siletz Basin are much greater than the 10% outlined by this HGMP but these stray rates are discredited by the HGMP as it ODFW professes that it is difficult to differentiate summer from winter hatchery fish so cannot determine the actual amount of straying that occurs. The monitoring sites within the Siletz basin have routinely found hatchery steelhead stray rates from 20-70%, which is grossly out of line with the 10% stray rate maximum outlined in the HGMP. "A second issue related to this hatchery program is the overall abundance of hatchery steelhead spawning in

natural habitats occupied by winter steelhead in the Siletz Basin. Limited observations in tributaries of the Siletz River indicate a substantial proportion of hatchery spawners in winter steelhead habitats. Some of these hatchery spawners are thought to be Siletz summer steelhead. However, given these fish have only an adipose fin clip which is a very common mark among hatchery steelhead, it is uncertain to what extent hatchery Siletz summer steelhead stray. There is also concern that large numbers of hatchery steelhead smolts released in the Siletz Basin may create competition with wild fish or attract predators which could also affect wild fish." Either ODFW needs to find out how to better determine summer from winter hatchery strays so as to have better data as to which hatchery population is straying or they need to take conservative steps to reduce the overall stray rates within the Siletz basin to no more than 10% so that they operate within their very own criteria standards.

- Up to 13.5 pair of wild Siletz summer steelhead can be taken for the Siletz summer brood stock program under this HGMP. The average total population size of the wild Siletz summer steelhead run is 500 fish. Taking up to 27 wild fish to create a broodstock program out of a run of only 500 fish reduces the overall fitness of this entire wild summer steelhead population, leaving a substantial vacancy of wild summer steelhead on the spawning beds. #8
    - Hatchery fish compete with both wild Siletz summer steelhead and wild Coho throughout the river. The fact that the Siletz Summer steelhead are recycled back downstream only increases their propensity to directly compete with wild species and also stray at higher rates yet nothing is actively being accomplished to minimize these negative interactions. "Adult hatchery summer steelhead are likely to interact with fish species present in the Siletz, including the listed Coho Salmon, at the time of their migration up the river. Stray adult hatchery summer steelhead are known to enter Coho Salmon spawning tributaries where they could interact with wild Coho. The characteristics and impacts of these interactions are not completely understood and cannot be comprehensively defined at this time. Recycling adult summer steelhead downstream for additional angler opportunities has become a common practice but also increases risk to Coho Salmon. Research in other basins indicate that recycled steelhead do not return to capture sites or are caught at high rates but potentially stray into natural production areas." Why does ODFW continue recycling fish when they no the negative consequences of this activity, have no actual data on hatchery summer steelhead stray rates, and yet know that actual stray rates within the Siletz basin as a whole are very high? (Section 3.5).

NMFS Responses to Comments from Matthew Lund.

Letter #	Comment #	NMFS Response
7	1	Noted. ODFW's HGMP for Siletz steelhead defines the protocols and criteria for pNOB. It is up to ODFW to implement.
7	2	Noted. This is evaluated in the EIS in section 3.4 and 4.4.
7	3	Noted. Provided in Siletz HGMPs and analyzed in sections 3.4 and 4.4. See new information in Table 7.
7	4	Noted.
7	5	Noted.
7	6	Noted.
7	7	Noted. All comments on the HGMPs themselves are directed to ODFW's attention.
7	8	Noted. See previous response.

Brian McLachlan
Portland, Oregon

October 25, 2016

Via Electronic Mail

National Marine Fisheries Service
Sustainable Fisheries Division,
2900 NW Stewart Parkway,
Roseburg, OR 97471
OregonCoastHatcheryEIS.wcr@noaa.gov

Re: Comments to Oregon Coast Hatchery DEIS

Dear Sir or Madame:

Thank you for the opportunity to provide comments to the National Oceanographic and Atmospheric Administration's (NOAA) draft environmental impact statement (DEIS) concerning the Oregon Department of Fish and Wildlife's (ODFW) Oregon Coast Hatchery and Genetic Management Plans (HGMP). I appreciate the time, effort and resources that went into preparation of the DEIS and encourage NOAA to dedicate the resources necessary to complete the Final EIS/Record of Decision and Endangered Species Act (ESA) Rule 4(d) process as soon as possible in order to provide ESA "take" coverage for Oregon's coastal hatchery programs.[1] #1

While my substantive comments below focus primarily on steelhead populations originating on the North Oregon Coast, many of the concerns and issues raised apply as well to other species and geographic areas. As encouraged in the DEIS, where possible I have offered potential solutions to the concerns I have raised.

As explained more fully in the comments which follow, the DEIS fails to satisfy the requirements of NEPA. The DEIS fails to ensure the high quality, accuracy and scientific integrity of its contents because it improperly relies on ODFW's 2014 steelhead viability assessment. ODFW's assessment is markedly flawed because, among other things, it purports to render scientifically reliable viability conclusions notwithstanding a severe lack of essential data regarding population abundance, productivity, and diversity, and it is void of any meaningful evaluation of the potential adverse effects of hatchery fish on natural populations. The DEIS also #2

[1]The DEIS notes that hatchery steelhead may prey on natural coho fry (which are listed as threatened under the ESA). DEIS at 4-26.

fails to adequately evaluate the current status of Oregon Coast steelhead, and fails to take the NEPA-mandated "hard look" at the potential effects of the hatchery programs on this resource.

Notwithstanding that the HGMPs under review are each site-specific actions, and will have different impacts on different populations, the DEIS takes a "big picture" approach and fails to sufficiently evaluate impacts on a population-by-population basis. Moreover, the DEIS fails to evaluate how the hatchery programs may impact the overall conservation status of the Oregon Coast steelhead Distinct Population Segment (DPS) notwithstanding that NOAA classifies this DPS as a candidate species/species of concern for listing under the ESA due in part to concerns over hatchery fish impacts, and despite the fact that it has been nearly 20 years since NOAA reviewed the status of this species. The DEIS also fails to address and apply the best currently available scientific research, methods and models to evaluate the foreseeable effects of the hatchery programs, notwithstanding that it just recently used these analytical tools to evaluate impacts of hatchery programs on Puget Sound steelhead.

Because of the number and magnitude of its deficiencies, the DEIS does not provide a meaningful analysis of the HGMPs and associated hatchery programs in terms of potential adverse impacts to natural steelhead populations. Accordingly, NEPA requires NOAA to prepare and circulate a revised DEIS for public review and comment in order to comply with the statute. *See* 40 CFR 1502.9(a) (if a DEIS "is so inadequate as to preclude meaningful analysis, the agency shall prepare and circulate a revised draft").

* * * *

1. <u>The DEIS improperly includes information that fails to meet NEPA's standards for high quality, accuracy, and scientific integrity</u>

NEPA requires Federal agencies to independently verify the scientific integrity, accuracy, and high quality of the information included in NEPA documents. 40 CFR 1502.24 (agencies shall insure the professional integrity, including scientific integrity, of the discussions and analyses in EISs); 40 CFR 1506.5 (agency shall independently evaluate and verify information submitted by applicant and be responsible for its accuracy); 40 CFR 1500.1(b) (requiring use of "high quality" information in NEPA documents); *see also* Information Quality Act Section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001 (Pub. L. 106–554); NOAA Information Quality Guidelines (2014) available at #3

http://www.cio.noaa.gov/services_programs/IQ_Guidelines_103014.html (requiring use of objective data meeting commonly accepted scientific standards).

In its description of the current status of steelhead, the DEIS cites the ODFW's viability assessment of steelhead which was included within the agency's Coastal Multi-Species Management Plan (CMP).[2] The DEIS states "Every population of winter and summer steelhead in the Oregon Coast ESU exceeded ODFW (2014a) VSP assessment criteria." DEIS at 3-27; *see also id.* ("For the Oregon Coast ESU, ODFW (2014a) described winter steelhead as "strong guarded" and summer steelhead as "sensitive guarded.""). Notably, this is the most current status assessment of steelhead viability referenced in the DEIS.

As explained below, ODFW's steelhead viability assessment is defective, lacks scientific credibility, and falls below commonly accepted professional fishery science standards appropriate for a viability analysis. It therefore fails to satisfy NEPA's required standards for accuracy, high quality, and scientific integrity. By referencing it without thoroughly discussing its flaws and limitations, the DEIS improperly imparts credibility to the assessment and invites readers to rely on it, thereby violating NEPA.

A. ODFW's Viability Assessment for Steelhead

In 2014, ODFW completed its CMP which, among other things, included an assessment of the current viability status of salmon, steelhead, and cutthroat trout populations along the Oregon Coast. ODFW 2014. ODFW's viability assessment is the foundation upon which the CMP builds long term goals (i.e., "desired status") and identifies management actions designed to achieve those goals. *See* ODFW 2014 at 6-7. Because the conservation goals and management prescriptions were developed based on the viability status assessments, as with the DEIS here, it was critically important for the CMP to contain scientifically credible assessments so that policy-makers, stakeholders, ODFW managers, and the general public could make well-informed choices based on accurate information.

The CMP indicates ODFW's assessments utilized "all available data and the most appropriate scientific methods." *Id.* at 6. Unfortunately, this is not the case, as ODFW's status assessment <u>for steelhead</u> lacked sufficient data and analysis to produce a scientifically reliable

[2] ODFW (2014) or CMP. Coastal Multi-Species Conservation and Management Plan. (2014). Oregon Department of Fish and Wildlife. *See* Appendix II. Available from http://www.dfw.state.or.us/fish/CRP/coastal_multispecies.asp.

estimate of viability. In particular, in its assessment ODFW failed to appropriately consider and evaluate important information concerning hatchery steelhead spawning levels and potential impacts. The assessment's flaws, taken together, raise considerable concern regarding the scientific integrity of the assessments.[3]

B. The Viable Salmonid Population (VSP) Framework

The CMP uses NOAA's Viable Salmonid Population (VSP) framework to assess the current status of the relevant salmonid populations.[4] CMP at 26 (citing McElhany et al. 2000).[5] #4 The VSP framework utilizes four parameters (i.e., metrics) to assess viability[6] – abundance, productivity, spatial structure and diversity. *Id.* Where data was available, each parameter's risk relative to the population's long-term viability was assessed on a scale of 1 to 5 (with 1 representing low risk and 5 representing high risk) so the parameters could be combined into a single viability score for the population. *Id.* When combining the parameters into a single score,

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[3]ODFW's assessment adopted a "stationary assumption" and made no attempt to factor likely future environmental impacts such as population growth, increased land-use pressures, or climate change into its evaluation of viability. *See* CMP at 165 (Appendix III). In addition, the CMP did not evaluate whether the management measures adopted in it would lead to achievement of the CMP's stated goal to "have all populations be highly viable." *See* CMP at 33. For example, the CMP nowhere evaluates in light of recent scientific research (and aside from a handful of conclusory statements) whether or how the plan's 30 percent hatchery-origin spawner (pHOS) target for certain steelhead populations will contribute to achievement of the criteria (e.g., >4 intrinsic productivity and 75% percentile of observed abundance) set forth in the plan to measure progress toward "highly viable" populations. *See* CMP at 164-65 (Appendix III). This poses a potential "disconnect" between certain CMP goals and the management measures prescribed in the plan.

[4] "The basic unit for status assessment is a salmonid population." ODFW 2014 at 26,

[5] McElhany, P., M. H. Rucklelshaus, M. J. Ford, T. C. Wainwright, and E.P. Bjorkstedt. 2000. Viable salmonid populations and the recovery of evolutionarily significant units. U.S. Dept. of Commerce, NOAA Tech. Memo, NMFS-NWFSC-42.

[6] McElhany et al. 2000 (at 2) defined a viable salmonid population as "an independent population of any Pacific salmonid (genus *Oncorhynchus*) that has a negligible risk of extinction due to threats from demographic variation, local environmental variation, and genetic diversity changes over a 100-year time frame." Thus, while a population may be rated as viable, that should not be interpreted to mean it is "healthy," "robust," or "resilient," nor at anywhere near its historical population size. Most natural (i.e., "wild") salmonid populations in the Northwest are very greatly reduced in abundance from their historical levels.

the abundance and productivity parameters were weighted more heavily than the spatial structure and diversity scores because those "parameter[s] are generally the most direct quantitative evaluation of a population." *Id.*; *id.* at 142 ("[a]bundance and productivity are key indicators of population health"). Thus, the abundance and productivity parameters cumulatively accounted for two thirds (2/3) of the viability score, and the spatial structure and diversity parameters each account for one sixth (1/6) of the final score. *Id.*

Or, at least that was how the assessment was designed to work.

C. ODFW's Assessment Lacked Abundance and Productivity Data for 17 out of 19 Steelhead Populations

Although abundance and productivity data are essential to a VSP analysis – indeed designed to comprise two-thirds (67%) of the CMP's viability score – ODFW did not have sufficient data to evaluate these parameters for 17 out of 19 steelhead populations along the Oregon Coast. CMP at 30, 162. Despite this lack of data, the CMP forged ahead to apply the VSP framework by utilizing only the spatial structure and diversity parameters. *Id.* The spatial structure and diversity scores were simply averaged to arrive at an overall population viability score. CMP at 26. Thus, population metrics designed to cumulatively account for one third of the viability score, now accounted for the entire score. The CMP contains no analysis or evaluation whatsoever regarding whether the VSP framework can reliably be used to render a scientifically credible viability assessment in this manner. Given that abundance and productivity scores are the most direct metrics evidencing a population's status, and were supposed to comprise two thirds of the model's final viability score, ODFW's "no data, no problem" approach to proceeding without such data (and without explanation) is quite concerning. #5

D. The CMP's Abundance and Productivity Data for the Nehalem River Population is Dubious

#6

The CMP viability assessment utilized abundance and productivity data for just two out of nineteen steelhead populations on the Oregon Coast – the Nehalem and the North Fork Umpqua. CMP at 30, 162. For the Nehalem, however, that data is derived from only one 4.8 mile section of one tributary, the Salmonberry River. CMP at 30, 140. This abundance and productivity data is then expanded to not only cover the entire Salmonberry River, but the entire

Nehalem River basin as well, which includes the mainstem, North Fork Nehalem, and several other significant tributaries.[7] CMP at 30, 122, 161.

Applying data from one 4.8 mile section to cover a basin as large and diverse as the Nehalem is scientifically questionable, especially considering the unique aspects of the Salmonberry River. The Salmonberry River is noted for having a late run of comparatively large steelhead, which has previously been identified by ODFW as one of the healthiest stocks in Oregon.[8] Moreover, as opposed to another substantial area of the Nehalem system (the North Fork), the Salmonberry River is not planted with hatchery steelhead and may receive less fishing pressure due to its remote location (e.g., primary access is walk-in via a washed-out railroad line and there are no developed boat access points). Moreover, the Salmonberry is located in a different ecozone (level 4 volcanics) than either the N.F. Nehalem (primarily level 4 coastal upland) or upper Nehalem (primarily level 4 Willipa Hills). Because the Salmonberry sub-population lies primarily in a different ecozone than other major parts of the basin, is far more remote, receives less fishing pressure and, most importantly, is not planted with hatchery steelhead (which ODFW and other fisheries agencies acknowledge may negatively impact the productivity of wild steelhead), it is doubtful that data from one 4.8 mile reach can be applied to the entire Nehalem River basin population with a reasonable amount of reliability (at least without additional data to verify accuracy).

The North Fork Umpqua is the other steelhead population for which the CMP utilized abundance and productivity data. The North Fork Umpqua does not represent a coastal population, however, because its spawning and primary rearing habitat lie in the Cascade Mountain range. This fact is reflected in ODFW's acknowledgement that "[i]n comparison to all

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[7] The Nehalem watershed is one of the largest watersheds on the Oregon coast, encompassing 855 square miles. Nehalem Watershed Analysis, Portland State University (1999), avail. at http://web.pdx.edu/~maserj/project/project1/1.htm. The Nehalem River mainstem is 118.5 miles long and several major and minor tributaries (including the North Fork Nehalem, Salmonberry River and Cook, Humbug and Rock Creeks) add significantly to the length of its anadromous reach.

[8] A waterfall on the North Fork Salmonberry appears to act as flow barrier during high winter flows, resulting in a relatively late peak spawn timing for a significant component of the Salmonberry population. *See* Ferguson, I. (2009), Winter Steelhead Spawning Ground Surveys Salmonberry River (Nehalem Basin), Oregon, ODFW STEP Project Report, at 12.

other Oregon coast steelhead populations, winter steelhead in the North Umpqua population exhibit a unique life-history characterized by their migration distance, smolt age, and age at first maturity." CMP at 11.[9] Thus, data from one 4.8 mile section of the Salmonberry is the *only* population-specific abundance and productivity data used in the viability assessments from a true coastal steelhead population.[10] And the Salmonberry River and its steelhead possess many unique attributes which may not be fully representative of other coastal populations.

E. The CMP Did Not Use Sufficient Data – Such as Genetic Studies or Life History Information – to Evaluate Diversity

#7

In addition to abundance and productivity, the VSP framework utilizes diversity and spatial structure to assess viability. The CMP's spatial structure parameter uses two criteria: loss of access to historical habitat and loss of non-linear distribution within a population area. CMP at 156.

In comparison, the diversity parameter is designed to assess a population's diversity in terms of genetic diversity and diversity of life history traits (such as adult run timing, spawn timing, age structure, morphology, etc.). CMP at 158; McElhany at 101. However, ODFW did not have sufficient data to directly evaluate steelhead population diversity, i.e., the "historical suite of life-history characteristics expressed within each population." *Id.* So instead the CMP evaluated steelhead diversity by assessing (1) the lost use of diverse habitats and (2) the loss or reduced variation of life-history traits. CMP at 159.

As to the latter – the loss of variation in life history traits – once again ODFW did not have sufficient population-specific information, acknowledging "little population level information with which to assess" this element. CMP at 163. For example, the CMP indicates "there is limited information to document the variation of historical spawn timing for any of the species". *Id.* To compensate for this lack of data, the CMP "*assumes*" that "changes in freshwater and estuarine habitat composition and quality . . . have led to less variation in at least one life

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[9] This point is reinforced in the CMP which noted that Salmonberry River spawner estimates had a much better correlation with recent estimates for other coastal steelhead populations, and for that reason only Salmonberry data was used in combination with more recent SMU-wide spawner data to estimate past SMU-wide annual spawner abundance (minus the North Umpqua) from 1973 through 2002. CMP at 123 (Appendix I).

[10] The CMP notes that both the Salmonberry and N.F. Umpqua steelhead populations exhibit slightly decreasing long-term abundance trends. CMP at 30

history trait for all species and populations within each SMU" (emphasis mine). CMP at 163. The CMP therefore determined that all populations in all SMUs cannot receive a risk score for this criteria less than 2. *Id*. at 145. Notably, the CMP does not make any parallel assumption regarding the potential impacts of hatchery fish on natural population diversity, notwithstanding a considerable body of fisheries literature discussing how hatchery fish may impact the genetic diversity and life history traits of natural populations.

With respect to use of diverse habitat, while it is not fully articulated in the CMP, an ODFW scientist explained to me that ODFW looked at natural steelhead spawning locations to get a sense of the health of the populations. In theory, if steelhead populations were at low productivity levels, it would be expected that natural spawning would be limited to spawning habitat areas of relatively high productivity. In contrast, ODFW surveys indicated that steelhead spawning was well distributed throughout more areas than would be expected if the populations were suffering from low productivity. This, according to ODFW, suggests adequate productivity. Personal communication, Kevin Goodson (ODFW), 2.11.16.

Given the other problems with the CMP's assessment discussed herein, ODFW's reliance on spawner distribution to evidence steelhead population productivity – while a valid indicator – seems like a thin-reed upon which to measure life history diversity or to hang a scientific conclusion of viability. Moreover, as NOAA acknowledges in the DEIS, hatchery fish can "mask the true status of natural populations where straying and spawning by hatchery fish in the wild is substantial". DEIS at 3-15.[11]

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[11] The DEIS goes not to explain that "continual supplementation of natural spawning by hatchery fish (intentional or unintentional) can increase production and thereby increase uncertainty of the status of the natural population to sustain itself without hatchery influence. Along the Oregon Coast, most natural populations currently have low percentage of hatchery fish on the spawning grounds (e.g., 0 to 10 percent). Therefore, *managers are able to evaluate the true status of the natural population because hatchery influence is relatively minor*." DEIS at 3-15 (emphasis added). The DEIS's concern regarding the masking effect of hatchery fish is well-stated. It is ironic, however, that the DEIS would propose that managers are able to evaluate the true status of natural population because hatchery influence is minor, yet fail to actually describe the true status of the steelhead DPS or any of its constituent populations. Moreover, the DEIS fails in this section to note that the Necanicum population of steelhead has historically been subject to a 63% pHOS rate, and that many other populations of steelhead have pHOS figures that are well above the levels recommended by the HSRG to maintain viable populations over the long run.

In addition, most concerning in ODFW's analysis of diversity is (1) the lack of direct data to assess the diversity parameter; (2) that, due to the lack of diversity data, the criteria for both spatial structure and diversity (which are the only two parameters used to assess steelhead population viability for 17 of 19 populations) are focused for the most part on loss, alteration, or use of habitat (e.g., loss of access to historical habitat, loss of non-linear distribution within available habitat, lost use of diverse habitat, and less life-history variation due to alteration of habitat) rather than on actual population attributes; (3) that the CMP (at 162) assigns the same "life history loss score" uniformly to all populations of steelhead, which suggests a lack of analysis on a population-by-population basis; and, (4) that high levels of hatchery fish spawning naturally may be propping up and masking the actual condition of certain natural populations. Nowhere in the CMP's population-specific winter steelhead viability assessments are genetic studies or direct life history traits considered. This is a significant deficiency that, when combined with the lack of abundance and productivity data, further degrades confidence in ODFW's steelhead viability assessment.

F. The CMP Viability Analysis Failed to Adequately Evaluate the Potential Impact of Hatchery Steelhead on Natural Populations

#8

Perhaps the most glaring defect in the CMP's assessment of steelhead is that nowhere is the potential impact of hatchery fish adequately factored into the viability assessment for any of the twelve populations where hatchery steelhead are released.[12]

Like the DEIS, ODFW acknowledges the potential for hatchery salmon and steelhead to negatively impact natural populations. CMP at 40 ("hatchery fish can pose a risk to wild fish populations"). Once more citing a lack of data, however, the CMP does not directly evaluate the impact of hatchery fish on individual populations. *Id.* at 35, 40 (indicating ODFW does not currently have sufficient information to assess hatchery risk on a population-by-population basis.). Rather, the CMP explains that the "potential threats and benefits" that the "genetic and ecological influence of hatchery fish" . . . "exert on the SMUs manifest themselves in the VSP parameters of the viability assessment, and were therefore not independently assessed as part of that viability assessment[.]" CMP at 30 (emphasis added). What this apparently means is that,

[12] The CMP indicates hatchery steelhead are released into 12 of the 19 winter steelhead population areas, and that in six of those areas spawning surveys indicate a relatively higher level of hatchery fish are seen on spawning grounds. CMP at 54-55.

although the impacts of hatchery fish were not directly evaluated, any impacts hatchery fish were or are having on natural populations will (at least theoretically) "manifest themselves" (i.e., show up) in the VSP parameters (of abundance, productivity, diversity and spatial structure) that are evaluated in the analysis.

While this "manifestation" theory may (or may not) work in other situations, as applied to the CMP's steelhead assessment, there is a fatal problem – ODFW did not evaluate any parameters or data in a manner that would be expected to adequately "manifest" the potential impacts caused by hatchery fish.

Hatchery impacts (if any) on natural populations would be expected to show up in the abundance, productivity and/or diversity parameters. For instance, a number of studies and reports have suggested that hatchery fish spawning in the wild can reduce the fitness and productivity of natural populations, as well as pose genetic diversity and ecological risks. *See* CMP at 35, 40-42, Chilcote 2011, 2013; HSRG 2009 at 8; HSRG 2015. Yet, as outlined above, the CMP did not report using any abundance, productivity or direct diversity data to evaluate steelhead viability for 17 out of 19 steelhead populations, including 11 out of the 12 populations where hatchery steelhead are released (the exception being the Nehalem which is discussed below). And the indirect diversity data it did use focused primarily on habitat-related indices (e.g., use of diverse spawning habitats) rather than on indices that would manifest hatchery impacts.

It is doubtful that hatchery fish-related impacts would adequately manifest themselves in the parameters and data used, and the assessment did not suitably address the possibility that progeny of hatchery fish may be masking impacts and/or propping up natural populations.

Moreover, for the Nehalem population, abundance and productivity data was extrapolated from one 4.8 mile reach of the Salmonberry River. But since there are no hatchery steelhead released in the Salmonberry, the abundance and productivity data used from that stream would not capture the potential impacts of the considerable hatchery program on the N.F. Nehalem.[13]

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[13] ODFW data indicates that the pHOS for the N.F. Nehalem was 56% for 2003-2012 and 6% for 2013-2015. pHOS for the entire Nehalem steelhead population was 19% for 2003-2012 and 3% for 2013-2015. pHOS for the mainstem Nehalem was 2% for both time periods. ODFW does not have an explanation for the sharp decrease in pHOS in 2013-2015 as hatchery production has remained similar during both periods. ODFW cautions that pHOS data is based on a limited number of spawning surveys and observations by those conducting the surveys. *See* Oct. 20,

Thus, the CMP did not include a sufficiently reliable analysis of the past and current impacts of hatchery fish for the 12 natural steelhead populations where hatchery steelhead are released.

Also concerning is that ODFW's viability assessment failed to evaluate observed hatchery pHOS rates for steelhead (such as the 63% pHOS rate reported in the Necanicum River, *see* discussion below) in conjunctions with publish, peer-reviewed, scientific literature and models (e.g., Chilcote et al. 2011; HSRG 2009, Ford Model, etc.) concerning hatchery impacts on natural populations.

G. The Necanicum River Example

The deficiencies of ODFW's steelhead viability assessment can be more fully illustrated by way of looking at a specific example – the CMP's assessment of the Necanicum River winter steelhead population. #9

The Necanicum River is a relatively small river which directly enters the Pacific Ocean at Seaside, Oregon. CMP at 23. The main-stem is approximately 21 miles long, draining a basin of 83.7 square miles. It is the first river entering the ocean along the Oregon Coast south of the Columbia River. ODFW has identified the naturally produced winter steelhead in the Necanicum as a discrete population. CMP at 20. The CMP's stated policy goal for the Necanicum population (as for all populations) is for it to remain viable, and to become "highly viable". CMP at 32-33.

The Necanicum River's salmonid habitat has been severely degraded. The Nehalem Hatchery Steelhead HGMP indicates that the Necanicum coho population complex is not viable given the current state of the habitat because high quality habitat is estimated to be present in only 3 miles of stream, well below the 15-mile threshold needed to support a viable population. Nehalem Hatchery Steelhead HGMP at 16 (citing Nickelson 2001). Due to considerable habitat utilization overlap with coho, steelhead habitat is likely to be severely degraded as well.

ODFW did not have sufficient population-specific abundance data to use in its viability assessment of Necanicum steelhead. Nonetheless, a number of sources estimate the natural (or

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2016 email exchange between Robert Bradley, Assistant District Biologist, ODFW, and Brian McLachlan, submitted to NOAA Oct. 25, 2016 with these comments. (Oct. 20, 2016 Bradley Email). In light of publications indicating reduced productivity as a proportion of pHOS (*see* Chilcote 2011, 2013; HSRG 2015), the substantial differences in long-term pHOS between the N.F. Nehalem and mainstem Nehalem (which includes the Salmonberry) illustrates why it may be improper to expand Salmonberry data to apply to the entire Nehalem population.

naturally spawning) winter run population to be in the neighborhood of 1000 steelhead. *See* Kenaston, K., ODFW Information Reports No. 89-1, Estimated Run Size of Winter Steelhead in Oregon Coastal Streams (1989) (estimating average wild run size of 1,017 steelhead for 1980-85*);* Snyder, K.U. et. al, Necanicum River Watershed Assessment (March 2002), 2-18 to 2-24, retrieved 2.8.16[14]; see also CMP at 167.[15]

Hatchery steelhead have been planted in the Necanicum for decades. *See* Nehalem River Watershed Assessment at 2-23. The average number of smolts planted since at least 1992 has been approximately 40,000 annually. Nehalem steelhead HGMP at 49. Hatchery stock from the N.F. Nehalem River are used. This stock has on average an earlier run and spawn timing than the natural population, although there is considerable run and spawn timing overlap. *Id.* at 33-34. The hatchery smolts planted in the Necanicum represent a segregated (aka "isolated") program utilizing a domesticated, out-of-basin, within-DPS, stock. *Id.* at 2-3. The N.F. Nehalem River is the next significant drainage south of the Necanicum River. Smolts are trucked from the N.F. Nehalem hatchery and directly planted into the Necanicum River at various locations up to river mile 18. *Id.* at 48. There are currently no steelhead smolt acclimation or adult collection facilities on the Necanicum. *Id.* at 13, 30, 32; *see* Oct. 20, 2016 Bradley Email.

In 1996, ODFW conducted an intensive natural spawning fish study on the Necanicum designed to look at hatchery/wild steelhead interactions. Lindsay (2001)[16]; Watershed

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[14] The Necanicum River Watershed Assessment contains an informative discussion of the river's natural steelhead population. The assessment estimates a natural population abundance of at least 1000 fish (as of 2002) and suggests that the population is healthy notwithstanding a high number of hatchery fish spawning in the wild. Viewed 2.10.14 at: https://nrimp.dfw.state.or.us/web%20stores/data%20libraries/files/Watershed%20Councils/Watershed%20Councils_182_DOC_Necanicum%20River%20Watershed%20Assessment.pdf.

[15] The CMP estimate of average observed abundance for naturally spawning steelhead for the North Oregon Coast stratum (Necanicum, Nehalem, Tillamook and Nestucca populations) is 19,800 steelhead. The CMP further estimates that the Necanicum River population may comprise 5% of the stratum. Assuming this estimate is accurate, it suggests a rough estimate of natural spawning abundance in the Necanicum River of 990 steelhead, which is consistent with the other referenced estimates. Although there is considerable uncertainty regarding the precision of these estimates, they nonetheless are useful to provide a "ball-park" estimate of average population size

[16] Lindsay, R., et al., Reducing Impacts of Hatchery Steelhead Programs, ODFW (2001).

Assessment at 2-23. At the time (as now) approximately 40,000 winter steelhead smolts from the Nehalem hatchery were planted annually in the Necanicum. Lindsay (2001) at 30. The study reported that 63% of the naturally spawning steelhead population were of hatchery origin.[17] *Id.* at 32-33. Although noting spatial and temporal separation, the study concluded that "in all basins, there was considerable overlap in spawn timing between hatchery and wild steelhead although wild fish tended to spawn later and over a longer time period than hatchery fish." *Id.* at 34.

In its 2005 Native Fish Status Report, ODFW discussed the status of the wild steelhead population in the Necanicum River with reference to hatchery fish:

> Annual releases of hatchery fish in the Necanicum have averaged 40,000 smolts. Data were not available to estimate hatchery-to-naturally produced ratios of spawners in the Necanicum the last couple years. In 2003 and 2004 spawning surveys, two fish and six fish were observed with none being hatchery finmarked. *Lindsay et al. (2001) provide a better indication of what annual hatchery fractions are in the basin*. In 1996, Lindsay et al. (2001) examined the temporal and spatial distribution of naturally and hatchery produced fish spawning in the basin. Fish were sampled via visual observation and dip netting. A total of 386 fish were observed, with 63% of those being hatchery origin. Hatchery practices have remained relatively stable since the early 1990s, so it is believed that *the 1996 surveys should be fairly representative of recent years*.

ODFW 2005 (Oregon Native Fish Status Report, Vol. II, Winter Steelhead at 246; *see also id.* Table 92 at 245) (emphasis added).[18] Given the high percentage of hatchery fish spawning naturally, ODFW indicated the Necanicum population failed to meet the relevant conservation standard (reproductive independence). *Id.* at 245.

In comparison, ODFW's 2014 CMP viability assessment concluded that the Necanicum steelhead population was viable. CMP at 162. So, how did the ODFW's viability assessment

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[17] For the Necanicum River steelhead population, ODFW data indicates 63% pHOS for 2003-2012, and 11% pHOS for 2013-2015. *See* Oct. 20, 2016 Bradley Email. These are estimates of observed ratios of hatchery fish on spawning surveys. ODFW cautions that sample sizes may be low in some cases and that there is also variability in surveyor ability to observe and distinguish marked versus unmarked fish. ODFW has no explanation for the significant reduction in pHOS in 2013-2015 as hatchery operations have remained similar over the time periods. *Id.* The 63% pHOS figure is consistent with that reported by Lindsay (2001) based on mid-1990s research, so it appears to represent a consistent long-term figure.

[18] Pertinent conditions (such as plant numbers) do not appear to have changed since 2005. *See* CMP at 55; ODFW 2005 at 245-46.

reach this conclusion? As described above, ODFW did not use any abundance or productivity data; nor did it utilize any direct population-specific diversity data (such as genetic studies or life-history information). *Id.* Rather, the assessment relied exclusively on spatial structure (which focuses on use and configuration of habitat) and indirect measures of diversity (which again focused primarily on use and alteration of habitat). *Id.* And despite (a) its own 2005 status report giving the population a failing grade because of potential hatchery fish impacts; (b) acknowledging in the CMP that the Necanicum had a high percentage of hatchery fish spawning in the wild that needed to be reduced (CMP at 50, 55); and (c) its own research reporting 63% pHOS for the Necanicum population, ODFW never directly evaluated the potential impact of hatchery fish on the natural population. Nor did ODFW explain how such impact would be expected to "manifest" itself in its viability assessment where no abundance, productivity or direct diversity data were utilized.

ODFW's failure to meaningfully evaluate the potential impact of hatchery steelhead is not only very concerning, it is difficult to fathom given (a) the focus on hatchery fish impacts and management in the CMP, (b) and the various studies and reports discussing the potential impacts of hatchery fish on natural populations referenced therein. *See e.g.,* CMP at 40 (citing, *inter alia,* Chilcote et al. 2011; HSRG 2009). For example, the Congressionally-chartered Hatchery Scientific Review Group (HSRG) advised that to conserve natural populations, hatchery-origin spawners should be limited to 5 to 10% of the natural spawning population for a "segregated" hatchery stock such as that used in the Necanicum. *See* HSRG 2009 at 9-10. In addition, research by ODFW's own scientists concluded that steelhead and salmon population productivity is significantly affected by the proportion of hatchery fish in the naturally spawning populations. Chilcote et al. 2011; Chilcote et al. 2013[19] Yet nowhere in the CMP's viability

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[19]Chilcote, et al., 2011. Reduced recruitment performance in natural populations of anadromous salmonids associated with hatchery-reared fish. Can J. Fish. Aquatic Sci. 68:511-522; Chilcote, et al., 2013. Corrigendum: Reduced recruitment performance in natural populations of anadromous salmonids associated with hatchery-reared fish. Can J. Fish. Aquatic Sci. 70:1-3. The Independent Scientific Advisory Board summarized the results of these studies in a recent publication:

> These studies examined how intrinsic productivity was related to a variety of variables using data for 23 Chinook, 30 steelhead, and 18 coho populations over a 20-year period. Most of the Chinook and steelhead populations were from the Columbia Basin whereas the majority of the coho populations were from the Oregon coast. The best statistical model included the mean percentage of hatchery fish in the spawning population and

assessment of the Necanicum River steelhead population is ODFW's own research indicating 63% pHOS even mentioned – let alone evaluated.

There is considerable uncertainty inherent in evaluating potential impacts of hatchery fish on natural populations, especially where, as here, there is limited data. (And I certainly do not purport to know what impact hatchery fish are having on the Necanicum or any other population.) A lack of data, however, does not mean the potential impacts can be discounted or ignored – any such "no data, no problem" approach simply falls below accepted scientific standards. *See e.g.,* Puget Sound Steelhead Technical Recovery Team (PSTRT) 2013. Viability Criteria for Puget Sound Steelhead. Final Review Draft at 111 (incorporating influence of hatchery fish into assessment of diversity parameter of VSP model). It is axiomatic that when assessing the condition of a population, all relevant data should be evaluated. With respect to steelhead, and especially the Necanicum river population, ODFW failed to adequately incorporate relevant data regarding hatchery fish into its steelhead viability analysis.

H. The CMP Rated All Populations as "Viable" Despite Inadequate Analysis

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> explained 88% of the variability in intrinsic productivity of the populations. The percentage of hatchery fish on the spawning grounds was 13 times more influential than the next best variable in the model, suggesting that hatchery strays have an important effect on natural salmon productivity. Their modeling results predicted that intrinsic productivity would decline by 45%, on average for these 78 populations, if the percentage of hatchery fish was increased from 0% to 25% (Figure VI.4). The observed percentage of hatchery fish on the spawning grounds averaged 24%. Intrinsic productivity of spawning populations consisting of 50% hatchery fish was predicted to decline by 74% compared to a population consisting entirely of natural-origin salmon. Although the absolute value of intrinsic productivity varied among the species, the model predicted similar rates of decline as the percentage of hatchery fish increased (Figure VI.4).

ISAB (2015), Density Dependence Report at 118 (emphasis added). Note, the rate of productivity decline reported applies to the whole spawning population, including both hatchery and naturally-produced fish. Therefore, the reported productivity declines may not apply equally to the hatchery and naturally-produced components of the population. In other words, the lower productivity of hatchery fish could be dragging down the reported productivity of the population as a whole and may not accurately reflect the productivity of the natural population. Kevin Goodson (ODFW), personal communication, 2.11.16.

#10

Despite the deficiencies outlined above, the CMP utilized the VSP framework to conclude that (1) the steelhead Species Management Unit (SMU) (which corresponds to NOAA's Oregon Coast steelhead DPS) is currently viable, (2) 4 out of 4 strata (similar to "major population groups") are viable, (3) 19 out of 19 coastal steelhead populations are viable, and (4) that there are no populations with unknown viability. CMP at 28 (emphasis added). Indeed, the CMP proclaims, "[t]he overall condition of wild salmon, steelhead and trout across the coast is remarkably good . . .". CMP at 26 (emphasis added).

To be fair, the CMP does point out that steelhead populations had an "indicator of lower confidence in the [viability] results than is ideal", and thus concluded that the status of the SMU[ ] as a whole [was} "Strong-Guarded". CMP at 30. There is a distinction, however, between having, on the one hand, lower confidence in scientific conclusions than "is ideal," and, on the other, utilizing the VSP framework in a manner that lacks scientific reliability and utterly failing to consider relevant data. This is a case of trying to jam a square peg into a round hole – the VSP framework simply cannot be used in a scientifically reliable manner without abundance and productivity data, direct diversity data, and – most importantly – appropriately assessing available data regarding potential hatchery impacts.[20]

The CMP's failure to meaningfully evaluate the potential impacts of hatchery fish, combined with the other inadequacies discussed above, resulted in a scientifically defective viability assessment of the Necanicum steelhead population in particular, and Oregon Coast steelhead populations in general.[21] NMFS should therefore not rely on ODFW's steelhead viability assessment in the DEIS without a thorough discussion of its flaws.

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[20]I outlined in detail my concerns about the CMP's steelhead viability assessment in written comments to ODFW during the public comment period for the CMP. *See* CMP Appendix VII, Attachment D (Public Comments) at 348. I also spoke with ODFW scientists about my concerns, and testified (albeit briefly under a 3-minute time limit) before the ODFW Commission at a public hearing concerning the plan. By the of time of the public comment period, however, the stakeholder process and many negotiations over the CMP had largely been completed. I suspect the proverbial "train had left the station" in terms of it being politically feasible at that time for ODFW to revisit its status assessments. This, of course, calls into question the integrity of the public review and comment process.

[21] Please note: while my comments are critical of ODFW's steelhead population assessments, I am not suggesting that the Oregon Coast steelhead DPS nor any of its constituent populations (including the Necanicum population) is or is not viable. (In fact, the CMP's estimate of SMU/DPS spawner abundance by decade appears fairly stable, with only a slight downward

I. NOAA's Position Regarding ODFW's steelhead viability assessments

#11

NEPA requires NOAA to "identify any methodologies used" and to "make explicit reference by footnote to the scientific and other sources relied upon for conclusions in the statement." 40 CFR 1502.24. NOAA must therefore be "explicit" in a revised DEIS (or FEIS) regarding whether or not it is relying on ODFW's steelhead viability assessment. As discussed above, ODFW's steelhead assessment is defective and lacks scientific integrity. It would be arbitrary, capricious and a violation of law for NOAA to rely on it or reference it without discussing its substantial flaws.

NOAA cannot completely ignore ODFW's steelhead viability assessment, however. Although flawed, it certainly is highly relevant information which forms the foundation for Oregon's CMP and HGMPs. Indeed, due to its relevance, NOAA referenced it and cited its conclusions in the DEIS. Thus NOAA cannot escape discussion of the scientific credibility of ODFW's steelhead viability assessment.

In your response to comments, please directly and clearly answer the following questions:

A. In NOAA's view, does ODFW's 2014 viability assessment for Oregon Coast steelhead populations (including the Necanicum steelhead population) satisfy NEPA's required standards for high quality, accuracy and scientific integrity? *Does it meet commonly accepted scientific standards appropriate for a viability analysis?*

B. Does NOAA, like ODFW, consider each and every population of winter and summer steelhead in the Oregon Coast DPS to be viable?

C. Does NOAA, like ODFW, consider the Necanicum steelhead population to be viable?

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trend. CMP at 14.) Moreover, I am not recommending at this time that any proposed hatchery program be disapproved. Actually, I support many if not most aspects of the CMP and the proposed hatchery operations under evaluation. I simply want NOAA to do what NEPA requires (and what ODFW failed to do) – take a scientifically sound "hard look" at the HGMPs by rigorously and objectively evaluating potential impacts of the hatchery programs under review on Oregon Coast steelhead.

2. **The DEIS fails to adequately describe the current status of the Oregon Coast steelhead populations effected by the Hatchery Programs under review** #12

Ultimately, the NEPA process is intended to help public officials make decisions that are based on an understanding of environmental consequences, and to take actions that protect, restore, and enhance the environment. 40 CFR 1500.1(c). In order to understand the environmental consequences of a proposed action and alternative, an accurate description of current environmental conditions is imperative. To this end, NEPA requires a DEIS to adequately describe the affected environment so that the effects of the alternatives considered may be understood. 40 CFR 1502.15.

To comply with this requirement, the DEIS purports to "describe[ ] the *current status* of salmon and steelhead populations throughout the Oregon Coast Region . . ." DEIS at 3-9 (emphasis added). Yet the DEIS fails to adequately describe the current status of the steelhead populations as a whole (i.e., the Oregon Coast steelhead DPS), nor the status of individual populations.

The DEIS provides a generalized "big picture" overview of salmon and steelhead habitat, ecology, hatchery practices, and some limited data (such as abundance and pHOS data) on the steelhead DPS and strata/major population groups. However, with the exception of its reference to ODFW's flawed steelhead viability assessments, it nowhere attempts to synthesize available data and information to describe the actual current status of the steelhead DPS nor its constituent populations. In this respect, it leaves unanswered the most basic – and important – questions relevant to understanding potential impacts: is the Oregon Coast steelhead DPS viable? Is it healthy, sustainable, depleted, depressed, or at risk of becoming endangered in the foreseeable future? The first and last questions are especially pertinent: viability is the current scientific benchmark used by NOAA, ODFW and other fisheries agencies and professionals to assess the conservation status of salmonid populations; and, the DPS's risk of becoming endangered is an vital concern in light of NOAA's classification of Oregon Coast steelhead as a candidate species/species of concern for listing under the ESA.

The same questions are also left unanswered regarding individual populations. For example, is the Necanicum steelhead population viable? Is it healthy, sustainable or depressed? How about the Nehalem, Tillamook, or Nestucca populations? While the DEIS includes data and describes a number of attributes about the DPS and some of its constituent populations, one

searches in vain for any determinations or conclusions about the current status of the discrete populations or DPS that would enable a reader to put the expected environmental effects of the proposed hatchery programs into meaningful context.

The DEIS must do more than simply recite data and numbers, such a pHOS levels – it must put that data and those numbers in context, i.e., evaluate them, so that it provides a meaningful analysis that will foster a clear understanding of the choices to be made and their expected environmental consequences. Simply reporting that the mid-coast steelhead populations have an average pHOS of 22% which provides a "moderate – readily apparent" risk level, does little to foster a clear understanding of potential impacts without that metric evaluated and put into proper context.

For example, how is one supposed to evaluate the potential consequences of the Nehalem steelhead hatchery program (as embodied in the Nehalem steelhead hatchery HGMP) without knowing whether the Necanicum steelhead population is – or is not – currently viable (or healthy, depressed, or sustainable)? As NOAA recognizes in the DEIS, "[t]he extent of adverse effects [from hatchery fish] depends on how the hatchery program is managed, <u>the current status of the natural-origin populations</u> and how [it is] affected by the hatchery program, and the condition of the habitat; among other factors." DEIS at 5-6 (emphasis added). NOAA has further recognized that population status is a "*key consideration*" in evaluating hatchery impacts. In it FEIS concerning Five Puget Sound steelhead hatchery programs, NOAA explained:

> [H]ighly productive populations may be able to incur considerable fitness losses and still remain highly productive, whereas low-productivity populations may be highly impacted by further reductions, *making population status a key consideration* in determination of acceptable fitness loss.

NOAA 2016 at B-12 (emphasis added).[22]

It just makes common sense that a "moderate impact" (defined in the DEIS as an impact that is "readily apparent", see DEIS at iv.) may have a vastly different effect on a robust and healthy (i.e., highly productive) population as compared to a population that is teetering on the

[22] NOAA Fisheries, Final Environmental Impact Statement to Analyze Impacts of NOAA's National Marine Fisheries Service Proposed 4(d) Determination under Limit 6 for Five Early Winter Steelhead Hatchery Programs in Puget Sound (March 2016) (NOAA 2016)

edge of viability (or perhaps is already not viable). Thus, NOAA must assess the current condition of each individual population in order for the effects of the alternatives to be put in context and understood. The DEIS does not do this. Rather, it takes a "big picture" approach and provides a general overview, without adequately assessing the current status of the individual populations.

The importance of NOAA taking a "hard look" at the current conservation status of Oregon Coast steelhead is underscored, as mentioned above, by NOAA's classification of Oregon Coast steelhead as a candidate species/species of concern for listing under the ESA. NOAA last completed a full status review of Oregon Coast steelhead in 1996. In that review, NOAA concluded that the ESU (now DPS) was at risk of becoming endangered in the foreseeable future. Busby et al. (1996) at 167.[23] Following subsequent scientific disagreement and additional data, NOAA prepared an update to its status review. In the update, a majority of its biological review team (BRT) concluded that Oregon Coast steelhead were not presently at risk of extinction, with minorities concluding that the ESU was likely to become endangered in the future and that there was insufficient information to determine the conservation status of the ESU. Busby (1997) at 28.[24] The status report update emphasizes that the majority view should not be interpreted as a conclusion that the ESU was heathy. Rather, the BRT had considerable concern for the ESU and accordingly "felt strongly" that the conservation status of the ESU should be revisited in the near future with updated data. *Id.* NOAA then issued a final rule (1) finding that Oregon Coast steelhead warranted classification as a candidate species for listing under the ESA; (2) expressing concern about the conservation status of the ESU; and (3) committing to reevaluate the status of the ESU within four years to determine whether listing was warranted. 63 Fed. Reg. 13347 (Mar. 19. 1998). Despite this commitment and its concerns for the ESU, it has been nearly 20 years since NOAA last completed a status review of Oregon Coast steelhead.

NOAA's policy is to take proactive conservation measures to prevent candidate species/species of concern from becoming threatened or endangered and warranting listing under

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[23] Busby, P., et al., Status Review of West Coast Steelhead from Washington, Idaho, Oregon and California, National Marine Fisheries Service (1996).

[24] Busby, P. et al, Status Review Update for Deferred and Candidate ESUs of West Coast Steelhead, National Marine Fisheries Service (1997).

the ESA. Thus, a key concern -- and an issue that must be addressed in the DEIS – is what effects the hatchery programs under review may have on the conservation status of the DPS in terms of its potential to be listed. In order to provide a full understanding of potential impacts, and to foster the informed decision-making NEPA requires, the DEIS must address this concern, as an ESA listing would have enormous ecological and socio-economic consequences.

In order to comply with NEPA and properly assess the status of Oregon Coast steelhead, NOAA will need to, among other things, (1) delineate the effected demographically independent steelhead populations using biological criteria; (2) utilize a scientifically accepted assessment framework, such as its Viable Salmonid Population framework; (3) determine the status of both individual populations and the steelhead DPS as a whole; (4) quantify (where possible) the impacts (such loss of fitness) of past and present actions (e.g., habitat degradation and hatchery practices) on the current status of the populations; and (5) where essential information is lacking, identify the missing information and use accepted methods and models to evaluate current status with available information.

A. The DIES Failed to Identify and Define Demographically Independent Populations

Identification of demographically independent populations is a necessary first step towards accurately describing the current status of Oregon Coast steelhead populations and evaluating potential impacts to them. #13

NOAA has recognized that the population level is the appropriate level to take conservation actions and examine potential impacts with respect to salmonids. *See* McElhany (2000) at 2 (noting "wide recognition among NMFS, other agencies, and independent scientists for the need to undertake conservation actions at scales smaller than the ESU" and that the "population is at an appropriate level for examining many extinction processes.") (internal citations omitted). NOAA has also concluded that "populations cannot be defined based on geography, rather they are defined based on biological processes, (i.e., reproductive isolation and demographic independence). Thus biology may cause a population's geographic boundaries to be smaller or larger than a single basin or sub-basin." *Id.* at 6.

It appears the DEIS may have relied on the delineation of independent populations found in ODFW's CMP. Prior to relying on ODFW's population delineations, NOAA should have evaluated and verified the scientific integrity of them. The DEIS contain no indication it did so.

While NOAA recognizes the importance of defining populations based solely on biological processes, the CMP acknowledged using non-biological considerations in identifying populations.

> [T]he population designations in the CMP represent a combination of scientific rationale, *management pragmatism*, and *traditional thinking*. Specifically, some currently defined population units possibly include several distinct reproductive units (e.g., winter steelhead and cutthroat) and some currently defined population units may actually be subsets of a single larger reproductive unit (e.g., Chinook populations in the Umpqua).

CMP at 20.[25] While most (if not all) of the populations designated in the CMP may prove to be sound from a biological perspective, NOAA should have independently verified the designations. In particular, NOAA should have examined the Nehalem and Tillamook steelhead populations designated in the CMP to determine if those units include additional demographically distinct populations.

The importance of this issue is illustrated by reference to the Nehalem River steelhead population(s). ODFW's 2005 Native Fish Status Report identified two natural-origin steelhead populations in the Nehalem Basin – a lower basin population, which included, among other areas, steelhead spawning in the N.F. Nehalem and the Salmonberry River; and an upper river population comprised of those steelhead spawning above Humbug Creek. ODFW 2005 at 241.[26] The report indicated that the Upper Nehalem population passed ODFW's reproductive independence criteria of less than 10% hatchery spawners; however, the Lower Nehalem River population failed this test. *Id.* at 245. In essence the ratio of hatchery to natural-origin spawners in the Lower population was too high. *Id.* at 246-47.

In 2014's CMP, ODFW again adopted a 10% pHOS target for the Nehalem basin. CMP at 174-75. However, in contrast to 2005, in the CMP ODFW combined the Upper and Lower Nehalem populations into one population, thus apparently increasing the number and ratio of natural-origin steelhead relative to hatchery-origin steelhead on the spawning grounds. *See id.* at

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[25] The CMP indicates steelhead population designations were based on "management consistency", a non-biological attribute. CMP at 11. The CMP leaves "management pragmatism," "traditional thinking," and "management consistency" undefined.

[26] ODFW. 2005. Oregon Native Fish Status Report. Available from http://www.dfw.state.or.us/fish/CRP/native_fish_status_report.asp.

20. Aggregating the two populations into one may allow ODFW to more readily meet the CMP's 10% pHOS target (at least on paper) without changes to the status quo of Nehalem steelhead hatchery program. This in turn may permit ODFW to avoid confronting the potential need to alter or reduce hatchery plants in the Nehalem Basin, or perhaps to raise the target pHOS, both of which measures could prove to be controversial.[27]

Of concern here is that because the CMP does not designate "populations" based on biological criteria alone, applying the 10% pHOS target to the entire Nehalem basin may in fact result in a demographically independent population being impacted at a much higher level than the 10% target level would suggest. Or, perhaps not. In any event, the DEIS should have considered the issue. And a revised DEIS should directly and carefully review the CMP's population designations and delineate the appropriate demographically independent populations based solely on biological criteria.[28]

B. The DEIS Fails to Use NOAA's Viable Salmonid Population Framework to Evaluate and Describe the Current Status of Oregon Coast steelhead #14

The standard methodology used by NOAA, ODFW and other fisheries agencies and professionals throughout the Northwest and California to assess the status of salmonid populations is NOAA's Viable Salmonid Population framework (VSP). McElhany, et al., 2000. The DEIS fails to utilize this conceptual framework to provide a consistent and useful evaluation of the present status of, and potential impacts to, Oregon coastal steelhead (and other salmonids). In a revised DEIS, use of the VSP framework and its parameters will allow NOAA to use a common framework, organization, and language to describe and discuss not only hatchery

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[27] This issue pertains to the Tillamook steelhead population as well. There are five separate rivers that enter the Tillamook Bay estuary. ODFW's 2005 Native Fish Status Report indicates natural-origin steelhead in these rivers comprise three separate steelhead populations, the Miami, Wilson/Kilchis, and Trask/Tillamook. ODFW 2005 at 241-47. In contrast, ODFW's CMP/steelhead viability assessment lists only one pan-Tillamook population. CMP at 29.

[28] While time and resources may not allow NMFS to do as thorough an analysis as was completed for Puget Sound steelhead populations, NMFS should nonetheless look to that analysis to provide a framework and method for the identification of populations along the Oregon Coast. *See* Myers, J.M., et al., 2015. Identifying historical populations of steelhead within the Puget Sound distinct population segment. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-128.

impacts, but place those impacts in the context of viability and other metrics (such as population "health," "resiliency" and broad-sense "recovery") related to salmonid ecology and conservation.

Utilization of the VSP framework is also warranted because Oregon coastal steelhead are designated as a species of concern/candidate species under the ESA, and this framework was specifically developed to be applied in ESA-related recovery and conservation contexts. *Id.* at xiii (VSP "intended to serve as the basis for a general approach to performing salmonid conservation assessments."). It thus provides the most appropriate and useful scientific framework to evaluate potential environmental impacts posed by the HGMPs, including impacts to the long-term productivity of steelhead populations. *See* 40 CFR 1502.16 (requiring EIS to discuss potential impacts to, and relationship between, short-term use and "maintenance and enhancement of long-term productivity" of affected environment).

If NOAA decides not to use its VSP framework in a revised DEIS (or FEIS), it should explain in detail why it does not do so. It should also clearly identify and thoroughly discuss whatever metric, method, model or criteria it is using to assess the current status of steelhead populations and the steelhead DPS, and explain why that alternate method is superior to its VSP framework in terms of fostering a well-informed understanding of environmental consequences.

C. The DEIS Fails to Assess the Current Status of Oregon Coast Steelhead on a Population-Specific Basis

#15

Because each HGMP may impact individual salmonid populations in distinct and unique ways, the DEIS should have, and a revised DEIS must, discuss and evaluate the status of, and impact to, Oregon Coast steelhead on a population-specific basis in order to comply with NEPA. Salmon and steelhead populations provide the fundamental building blocks of salmonid species diversity and productivity. Accordingly, populations are the appropriate level to assess current status, potential impacts, mitigation actions, and other environmental concerns. Evaluating the current status of each population is also required in order place the potential impacts of the individual HGMPs in context.

D. A Revised DEIS Should Discuss Historical Population Size and Structure to Provide the Context Necessary to Understand the Current Status of the Populations and the Potential Impacts of the Hatchery Programs

#16

In order to properly describe current status and potential impacts, a basic understanding of the *historical structure*, abundance, productivity and diversity of the relevant salmonid populations and DPS is necessary. A revised DEIS should thus discuss the estimated historical

size and structure of Oregon Coast steelhead populations (at least major populations) in order to place in context and provide perspective on the current status of the existing populations and the potential impacts of the proposed hatchery programs. Historical population information is also necessary to avoid the "shifting baseline" phenomena, and to provide an estimate of the intrinsic potential of the populations. This may be especially informative to evaluation of a "no hatchery" alternative.[29]

In addition to responding to the above points, the DEIS should answer the following questions:

1. In NOAA's last status review, it reported insufficient information to determine the status of the Oregon Coast steelhead DPS. Does NOAA now have sufficient information to determine the current status of this DPS? Does NOAA have sufficient information to determine the current status of the Necanicum population?

2. In NOAA's last status review, it expressed significant concerns about the potential negative impacts of hatchery fish on the Oregon Coast steelhead DPS? Does NOAA continue to have these concerns?

3. In NOAA's view, should the Oregon Coast steelhead DPS remain on the candidate species/species of concern list?

3. The DEIS fails to take a "hard look" at the potential effects of the hatchery programs on the Oregon Coast steelhead DPS and its constituent populations

#17

The National Environmental Policy Act (NEPA) requires Federal agencies to conduct environmental analyses of proposed actions to *fully consider* their effects on the environment. The purpose of a DEIS under NEPA is to promote disclosure, analysis, consideration, and a full understanding of the broad range of environmental issues surrounding a proposed major Federal action. *See Lands Council v. McNair*, 629 F.3d 1070, 1075 (9th Cir.2010) (purpose of NEPA is

[29] In the context of coho recovery efforts, NMFS has emphasized the importance of understanding historical population structures in order to "provide[] a framework for comparing the historical to the present status of populations, the changes that have affected them, and the restoration of processes that may be necessary to recover them." Lawson, P.W., et al., 2007. Identification of historical populations of Coho salmon *(Oncorhynchus kisutch)* in the Oregon coast evolutionarily significant unit. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-79, 129 p.

to "ensure that agencies carefully consider information about significant environmental impacts" and "guarantee that relevant information is available to the public").

To accomplish its purpose, NEPA requires federal agencies to take a "hard look" at the potential environmental consequences of proposed actions, *Lands Council v. McNair,* 629 F.3d 1070, 1075 (9th Cir.2010), such that an EIS's form and content foster both informed decision-making and informed public participation, *Save the Peaks Coal. v. United States Forest Serv*., 669 F.3d 1025, 2012 (9th Cir., 2012). This requires a "reasonably thorough discussion of the significant aspects of the probable environmental consequences*," League of Wilderness Defenders Blue Mountains Biodiversity Project v. Allen,* 615 F.3d 1122, 1130 (9th Cir.2010), and includes "considering all foreseeable direct and indirect impacts" and "a discussion of adverse impacts that does not improperly minimize negative side effects." *N. Alaska Envtl. Ctr. v. Kempthorne*, 457 F.3d 969, 975 (9th Cir.2006). "[G]eneral statements about possible effects and some risk do not constitute a hard look absent a justification regarding why more definitive information could not be provided." *Or. Natural Res. Council Fund v. Brong*, 492 F.3d 1120, 1133 (9th Cir.2007) (internal quotation marks and citations omitted).

A. The DEIS Fails to Take a Hard Look at Population-Specific Impacts

The DEIS purports to be "a *comprehensive evaluation* of all hatchery programs along the entire Oregon Coast" which evaluates the "genetic, ecological, and social effects of hatchery fish . . . at multiple *local* and regional scales for the Oregon Coast." NOAA 2016 at iv (emphasis added). In reality, however, the DEIS falls well short of this objective. The DEIS takes a "big picture" approach that is far from comprehensive and utterly fails, at least with respect to steelhead, to take a sufficiently "hard look" at site-specific impacts at the local population or watershed level.[30]

[30] NOAA acknowledges taking a "big picture" approach in the DEIS. NOAA Fisheries, Draft Environmental Impact Statement for Oregon Coast Hatchery Programs, Frequently Asked Questions. Undoubtedly, this "big picture" approach was adopted because the DEIS attempts to review 42 discrete hatchery programs. Here it worth noting that, similar to the Oregon Coast hatchery DEIS, NOAA previously prepared a DEIS reviewing all Puget Sound salmon and steelhead hatchery HGMPs. NOAA subsequently abandoned this project because it was too large in scope and instead determined that "NEPA analyses organized around smaller numbers of HGMPs would allow for a more detailed analyses of potential effects of individual HGMPs than the scope of review in the PS Hatcheries DEIS." NOAA 2016 at 4-5. Like the P.S. Hatchery DEIS, the scale of review in the Oregon Coast DEIS results in NOAA overlooking the impacts of individual hatchery operations on discrete populations of steelhead (as well as coho and Chinook). This point is well-confirmed by

For example, the Nehalem hatchery steelhead program (as represented by the Nehalem hatchery steelhead HGMP) releases hatchery steelhead into the Nehalem and Necanicum Rivers. Those releases have the potential to cause significant adverse effects to the Necanicum natural-origin steelhead population (which in turn may impact, *inter alia,* recreational fishing in the Necanicum River). Yet NOAA has chosen to combine its evaluation of the Nehalem steelhead HGMP with 41 other HGMPs concerning salmon and steelhead hatchery programs on the Oregon Coast. Combining 41 HGMPs under one EIS may result in certain efficiencies and allow NOAA to take a "big picture" view of Oregon Coast hatchery programs. However, it does not relieve NOAA of its duty under NEPA to take a "hard look" at the potential impacts of *each separate* HGMP. NEPA thus requires the DEIS to rigorously evaluate and describe the potential effects of the Nehalem HGMP (and alternatives) on the Necanicum steelhead population. The DEIS fails to do this because it does not describe the current status of the Necanicum population, nor adequately evaluate the discrete and unique effects the hatchery program may have on it. The same can be said of the Nehalem, Tillamook, Nestucca and other steelhead populations.

To comply with NEPA, the DEIS must evaluate potential impacts on a population-by-population basis. The reason for this is obvious -- *site-specific evaluation* (e.g., effects on individual populations) *is required because site-specific action* (e.g., releasing hatchery fish into specific rivers) *is what is under review*.[31]

Moreover, while some generalizations are appropriate, NOAA must consider the unique attributes and status of each population and hatchery program in order to provide decision-makers and the public with the information necessary to make informed choices. For example,

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comparing the depth of analysis set forth in NOAA's FEIS for Five Early Winter Hatchery Steelhead Programs in Puget Sound (NOAA 2016) with the lack of population-specific analysis contained in the Oregon Coast Hatchery DEIS.

[31] NEPA requires a thorough discussion of direct, indirect and cumulative effects "and their significance." 40 CFR 1502.16 (a), (b). To address significance, NEPA requires consideration of both context and intensity, and with respect to context, mandates that "the significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality." 40 CFR 1508.27(a). Thus, for the proposed hatchery programs considered here, NEPA requires NOAA to not only take a "big picture" look, but also a "hard look" at the discrete impacts resulting from each individual hatchery program, and analyze the significance of those impacts at the local level, i.e., the effects on discrete populations and watersheds. The DEIS fails to do this.

the DEIS in places describes potential impacts based on pHOS levels. The DEIS fails to distinguish, however, between isolated/segregated hatchery programs and integrated/native brood programs in addressing the potential impacts at given pHOS levels. For instance, ODFW's CMP and the relevant HGMPs provide a target pHOS level of 30% for both the Necanicum and Nestucca hatchery steelhead programs. However, the hatchery program in the Necanicum is an isolated/segregated program that uses an "early-timed" out-of-basin stock that has undergone significant hatchery-influenced selection. In this respect, it has similarities with the Chambers Creek stocks evaluated in the context of the Puget Sound steelhead HGMPs. In contrast, part of the hatchery steelhead program in the Nestucca River (as well as Wilson River) is an integrated program which utilizes native broodstock. *Compare* Nehalem Hatchery Winter Steelhead Program HGMP at 3 *with* Cedar Creek Hatchery Winter Steelhead Program HGMP at 1-2. Current fisheries science suggests that notwithstanding the same pHOS target levels, the impacts of these two programs may be vastly different. *See* HSRG 2015; NOAA 2016 at B-7 (different hatchery brood stocks may have quite different impacts). This issue is nowhere adequately discussed in the DEIS.[32]

There are other inadequacies as well. The DEIS fails to evaluate pHOS levels on specific populations on the North Coast, instead using an average pHOS level for all four (or more) populations. DEIS at 31. Using an average, however, obfuscates the potential for substantial adverse impacts to individual populations or sub-populations such as the Necanicum and Nestucca populations and North Fork Nehalem subpopulation that are subject to either high pHOS targets (Nestucca 30%), high observed pHOS (North Fork Nehalem 56%, *see* Oct. 20, 2016 Bradley Email), or both Necanicum (30% pHOS target; 63% observed historical pHOS, *see supra*).

[32] In its evaluation of Puget Sound hatchery steelhead programs and their impact on natural populations, NOAA discussed the impact that hatchery summer steelhead released in the Snohomish system had on natural summer steelhead populations. NOAA has identified historical populations of natural summer steelhead in the Tolt and N.F. Skykomish Rivers, which are tributaries in the Snohomish River system. Recent genetic data, however, suggest these natural populations may now essentially be considered feral populations of Skamania hatchery stock summer steelhead. ODFW 2016 at B-29. The DEIS here should thus evaluate how hatchery summer steelhead may differ from hatchery winter steelhead in terms of impact on natural populations, including natural summer steelhead populations.

B. The DEIS Failed to Adequately Evaluate Impacts to the North Coast Stratum

#18

In addition to evaluating potential effects on a population-by-population basis, the DEIS fails to, and a revised DEIS must, evaluate impacts at the stratum/major population group level. Under the CMP and HGMPs, not only do all North Coast steelhead populations receive hatchery plants, but all populations have management pHOS targets (30% and 10%) above pHOS levels recommended by the HSRG (2-5%). The average actual observed pHOS for the stratum (11%) is also above the HSRG recommendation, as is the observed pHOS for at least two of the four populations (Necanicum and Nehalem). Oct. 20, 2016 Bradley Email. The DEIS should therefore assess the viability and sustainability of the North Coast stratum in light of this concern. NOAA knows well the importance of evaluating the status of, and impacts to, the stratum/major population group level of a steelhead DPS, as this is a major focus of its recovery planning for salmonids.

C. The DEIS Fails to Use the Best Available Science

#19

To evaluate impacts, the DEIS relies significantly on observed pHOS levels. Yet relying simply on pHOS levels without a more thorough and in-depth analysis falls below current fishery science standards, including those employed by NOAA. This point is aptly illustrated by comparing the analysis in the DEIS with that in the FEIS for Five Puget Sound Early Winter steelhead hatchery programs. The discussions contained in the Puget Sound FEIS and its Appendix B provide a state-of-the-science example of how an evaluation of hatchery impacts should be done, what data and issues must be considered, and what methods and models are available to quantify and evaluate impacts. *See* NOAA (2016).

In contrast to the DEIS here, the Puget Sound hatchery steelhead FEIS (including Appendix B) (1) discussed pHOS levels (census and effective) and other metrics (e.g., gene flow, proportionate effective hatchery contribution) for each specific population; (2) used multiple models to calculate potential impacts to gene flow and fitness for each population; (3) evaluated the unique attributes of the hatchery stock utilized (e.g., spawn timing and location); (4) evaluated the unique attributes of each natural population; (5) discussed unique habitat attributes (e.g., hydrologic conditions); and (6) discussed these attributes in light of various studies and models addressing hatchery impacts to natural populations. *See* ODFW 2016 (discussing and applying, *inter alia,* HSRG AHA Model, the FORD Model, the Warheit Method, the Scott-Gill

Method and a model NOAA developed specifically for evaluation of Puget Sound steelhead (EWS SIM). *See* ODFW 2016 Appendix B.

While this level of analysis was warranted, in part, by the threatened status of the Puget Sound steelhead DPS, it should be noted that Oregon Coast steelhead are classified as a candidate species/species of concern for listing under the ESA due in part to the potential adverse impacts of hatchery fish. It is an established Federal policy objective to encourage proactive conservation steps to ensure candidate species do not warrant listing in the future.[33] Thus, Oregon Coast steelhead deserve the same level of thorough analysis as Puget Sound steelhead. In this respect, an ounce of prevention is worth a pound of cure.

Given that NOAA and others have already developed numerous analytical frameworks and quantitative models necessary to evaluate the current status of, and potential impacts to, steelhead at the population, MPG and DPS levels (e.g., HSRG's recommended pHOS levels; Warheit Method; Scott-Gill Method; All "H" Analyzer (AHA); Ford Model; NOAA's EWS-Sim model; NOAA 2016 at 62-63 & B-8, B-12), it would be arbitrary and capricious and violate NEPA for NOAA not to use the tools readily at its disposal. While it may take additional effort, it is necessary to satisfy NEPA's "hard look" requirement.

In addition, the DEIS should have considered the Forks Creek study by Seamons et al. (2012), as discussed in the Puget Sound hatchery steelhead FEIS. NOAA (2016) at B-26 & D-17.[34] Indeed, the Puget Sound FEIS expressly noted the importance of discussing this study in light of the early-timed winter steelhead hatchery stock used in the Puget Sound, which is similar to the early-timed winter hatchery steelhead stock used in the Nehalem and other Oregon Coast hatchery programs.[35]

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[33] NOAA's policy is the take proactive steps to ensure that candidate species/species of concern do not warrant listing in the future. *See* http://www.nmfs.noaa.gov/pr/species/concern/; http://www.fisheries.noaa.gov/pr/species/fish/steelhead-trout.html

[34] Seamons, T. R., L. Hauser, K. A. Naish, and T. P. Quinn. 2012. Can interbreeding of wild and artificially propagated animals be prevented by using broodstock selected for a divergent life history? Evolutionary Applications 5(7):705-719.

[35] Concerning Seamons et al. (2012), the Puget Sound FEIS said, "[g]iven the high visibility for this work, and the obvious potential for applying the conclusions to Puget Sound EWS programs, *we consider it important to discuss in detail the potential applications of this research* to Puget

The Forks Creek study is particularly pertinent to Oregon Coast steelhead populations because, unlike Puget Sound rivers which have snow or rain/snow dominated hydrographs, Forks Creek, like the Necanicum, N.F. Nehalem, and other Oregon Coast streams, is a coastal, rain dominated system (Willipa Bay) where earlier spawning may be more successful and spawning overlap between early-timed hatchery steelhead and wild steelhead may be greater. The results of the Forks Creek study raise a concern that the high numbers of hatchery steelhead spawning in the Necanicum, North Fork Nehalem, and elsewhere, although they may be less productive than the natural populations, may potentially be masking the true status of the natural population.

D. The DEIS Description of Impacts is Impermissibly Vague

The DEIS's manner of describing impacts is vague and ambiguous, and does not foster an informed understanding of the relative magnitude of expected effects. In this regard, it too violates NEPA. *See Or. Natural Res. Council Fund v. Brong*, 492 F.3d 1120, 1133 (9th #20

Sound EWS programs." NOAA 2016 at B-26 (emphasis added). The FEIS's discussion continued:

> In evaluating the Forks Creek study, there are two primary issues: spawning overlap of natural-origin and hatchery-origin fish, and the presence of HxN hybrids resulting from that overlap. In the Seamons et al. (2012) study, the median day of arrival for hatchery-origin adults was early to middle January, and the median day of arrival for natural-origin (unmarked) adults assigned by Seamons et al. (2012) to the wild category was middle to late April. There was no overlap between the hatchery and wild distribution quartiles, and very little overlap between the 95% CIs (Seamons et al. 2012, Fig. 5 1). Thus, the spawning overlap in Forks Creek does not appear to be different from the values used in the Scott-Gill modelling (Hoffmann 2015a;Hoffmann 2015b). Because there is no evidence for more spawning, the question is - why does the Forks Creek research indicate a considerably larger number of hatchery-wild hybrids than are detected by Warheit in several basins? The most likely explanations are higher pHOS and higher spawner overlap than would be expected in Puget Sound. *Unpublished work in WDFW (2015) indicates that pHOS in Forks Creek is 15%,* far higher than in most of the streams in the Proposed Action (Table B-5), so more hybrids would be expected than in lower pHOS systems. The spawner overlap argument is based on size of the system and hatchery location. Hatchery fish were therefore likely to be attracted back to Forks Creek, increasing the spatial overlap of spawning. Thus, the degree of hybridization seen in Forks Creek may be more similar to small river systems with similar characteristics, systems which are quite different in size and hatchery location from the three dealt with in the Proposed Action. A final possibility is an upward bias in assignment of fish to the hybrid category.

Id. (emphasis added). NOAA must thoroughly address Seamons et al. in a revised DEIS because the Necanicum and other Oregon Coast streams share similar attributes with Forks Creek, including rain dominated hydrology, a segregated programs using an early-timed stock, hatchery and wild spawning spatial and temporal overlap, and pHOS levels approaching and well in excess of 15%. *See also* NOAA 2016 at D-17 (which includes a bullet point critique of the Forks Creek study).

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Cir.2007) ("[G]eneral statements about possible effects and some risk do not constitute a hard look absent a justification regarding why more definitive information could not be provided.") (internal quotation marks and citations omitted).

For example, a "medium" impact is described as "readily apparent." DEIS at iv. As applied to salmon and steelhead populations, what does this description really mean? A dictionary definition indicates "readily apparent" means "promptly or easily perceived; clear, plain or obvious." Given the multitude of ever-changing causal factors that impact steelhead population abundance and productivity (such as ocean conditions, quantity and quality of riverine habitat, freshwater flows and temperature, harvest and hatchery impacts, normal population cycles, etc.), and a general lack of monitoring, fishery scientist often cannot determine the precise cause of population fluctuations. Indeed, it can take years of study to figure out what is causing increased or decreased abundance and productivity, and even then there is usually considerable uncertainty. Accordingly, if NOAA continues to use impact descriptions such as "readily apparent," please explain the magnitude and duration of change necessary for a variation in steelhead population abundance or productivity to be "readily apparent" and causally assignable to hatchery practices.

Quite frankly, using an ambiguous descriptor like "readily apparent" appears to be a way to avoid saying anything meaningful at all. The solution is simple – describe potential impacts quantitatively or in concrete terms. For example, if you expect a "medium/readily apparent" negative impact to a natural population, then provide an estimated range of the percent or number that the population or fitness may decrease. As discussed elsewhere herein, there are a number of models used in the fisheries profession that would allow NOAA to do this with information it currently has or which is readily available to it. *See* NOAA 2016 Appendix B (discussing and explaining use of fitness models and assessment methods). Such analysis is essential to a reasoned choice among alternatives.

E. The DEIS Fails to Assess the Status of the Oregon Coast Steelhead DPS as a Whole and the Potential Impacts to Its Status Due to Hatchery Operations; the DEIS Also Fails to Address Missing or Incomplete Information Relevant to These Issues.

An agency's obligation with respect to incomplete or unavailable information is spelled out in 40 C.F.R. § 1502.22. The agency "shall always make clear that . . . information is lacking." *Id.* If the missing information is "relevant to reasonably foreseeable significant #21

adverse impacts" and is "essential to a reasoned choice among alternatives and the overall costs of obtaining it are not exorbitant," the agency must include that information in the EIS. *Id.* § 1502.22(a). If the missing information "cannot be obtained because the overall costs of obtaining it are exorbitant or the means to obtain it are not known," the agency must include the following in the EIS: (1) a statement that such information is "incomplete or unavailable"; (2) a statement of the "relevance of the incomplete or unavailable information to evaluating reasonably foreseeable significant adverse impacts on the human environment"; (3) a "summary of existing credible scientific evidence . . . relevant to evaluating the reasonably foreseeable adverse impacts"; and (4) the agency's "evaluation of such impacts based upon theoretical approaches or research methods generally accepted in the scientific community." *Id.* § 1502.22(b).

In 1998 NOAA classified the Oregon Coast steelhead DPS as a candidate species for listing under the ESA due, in part, to substantial concerns regarding the potential impact of hatchery releases on natural populations. Despite the strong recommendation from its biological team that it reassess the status of the DPS within 4 years, NOAA has not completed any further status review of the DPS since adding it to the candidate species list nearly 20 years ago.

Notwithstanding hatchery fish reforms through the Northwest, including the Oregon Coast, the DEIS reports that all four strata comprising the Oregon Coast steelhead DPS have average pHOS levels that exceed the 2-5% levels recommended by the HSRG to maintain sustainable natural populations. *See* HSRG 2015 *discussed supra*; DEIS at 4-31 to 4-32 (citing Jacobsen et al. 2015) (reporting average pHOS levels for North Coast of 11%, Mid-Coast of 22%, Mid-South Coast of 17%, and Umpqua of 6%).

The standard measure used by NOAA to assess the status of salmon and steelhead in the ESA context is viability. Because the Oregon Coast steelhead DPS is classified as a candidate species/species of concern by NOAA for listing under the ESA, the DPS's viability, and any adverse impacts to that viability resulting from the hatchery programs at issue, are essential information to a reasoned choice among alternatives. The DEIS fails to include any credible assessment of the DPS's viability; nor does it identify this essential information as missing. Moreover, the DEIS cannot rely on ODFW's viability assessment for steelhead because, as discussed above, it is not reliable and thus lacks scientific integrity.

NOAA must therefore either assess the viability of the DPS or, if there is not sufficient information to assess the DPS's viability, and the necessary information is not obtainable, it must follow NEPA's required steps as outlined above.[36]

To assess viability, NOAA developed and now widely uses its Viable Salmonid Population (VSP) framework throughout the Northwest and California. Under the VSP framework, to assess the viability of the DPS, NOAA must first assess the viability of its constituent populations. To do this, NOAA will require adequate information and data regarding each population's abundance, productivity, diversity and spatial structure. If such information is not obtainable, NEPA once again will require NOAA to follow the steps outlined above. In particular, 40 CFR 1502.22(b) requires the agency to evaluate potential impacts based on theoretical approaches or research methods generally accepted in the scientific community. This would require NOAA to utilize one of the fitness/gene flow models discussed in the Puget Sound hatchery steelhead FEIS.

Another key element missing from the DEIS is a more thorough evaluation of habitat conditions and protections. The DEIS recognizes that for natural steelhead populations, "habitat productivity is substantially reduced from historical levels and remains a key limiting factor." DEIS at 4-49. Yet, the DEIS fails to evaluate the current status of natural steelhead populations in light of this reduced productivity and limiting factor. Nor does the DEIS adequately discuss the potential synergistic – i.e., cumulative – effects of low habitat productivity (and inadequate habitat protections and regulatory mechanisms) in combination with reduced natural productivity resulting from hatchery introgression.

Of particular note, in 2016 NOAA released its 5-Year status review of the Oregon Coast Coho ESU.[37] In that review, NOAA determined that habitat protections across the ESU are likely inadequate to conserve sufficient habitat to sustain natural-origin coho now and in the future. The Coho Status Review explained that NOAA does "not have confidence in the ability of current land use regulations to protect species viability over the long term and [that] there remain

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[36] The FEIS for 5 Puget Sound steelhead hatchery programs reported that NOAA scientists had recently reviewed the viability of the Puget Sound Steelhead DPS and its component populations and found that none of the natural-origin populations were currently viable. NOAA P.S. 5 FEIS at 51 (citing NWFSC (2005)).

[37] NOAA 2016b. 2016 5-Year Review: Summary & Evaluation of Oregon Coast Coho Salmon

a number of concerns regarding existing [land-use] regulatory mechanisms." NOAA 2016b at 27.

Steelhead occupy the same rivers as coho, and there is considerable overlap in habitat requirements of the two species. For instance, a lack of large woody debris and high water temperatures are harmful to the productivity of both species. If there are insufficient habitat protections to maintain coho viability, are these same protections sufficient to maintain steelhead? To address this and related issues, a revised DEIS should more thoroughly take into consideration current habitat conditions and habitat protection mechanisms in evaluating the status and potential effect to both the steelhead DPS and individual steelhead populations.[38]

F. The DEIS Fails to Sufficiently Address Cumulative Impacts

The DEIS's summary of cumulative effects of the proposed action (Table 16) illustrates the deficiencies of NOAA's "big picture" approach and its choice to evaluate 42 separate and unique HGMPs in one DEIS. For salmon, steelhead and their habitat, the table indicates cumulative effects of past, present and reasonably foreseeable future actions (including, *inter alia,* habitat conditions and hatchery and harvest practices) will be "[m]ixed (moderate negative to low positive), *depending on population*." DEIS at 5-30 (emphasis added). This vague conclusion is so unspecific and ambiguous it does not foster an informed understanding of the potential synergistic effects of the proposed action when combined with other factors impacting salmon and steelhead populations. Instead, the summary highlights and implicitly acknowledges ("depending on the population") that cumulative effects must be evaluated first *at the population level* for any meaningful conclusions to be drawn. Each of the populations, and the factors impacting them, are unique. While "big picture" generalizations are useful, they do not substitute for site-specific evaluations of individual populations and/or watersheds. #22

[38] With regard to the Necanicum River, the Nehalem Hatchery Steelhead HGMP indicates that the Necanicum coho population complex is not viable because high quality habitat is estimated to be present in only 3 miles of stream, well below the 15-mile threshold needed to support a viable population. Nehalem Hatchery Steelhead HGMP at 16 (citing Nickelson 2001). If natural-origin coho in the Necanicum are not viable due to poor habitat conditions, what is the status of the Necanicum's natural-origin steelhead population given these poor habitat conditions combined with hatchery steelhead pHOS levels greatly in excess of the levels recommended by the HSRG to maintain sustainable and viable populations?

For example, what are the expected cumulative impacts of the proposed action for the Necanicum River natural steelhead population? How will the proposed action synergistically interact with other factors impacting this population? The Necanicum River watershed is mostly in private ownership with industrial forest lands the dominate land use. There is quite extensive urban development in the estuary and substantial development in the riparian areas. Salmonid habitat in the Necanicum has been severely degraded, which, according to the DEIS, would be expected to significantly reduce the productivity of the natural steelhead population. ODFW did not include any abundance, productivity or direct diversity data for this population in its viability assessment contained in the CMP. ODFW's 2005 assessment indicated this population failed to meet applicable criteria due to hatchery fish. ODFW 2005. ODFW studies and data indicate extremely high pHOS figures for this population (up to 63%). Oct. 20, 2016 Bradley Email, ODFW 2005, Lindsay 2001. Current and proposed hatchery practices use an in-DPS/out-of-basin stock that has been highly domesticated and exhibits a truncated and somewhat earlier peak run-timing than the natural population. Given (1) likely lowered productivity due to habitat degradation, (2) compromised diversity and productivity due to long-term high pHOS associated with a domesticated stock; and (3) the proposed continuation of essentially the status quo with respect to hatchery practices: what is the likely cumulative impact to the Necanicum natural steelhead population?

4. <u>The DEIS Failed to Discuss Conflicts with *Federal* Policies and Objectives</u>

NEPA regulations require an EIS to discuss "[p]ossible conflicts between the proposed action and the objectives of Federal, regional, State, and local (and in the case of a reservation, Indian tribe) land use plans, policies and controls for the area concerned. (See Sec. 1506.2(d).)." 40 CFR 1502.16. Accordingly, the DEIS should have disused if and how the proposed action may conflict with or impact Federal policies, namely designation of Oregon Coast steelhead as a candidate species/species of concern, and the associated federal policy objective to take proactive measures to avoid listing of salmon and steelhead under the ESA.[39] It did not. #23

[39] "Species of Concern are those species about which [NMFS] ha[s] some concerns regarding status and threats, but for which insufficient information is available to indicate a need to list the species under the Endangered Species Act (ESA)**.** [NMFS] wish[es] to draw proactive attention and conservation action to these species." NMFS species of concern list, *inter alia*, identifies species potentially at risk and "fosters voluntary efforts to conserve the species before listing becomes warranted." NMFS's objective is to "draw proactive attention and conservation action

Given the federal policy objective to promote proactive measures to avoid an ESA listing, the DEIS should be revised to discuss whether the proposed HGMPs conflict with that policy objective. In order to do that, because the steelhead DPS is listed as a species of concern/candidate species, the revised DEIS should determine what impact these HGMPs (and associated hatchery programs) will have individually, and collectively, on the risk that the DPS will warrant listing under the ESA. And in order to accomplish that, among other things, the revised DEIS should assess the current viability of, and expected impacts to, the steelhead DPS and its constituent populations using scientifically sound methods, such as NMFS's VSP framework. *See also* 40 CFR 1506.16 (requiring EIS to discuss the "relationship between short-term uses of man's environment [i.e., production of hatchery steelhead for harvest] and the maintenance and enhancement of long-term productivity [i.e., the long term viability of natural populations])."

5. The DEIS Fails to Discuss Conflicts with *State* Policies and Objectives

NEPA regulations also require an EIS to discuss how the proposed action may conflict with state policies and objectives. The State of Oregon, through its Native Fish Conservation Policy and CMP, has adopted policies and objectives intended to prevent ESA listings (Native Fish Conservation Policy at 1 & Definitions 1) and calling for all populations to achieve viable status, and be moving towards high viability (CMP at 32-33).[40] The DEIS fails to evaluate #24

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to these species." http://www.nmfs.noaa.gov/pr/species/concern/; http://www.fisheries.noaa.gov/pr/species/fish/steelhead-trout.html; both sites visited 2.7.2016, 10:45 p.m.

[40] The CMP (as implemented through the HGMPs) provides: "Hatchery fish for harvest opportunities will be provided in those Management Areas identified to receive hatchery fish. While the management direction will be to provide hatchery fish for harvest, it will not be at the expense of the long-term viability of the wild populations residing in those Management Areas. For example, the Nestucca River has healthy Chinook and winter steelhead populations, as well as important hatchery programs; the objective in this situation is to make sure that wild populations remain viable and productive while maintaining the hatchery programs that provide an additional, quality fishing opportunity. The targets for the proportion of naturally spawning hatchery fish on the spawning grounds (pHOS) identified in Table A-III: 4 are intended to prevent the risk from hatchery programs being so great that the wild populations' viability is jeopardized." CMP at 41 (emphasis added).

whether the hatchery programs, and in particular the HGMP pHOS targets and actual pHOS levels (some of which greatly exceed HSRG recommended levels), are consistent with these policies and objectives. To remedy this, a revised DEIS should evaluate potential impacts at the Species Management Unit/DPS, stratum/major population group, and population levels, and discuss whether the hatchery programs are consistent with Oregon's stated policy objectives, including ensuring that all wild populations remain viable and their viability is not jeopardized by the hatchery programs under review.

6. The DEIS Failed to Evaluate Potential Impacts Related to the HGMP's pHOS Targets

The CMP prescribes a number of pHOS targets for specific populations. CMP at 41, 175. These targets are implemented through the HGMPs under review, and thus their potential impacts must be evaluated in the EIS. #25

For example, the CMP's 30% pHOS target for steelhead in the Necanicum River is specifically incorporated into the Nehalem HGMP.[41] Nehalem HGMP at 3. A revised DEIS must evaluate the potential consequences of this target on the natural steelhead population in the Necanicum River. In particular, because the CMP's intent (i.e., objective) for all pHOS targets "is for all hatchery programs to be managed such that their impact to wild populations does not affect their viability", CMP at 171, a revised DEIS should evaluate whether the 30% target (as well as other pHOS targets) is consistent with maintaining a viable population. And in doing so, a revised DEIS should address the HSRG's recommendations and NOAA's own work in evaluating pHOS levels and associated viability with respect to, among others, the Puget Sound steelhead DPS and its constituent populations.

Accordingly, a revised DEIS should discuss and consider, among other things:

A. The HSRG recommendations that primary and contributing populations affected by isolated hatchery programs have a pHOS of no more than 5 and 10 percent, respectively. HSRG 2009.

[41] The CMP recognizes that the 30% pHOS target for the Necanicum steelhead population represents a higher level of hatchery risk than applied to all but two other steelhead populations. The CMP also applies a higher risk level 30% pHOS target for the Chinook population in the Necanicum. This results in the Necanicum being the only "30/30" river (higher hatchery risk level for both steelhead and Chinook) in the CMP. *See* CMP at 175.

B. The HSRG recommendation that integrated hatchery programs affecting primary populations have a Proportionate Natural Influence (PNI) of 0.67. HSRG 2009.

C. The more recent HSRG recommendation that pHOS levels should be lower than 5 percent for isolated programs and the suggestion that 2 percent would be more appropriate for some programs based on their modeling.[42]

D. The distinction between effective pHOS and census pHOS and the application of these concepts to the HGMPs targets and actual pHOS levels for the affected populations. The CMP defines pHOS as percent hatchery fish on spawning grounds (CMP at 3, 43) and thus appears to refer to census pHOS in the CMP targets. Accordingly, effective pHOS, especially with respect to segregated hatchery programs, may be significantly lower. For example, a 30% census pHOS target, depending on the hatchery stock

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[42] HSRG 2014. On the Science of Hatcheries: An updated perspective on the role of hatcheries in salmon and steelhead management in the Pacific Northwest. In the context of an EIS evaluating potential hatchery impacts on natural steelhead populations, NMFS has recently summarized the HSRG conclusions as follows:

> "In 2004, the HSRG released its recommendations for hatchery reform (HSRG 2005). While not addressing the early winter steelhead hatchery programs specifically in their guidelines, the HSRG discussed risks posed by highly diverged hatchery stocks and concluded that ". . . if non-harvested fish spawn naturally, then these isolated programs can impose significant genetic risks to naturally spawning populations. Indeed, any natural spawning by fish from these broodstocks may be considered unacceptable because of the potential genetic impacts on natural populations . . . to minimize these risks, isolated hatchery programs need to be located in areas where virtually all returning adults can be harvested or recaptured, or where natural spawning or ecological interactions with natural-origin fish are considered minimal or inconsequential" (HSRG 2005). In 2009, the HSRG recommended that primary populations (those of high conservation concern) affected by isolated hatchery programs have a proportion of hatchery-origin spawners (pHOS) of no more than 5 percent (HSRG 2009). The HSRG recommended that integrated hatchery programs affecting primary populations have a Proportionate Natural Influence (PNI) of 0.67 (HSRG 2009). More recently, the HSRG suggested that perhaps pHOS levels should be lower than 5 percent for isolated programs and suggested that 2 percent would be more appropriate for some programs based on their modeling (HSRG 2014). As a result, based on available information, NMFS concludes that isolated programs with a pHOS of less than 2 percent and integrated programs with a PNI of greater than 0.67 pose a low genetic risk to natural-origin populations."

NOAA (2015) Draft Environmental Impact Statement to Analyze Impacts of NOAA's National Marine Fisheries Service Proposed 4(d) Determination under Limit 6 for Five Early Winter Steelhead Hatchery Programs in Puget Sound, at 51

correction factor applied, could result in an effective pHOS within or approaching the limits prescribed by the HSRG.

E. The CMP pHOS targets provide for higher pHOS levels for certain populations in certain areas related to hatcheries and hatchery fish release sites. For steelhead, on certain rivers, the targets allow up to 8 miles (or potentially more where there are multiple release sites) of significantly elevated pHOS levels, which in turn could result in the aggregate population pHOS level to be higher than the primary objective. The EIS should evaluate the impact of these elevated pHOS target areas.[43]

F. Evaluate the pHOS targets and actual levels in light of the conclusions reported in Chilcote 2011 and Chilcote 2013.

G. Evaluate pHOS targets and actual pHOS in relation to the Ford Model and other models utilized to evaluate hatchery impacts by NMFS in its FEIS for Five Puget Sound steelhead hatcheries. See HSRG (2015) at 17; NOAA 2016.[44] In this regard, the EIS

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[43] "The proportion of hatchery winter steelhead that comprise natural spawners in the Nehalem, Tillamook, Siletz, Alsea, Siuslaw, South Umpqua, Coos, and Coquille winter steelhead population areas is targeted for a level of 10% or less for the majority of the wild spawning areas. Targets of less than 30% and 60% for significant and less significant spawning areas, respectively, within a four-mile radius of the hatchery or release site are also allowed if these sites skew the population-wide rate in any given year." CMP at 174 (emphasis added). Please also consider whether some populations or rivers (e.g., Wilson River) may have multiple release sites and therefore an area larger than 8 miles that may be subject to higher pHOS target levels.

[44] The HSRG recently reported to Congress that "studies and further analyses based on the Ford (2002) fitness model suggest that segregated hatchery programs should be used with greater caution . . ." and that the HSRG standard for a segregated population (pHOS < 5%) results in a significantly lower relative fitness (0.62) than the corresponding fitness value (0.83) for an integrated population with a PNI > 0.67. This suggests that the HSRG standard for segregated populations [effective pHOS <5%] may be insufficient to safeguard the long-term viability of the affected naturally spawning Primary and Contributing populations. HSRG 2015 at 18. Of particular concern to me is that the Necanicum steelhead population appears (based on my admittedly "back of the envelope" calculations below) to have been above – indeed significantly above – 10% effective pHOS for decades. (Other populations, or significant sub-populations (e.g., N.F. Nehalem) may have exceeded this level as well.) According to the HSRG using the Ford Model, a 10% effective pHOS may result in a reduction in fitness to 20 percent of that of a natural population without hatchery influence. *See* HSRG 2015 at 19. If this is correct, it would be a major reduction in fitness (perhaps to a non-viable level) for a natural population like the Necanicum with a population in the neighborhood of 1000 steelhead. It should also be noted that this lower fitness estimate is consistent with the productivity conclusions presented in Chilcote 2011, 2013. On the other hand, however, notwithstanding decades of hatchery plants, and

should calculate both the census pHOS and effective pHOS. In calculating the effective pHOS, the EIS should take into consideration the unique attributes of both the hatchery stocks used and the rivers in which they are planted. For example, the Nehalem steelhead hatchery stock shares some similarities with Puget Sound Chambers Creek stock – both are domesticated, segregated, early-timed winter steelhead stocks. However, the Chambers Creek stock has been domesticated for a longer time; has a lower smolt to adult return rate in recent years in many areas where it is used; has greater temporal run and spawn timing separation from the natural populations in many areas where it is used; and the hydrologic cycle is snow or snow/rain dominated in many areas where it is used, which would reduce its reproductive efficiency compared to rain-dominated systems, like most Oregon Coast rivers (e.g., compare seasonal river flows of Necanicum River to that of Skykomish River in Washington State). Moreover, the Nehalem hatchery steelhead stock was developed predominately from wild Nehalem River steelhead and therefore, although domesticated, may be better adapted to the Nehalem River than an out-of-basin stock. These differences should be factored into the analysis when applying relevant models.

7. <u>The DEIS Failed to Adequately Evaluate ODFW's "Portfolio" Strategy</u>

ODFW implemented a "portfolio" approach to fisheries management on the Oregon Coast through the CMP and the HGMPs under review. CMP at 7. One aspect of this approach is a diversity of hatchery strategies. *Id.* at 42. For example, a number of watersheds/sub-watersheds receive reduced or no hatchery plants for a particular species; some areas receive no hatchery plants of any species at all; and other areas see significant hatchery plants. *See id.* at 42-48. In addition, ODFW utilizes a variety of hatchery approaches. For example, ODFW uses a segregated hatchery steelhead stock and allowance of greater conservation risk in the Necanicum #26

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significant recreational fishing pressure, Necanicum spawning surveys (albeit a limited number) as reported in the 2002 Necanicum Watershed Assessment suggest a healthy number of wild spawners.

River (30% pHOS), and uses the same stock but with less conservation risk in the Nehalem Basin (10% pHOS). In contrast, other areas use, in part, an integrated stocks (i.e., wild broodstock), and allow more (Nestucca 30% pHOS) or less (Tillamook 10% pHOS) conservation risk. *See id.* at 54-56; Cedar Creek steelhead hatchery HGMP at 1-4.

While this appears to be a reasonable approach, a revised DEIS should evaluate this portfolio approach in light of current scientific thinking on conservation of steelhead and salmon populations and DPSs.

In particular, the EIS should consider:

A. Does the CMP, as implemented by the HGMPs, have sufficient areas and/or populations set aside as "wild fish management zones" to ensure the continued viability and productivity of the steelhead DPS? The DEIS should discuss the HSRG's recommendations concerning creation of wild fish only management zones.

B. While all four populations of steelhead (as designated by ODFW in the CMP) in the North Coast stratum/major population group receive hatchery plants, several significant sub-basins/sub-populations (mainstem Nehalem, Salmonberry, Miami, Trask, Kilchis, Tillamook) do not. Is this sufficient under current scientific thinking to reasonably ensure that the stratum/major population group will remain viable? Or is there a need for an entire demographically independent population to be essentially free from significant hatchery influence within each stratum/MPG?

C. What are the population and DPS risks of having major sub-watersheds/sub-populations differentially affected by hatchery programs and pHOS targets that are significantly above (a) HSRG recommendations and (b) CMP/HGMP targets? For example, the N.F. Nehalem River and Wilson River will likely bear much of the burden of potential hatchery impacts, while other sub-watersheds/sub-populations (e.g., mainstem Nehalem River, Trask River) within their larger population areas will have much lower impacts. Please discuss the risks and benefits of an uneven distribution of impacts <u>within</u> populations and, in particular, how this may impact within population diversity, productivity, and fitness and the viability of the population as a whole.

8. <u>The DEIS Fails to Quantify Potential Impacts</u>

The DEIS fails to quantify potential impacts notwithstanding that quantification is not only possible (NOAA and other fisheries agencies and professionals have previously applied #27

various models to quantify hatchery impacts), but essential to foster a clear understanding of potential impacts. Accordingly, in a revised DEIS, NOAA should quantify potential impacts from hatchery operations using the best scientific methods and information available.[45] While there will need to be professional judgment calls as to the models and input values used, the information generated may prove quite valuable in revealing potential impacts and comparing alternatives.

The following examples are provided to demonstrate the type of quantitative analysis that is possible; they are not intended to actually quantify potential impacts – that is a task for professional fisheries scientists at NOAA, whom I am confident can do a much more accurate and scientifically credible job than I.[46]

The HSRG (2015) provides a method to calculate effective pHOS, and then to estimate relative fitness based on the Ford Model. Effective pHOS can be estimated from the observed abundance of hatchery-origin and natural-origin spawners (*HOS* and *NOS*) and application of a *correction factor* (cf) as:

pHOSeff = (HOS x cf)/[(HOS x cf) + (NOS)].

HSRG (2015) at 16.

The Necanicum average spawning population is estimated by a number of sources to be in the ball park of 1000 steelhead. *See* above. Lindsay (2001) and more recent data indicate a long-term pHOS of 63 percent. This suggests a possible, ball park estimated spawning population of 370 natural-origin spawners and 630 hatchery-origin spawners.[47]

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[45] NMFS provides an informative discussion of the Ford Model and other models in Appendix B to its FEIS for 5 Puget Sound steelhead hatchery programs. NOAA 2016. NMFS should include the same detailed level of analysis as appears in the above-cited FEIS in a revised DEIS here, including population-specific evaluations. Oregon coastal salmon and steelhead deserve the same rigorous scientific evaluation under NEPA as Puget Sound steelhead (especially given the species of concern designation of Oregon coastal steelhead).

[46] I apologize if I have made any miscalculations, misunderstood the HSRG report, or misapplied the Ford Model. My intent here is simply to show that applying quantitative models is possible and may be informative to the EIS's evaluation of impacts.

[47] The figures used in the calculations should be ground-truthed by considering, among other things, hatchery smolt plant numbers, estimates of smolt to adult return (SAR) rates of the Nehalem hatchery stock, recreational catch, recreational harvest rate of hatchery returns, etc. to develop a reasonable range of figures to use in the calculations. *See e.g.,* CMP at 65 (reporting

The correction factor "reflects the reduced reproductive success of first generation hatchery origin fish due to behavioral differences between natural- and hatchery-origin fish in terms of spawn timing and/or location . . . and is likely to vary case to case." HSRG (2015) at 16. The correction factor developed for Puget Sound Chambers Creek early-timed winter steelhead is .11. *Id.* at 16. The Nehalem hatchery steelhead stock is similar to the Chambers Creek stock in that they are both early-timed, domesticated, isolated/segregated socks. However, as described above, the Nehalem stock has been domesticated for less generations; it's run and spawn timing may not be completed as early as Chambers Creek stock; it was developed from wild fish (with possibly some out-of-basin hatchery influence) in the N.F. Nehalem basin, which is immediately adjacent to the Necanicum basin; and the Necanicum watershed is hydrologically rain-dominated, which would suggest earlier spawn timing may be more effective than in snow and snow-rain dominated systems in Washington State. Therefore, the correction factor for the Chambers Creek stock may under estimate effective pHOS. Nonetheless, I will use that figure in the calculation below.[48]

Effective pHOS = 630 x .11/(630 x .11) + (370).

This results in an effective pHOS of 15.775%, which I've rounded to 16%. The Ford Model predicts a long-term relative effect on fitness for an effective pHOS of 10% as .20 for a segregated stock, such as the stock used in the Necanicum. HSRG (2015) at 19. Thus, an effective pHOS of 16% would be expected to have an even greater effect on relative fitness. The HSRG suggests such low levels of relative fitness "may be *insufficient to safeguard the long-*

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that harvest rates in hatchery winter steelhead fisheries are rarely greater than 40%). Calculations should also be made using a range of (a) pHOS (including the target pHOS), (b) correction factors, and (c) long term effect on fitness estimates. *See* HSRG (2015) at 19. The point is that by performing the calculations a number of times with different estimates for the separate parameters, a reasonable range of potential impacts could be generated which may prove to be informative. Moreover, simply citing a lack of certainty in the data is an unsatisfactory excuse for not attempting to apply quantitative methods to the impacts analysis.

[48] If the correction factor is increased, for example from .11 to .2, the negative effect on relative fitness would be even greater. Although this begs the question, if a hatchery stock is more reproductively effective in a given basin, does it pose the same fitness risks to the natural population?

term viability of the affected naturally spawning Primary and Contributing populations." HSRG (2015) at 18 (emphasis added).[49]

Quantitative analysis will also demonstrate the need to rigorously assess the current status of steelhead populations in order to provide a reasonable estimate of potential impacts from the hatchery programs under review. For example, applying a 30% target pHOS to a population that has for decades exceeded that rate, may have significantly different impacts than applying that same target to a population that has not historically been impacted by hatchery fish.

9. The DEIS Fails to Adequately Evaluate Potential "Hatchery Subsidies" and "Masking" Impacts

Given the high percentage of hatchery steelhead spawning naturally in the Necanicum (and other rivers), another key question left unaddressed in the DEIS, and which should be evaluated in a revised DEIS, is whether the Necanicum and other populations exhibits sufficient #28

[49] Just for informative purposes, I've included below two additional approaches to calculations of relative effective fitness using the Ford Model as explained by the HSRG.
(1) Assume a higher number of natural-origin spawners (1000), and lower census pHOS (50%), which would result in 1000 hatchery-origin spawners, and use the same correction factor (.11) as above.

pHOS eff. = 1000 x .11/(1000 x .11) + 1000.

This results in an effective pHOS of 0.099, which I've rounded to 10%. Applying the Ford model, this results in a relative long-term effective fitness of .20, which again is a very significant decrease in relative fitness, and which according to the HSRG may not be consistent with maintaining long-term population viability. HSRG (2015) at 18-19.
(2) Assume natural-origin spawners of 1000 and a census pHOS of 30%, which is the CMP target. This results in a total spawning population of 1429, of which 429 are hatchery-origin spawners. Use .11 again for the correction factor. Effective pHOS is 4.5% (429 x.11/(429 x.11) +1000), resulting in a relative fitness of about .65 under the Ford Model. *See* HSRG (2015) at 19. The HSRG again raises concerns when relative effective fitness approaches this level; however, this level may be more in line with the CMP policy to allow a greater conservation risk for the Necanicum population. However, it may not be consistent with achieving a "highly viable" population, which is another CMP policy goal. In any event, these figures may under-estimate the correction factor, which would result in over-estimating long-term relative fitness and under-estimating the impacts of hatchery fish on the natural population. For example, if the correction factor is increased to .20 to take into account the possibility that Nehalem stock hatchery steelhead are more productive in the natural environment than Chambers Creek stock, the resulting effective pHOS is 7.9%, with an estimated Ford Model relative fitness score of approximately .35-.40. The results of the Seamons et al. (2012) study on Forks Creek should also be evaluated with reference to any models used because the results there indicated a very high hybridization rate per a given pHOS.

productivity from naturally-produced spawners to maintain population abundance at or above viability thresholds *in the absence* of a hatchery subsidy. *See* McElhany et al. 2000 at 89. Some studies have found that despite being relatively ineffective at producing adults, a high proportion of spawning hatchery fish can result in offspring that would be a major component of naturally produced juveniles and adults. *See* Leider et al. 2003; Kostow et al. 2003; Seamons, et al. 2012. Thus, hatchery spawners may be "propping up" the abundance of the natural population (as well as reducing the overall "on paper" productivity score of the natural spawning population, if hatchery fish spawning in the wild are included in that population). The presence of hatchery fish may thus "mask" the actual condition of the natural population. Moreover, progeny of hatchery x hatchery and hatchery x wild mating may be competing with wild x wild progeny for limited rearing habitat.

In this regard, the HSRG has noted that even in segregated programs with spatial and temporal separation of spawning activity, hatchery influence can be substantial.

> Segregated programs have been studied in several systems. Seamons et al. (2012) evaluated a segregated steelhead program at Forks Creek, Washington, where the Chambers (via Bogachiel Hatchery) stock was introduced. Segregation relied on divergent life history based on spawn timing. They found that spawn timing failed to prevent interbreeding when physical isolation was ineffective. Up to 80% of the naturally produced steelhead in any given year consisted of hatchery/wild hybrids.

HSRG (2014) at 50. The conditions present in Forks Creek may (e.g., pHOS, segregated programs using early-timed stock) or may not (e.g., proximity to hatchery) be applicable to conditions on the Oregon Coast, so the revised DEIS will need to carefully evaluate this issue.

10. The DEIS Fails to Adequately Address Mitigation Measures; A Revised DEIS Should Evaluate Whether and When Mitigation Measures and Associated Conservation Targets will be Implemented and Achieved

NOAA should evaluate the various mitigation measures and conservation targets outlined in the CMP and HGMPs in terms of their potential (or actual) effectiveness, and whether and when they are likely to be implemented. The CMP was finalized in 2014. Sufficient time has passed since its adoption to assess whether the mitigation measures outlined in it are actually being implemented in a timely fashion. #29

With regard specifically to the mitigation measures relevant to Necanicum River winter steelhead, the CMP proposes to "explore the feasibility" of developing an acclimation site, or tributary release location, with an adult trap in the Necanicum" in order to reduce the risk of the hatchery program on wild steelhead. CMP at 55. The phrase "explore the feasibility," while aspirational, lacks any assurance that the mitigation actions will actually be implemented. It also lacks a clear deadline for action. Moreover, if an acclimation site/tributary release location/adult trap is not feasible – or not effective – at reducing pHOS, what action will ODFW take to reduce hatchery risk in the Necanicum? The CMP provides:

> If these efforts to reduce risk are not successful, ODFW will work with local interests to explore, implement, and experiment with management options around hatchery risk reduction with the understanding that a) there will be no net loss to existing fishing opportunity, b) a local interest group will take the lead to organize discussions with all interested parties and implement any actions above and beyond what current ODFW staff levels can accomplish, and c) any implemented management changes require support of both wild fish conservation and consumptive fishery interests.

CMP at 55. No reduction in fishing opportunity – how can that be accomplished if reducing hatchery plants is necessary to reduce pHOS?; an unidentified local interest group taking the lead – sounds like ODFW is abdicating what should be its responsibility to take the lead to meet conservation targets; and how successful have other efforts been at reaching consensus between wild fish groups and consumptive fishery interests with respect to reducing hatchery plants/impacts and/or implementing a wild steelhead kill fishery? – the track record here is spotty at best.[50] While undoubtedly reflecting existing political and economic realities, burdening implementation of the CMP's 30% pHOS target with the above conditions does not reflect a concrete commitment by ODFW to achieve this specific management objective. While I hope

[50] *See* CMP at 55, n.22 (suggesting option of "utilizing wild fish in the consumptive fishery to offset hatchery program reductions"). Do ODFW managers really think wild fish groups will agree to support a wild steelhead kill fishery on the Necanicum? *See* CMP at 65 (reporting significant opposition to proposed wild steelhead harvest proposals). And is wild steelhead harvest a responsible management alternative if the Necanicum steelhead population may already be suffering from reduced productivity due to years of elevated impacts from hatchery fish. Moreover, if hatchery steelhead spawning in the wild are propping up the natural steelhead population, the elimination or significant reduction of hatchery releases may result in a reduced natural-origin abundance (at least in the short-term), which may not be able to support a wild fish harvest regime. This shows the alternative mitigation measures set forth in the CMP with regard to Necanicum steelhead are not very well thought out.

ODFW is successful in reducing pHOS on the Necanicum and elsewhere, the CMP does not make a firm commitment to do so. The CMPs 30% pHOS target for the Necanicum, as implemented in the Nehalem HGMP, is thus at best an aspirational objective and NMFS should accordingly factor this into its EIS impact analysis.

Up to this point, ODFW has failed to take concrete steps to implement the mitigation measures prescribed for the Necanicum steelhead population.[51] In addition, the State of Oregon in general and ODFW in particular are facing a budget crisis and may lack sufficient monetary and human resources to promptly complete these measures given other higher priority agency activities. Thus, in order to provide an accurate evaluation of reasonably foreseeable outcomes, the EIS must evaluate the actual pHOS of Necanicum River steelhead, and may not rely on the CMP's prescribed mitigation measures where there is insufficient concrete assurance that these mitigation measure will be completed, nor weather they will be effective.

11. Evaluate Regulatory Climate in Cumulative Impacts Section

A revised DEIS should evaluate the cumulative impact of hatchery operations in conjunction with habitat conditions and trends and the regulatory environment in Oregon, including regulations concerning land use, forestry, and agriculture. NMFS's draft recovery plan for Oregon Coast coho and its 5 Year Status Review for that species indicate Oregon's statutes and regulations pertaining to land use, forestry and agriculture are a significant factor negatively impacting coho recovery. The EIS should discuss whether the same could be said with respect to steelhead, Chinook and other salmonids, and how this may impact those species in conjunction with any impacts resulting from hatchery operations. #30

12. The DEIS Failed to Adequately Evaluate Density Dependence, Competition and Other Ecological Concerns

The Independent Scientific Advisory Board (ISAB) recently published a report which emphasized the need to consider density dependent issues when evaluating hatchery impacts and operations in the Columbia River basin. ISAB-2015-1.[52] This concern should also be addressed #31

[51] As of October 2016, ODFW was still evaluating options for establishing a tributary release and recapture site on the Necanicum River. *See* Oct. 20, 2016 Bradley Email.

[52] Independent Scientific Advisory Board for the Northwest Power and Conservation Council, Columbia River Basin Indian Tribes, and National Marine Fisheries Service (ISAB), Density Dependence and its Implications for Fish Management and Restoration in the Columbia River

in a revised DEIS with respect to the hatchery programs under review here. In particular, the revised DEIS should evaluate this issue with regard to steelhead populations subject to high pHOS. Freshwater rearing habitat is often cited as a limiting factor for steelhead populations. Although less productive than wild steelhead, as discussed above, high numbers of hatchery steelhead spawning naturally may be producing significant numbers of juveniles. These juveniles may in turn be competing with progeny of wild steelhead for limited rearing habitat.

13. The DEIS Failed to Evaluate Potential Changes in Life History Traits Due to Selective Pressures

#32

A revised DEIS should explore the potential changes in life history traits (age-structure, adult return and spawn timing, etc.) of the natural populations that may have occurred, or which may occur in the future, as a consequence of the hatchery programs under review.

Of particular concern is the early-timed component of the natural winter steelhead populations. There may be considerable overlap in return and spawn timing between early-timed hatchery steelhead (e.g., Nehalem, Trask/Cedar Creek and Alsea hatchery stocks), and the early-timed component of the natural population. *See* Lindsay 2001. There may also be greater spatial overlap in spawning areas (tributaries) between the early-timed component of the natural population and early-timed hatchery fish, than between the later-returning component, which tend to spawn more in mainstem areas. *Id.*; *see also* Nehalem HGMP at 33-34. Furthermore, during the time before hatchery steelhead were marked and wild steelhead release regulations were enacted, there may have been higher harvest rates on the early-timed component of the natural population due to anglers targeting abundant hatchery steelhead, which in turn may have selected against the early-component of the wild run.

If there has been any shift in run timing (or any other life-history trait), this may have impacts on the diversity and productivity of the natural population (including its ability to adapt to future conditions such as climate change).

Basin, ISAB-2015-1 (2015). In its report, the ISBA included a lengthy discussion of ODFW research on the Clackamas River concerning the impact of natural spawning hatchery summer steelhead on wild winter steelhead. As reported, the research studies concluded that the high number of juvenile progeny of hatchery summer steelhead resulted in lower productivity and capacity of wild winter steelhead due to competition for limited habitat. NMFS should independently evaluate the conclusions drawn and their applicability to the HMGPs under review. *See* ISAB at 116-120.

In this regard, please note:

A. NMFS has noted that selective pressures may have impacted the earlier-timed component of Puget Sound winter steelhead populations. Myers, J.M., et al., 2015. Identifying historical populations of steelhead within the Puget Sound distinct population segment. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-128, at 70-71 (and various other pages throughout document); *see also* McMillian, B, 2008.[53] Differential harvest may have been a large factor with significant tribal and non-tribal fisheries targeting early-timed hatchery steelhead. The early-timed component may also have been impacted to a greater extent than later-timed fish because of greater interaction with hatchery fish and extensive degradation of tributary habitat, especially in low elevation, rain dominated areas.

B. Cederholm noted that the peak spawning of the natural winter steelhead population in the Clearwater River occurred significantly earlier in tributaries than in the mainstem. The Clearwater River is a coastal rain-snow dominated tributary to the Queets River in Washington State. Cederholm's research was conducted before hatchery steelhead were planted in the system. Cederholm, C.J. 1984. Clearwater River wild steelhead spawning timing. In J.M. Walton and D.B. Houston (eds.). *Proceedings of the Olympic Wild Fish Conference* (March 23-25, 1983). Fisheries Technology Program, Peninsula College, Port Angeles, WA. 257-268.

C. Lindsay et al. (2001) reports that early-timed hatchery steelhead predominately spawned in tributaries to the Necanicum River, while later-timed wild steelhead predominately spawned in mainstem areas. Lindsay 2001 at 30-31; *see also* Nehalem HGMP at 33-34. Because a number of tributaries may go dry in the summer – or be subject to extremely low flows – earlier spawning in tributaries may have been necessary so that fry can emerge and emigrate to mainstem areas before tributary flows became too low. Earlier emergence may have also provided certain competitive advantages vis a vis later emerging fry.

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[53] Wild Winter Steelhead Run Timing: How It Has Been Reshaped by Fisheries Management in Washington, Presentation to 2008 Pacific Coast Steelhead Management Meeting, available at: http://www.academia.edu/737972/Wild_Winter_Steelhead_Run_Timing_How_It_Has_Been_Reshaped_by_Fisheries_Management_in_Washington_2008_Pacific_Coast_Steelhead_Management_Meeting_Bill_McMillan

D. A number of studies indicate that hatchery x wild crosses are less productive than purely wild pairings. *Discussed* above. Because most hatchery fish spawn during the early part of the wild spawning period, any negative impacts of hatchery fish spawning with wild fish may be reflected more acutely in the early-timed component of the wild population. In other words, high numbers of hatchery fish spawning with lower numbers of wild fish in the early part of the run may have reduced the productivity and relative abundance of the early-component of the wild population. A revised DEIS should explore and evaluate this hypothesis.

14. <u>The DEIS Failed to Evaluate Chinook Age and Size Decline</u>

Average body sizes and ages of many populations of Chinook salmon have declined over the past several decades. *See* CMP at 163. The DEIS failed to evaluate whether (and if so how) the proposed hatchery programs may affect the long-term decline in Chinook age and size at maturation. Please also evaluate this issue in the context of the cumulative impacts analysis, including the extent these trends are affecting population dynamics, productivity, and genetics of coastal Oregon Chinook salmon. #33

15. <u>Miscellaneous Comments</u>

A. The DEIS erroneously fails to list the Necanicum River as a waterbody into which hatchery fish are released. DEIS at i. In my scoping comments, I pointed out that NOAA erroneously failed to include the Necanicum River its list of affected waterbodies in its Federal Register scoping notice. NOAA's error appears to have been repeated in the DEIS. #34

B. The DEIS fails to consider an alternative where Oregon Coast hatchery programs meet the guidelines and recommendations of the Hatchery Scientific Review Group. This alternative would result of individually tailored, population or watershed specific hatchery programs in contrast to the no hatchery and 50% reduction alternative currently evaluated in the DEIS. It would thus provide a more biologically justified alternative than either of those across-the-board alternatives. #35

C. The DEIS reports that "[t]he proportion of hatchery steelhead spawning in the wild ranges from five percent (south coast), seven percent (Rogue River Basin), six percent (Umpqua River Basin), 17 percent (mid-south coast streams, like Coos, Coquille), 22 percent mid-coast, (e.g., Siuslaw, Alsea, Siletz), and 11 percent (north coast, e.g., Wilson, Nehalem, Necanicum) (Jacobsen et al. 2015)." DEIS at 4-3. This statement is somewhat misleading because it relies on averages across multiple populations and it does not take into account the different attributes #36

(isolated vs. native brood) of the hatchery programs. It thus obfuscates the true potential impact of the hatchery programs. For instance, the statement includes the Necanicum within the North Coast group with an average pHOS of 11. In fact the Necanicum has been historically subject to pHOS levels many times this figure. NOAA assesses pHOS levels at the population level, and that's how it should be reported in the DEIS.

D. The DEIS at 3-27 to 3-28 selectively reports on results of ODFW's 2005 steelhead status assessment. The DEIS fails to report that the Necanicum, and other populations failed to meet the criteria utilized in ODFW 2005 due to concerns of hatchery fish. The DEIS also fails to report that ODFW 2005 included multiple populations in Tillamook and Nehalem, and that these populations were combined in ODFW 2014. #37

E. The DEIS states that "in the population areas where the hatchery fish are released near the estuary and ocean (e.g., Chetco, Elk, Coos, Tenmile, Necanicum), the time of interaction between hatchery- and natural-origin fish in the space where hatchery fish are released (Figures 13-20) is very limited (likely hours to a few days)." DEIS 4-30.

Unlike other areas, there is no acclimation facility on the Necanicum River for steelhead, and therefore volitional release of hatchery fish is not practiced. The fish are transported from the Nehalem hatchery and released directly into the river. This may result in greater delay in the hatchery fish migrating to the marine environment in comparison to hatchery facilities that practice volitional release. #38

F. The DEIS states that "[n]atural spawning by hatchery steelhead is likely to be concentrated most in the areas around where the fish were released as smolts. Consequently, natural-origin fish will be most affected in these areas. If the hatchery fish point of release, or hatchery facility, is located near prime spawning areas, then interbreeding between hatchery and natural steelhead is likely to occur. The risks of hatchery-influenced selection will be highest in these areas. Other spawning areas not in the vicinity of the hatchery fish release points are not likely to be affected at all." DEIS at 4-32. #39

While this seems to make intuitive sense, the DEIS should cite published, peer reviewed research or the equivalent to substantiate this point. If there is a continuing subsidy of hatchery fish in one area, and those fish are successful in producing adult offspring either with other hatchery fish or via hatchery x wild pairings, would it not be possible – perhaps even probable – given a continual subsidy of hatchery fish spawning naturally, that offspring of hxh or hxw

pairings might act as *vectors* for hatchery gene introgression into other spawning areas of a given population?

It is vitally important that NOAA address this issue because the pHOS targets set forth in the CMP and implemented in the HGMPs provide for high and extremely high levels of pHOS (30, 60 and 90 percent) for a four-mile radius (which equates to 8 miles of river habitat) surrounding hatchery release sites. *See* CMP at 175 (App. III). Eight miles of habitat with potentially very high pHOS levels is a concern which requires NOAA's careful attention as it may render the lower pHOS targets for non-hatchery release areas to be essentially ineffective. For example, under the CMP the Alsea steelhead population has a pHOS target of less than or equal to 10%; except, in the eight miles surrounding a hatchery release site the target pHOS is less than 30% or less than 60% depending on the significance of the area as natural-origin steelhead spawning habitat. Conceivably, due to the high pHOS level allowed in areas adjacent to hatchery release sites, the pHOS level (both census and effective) for a population as a whole may be considerably higher than the 10% target for non-release site areas.

G. The DEIS states that "given the pHOS estimates, populations of steelhead associated with the Siuslaw, Alsea, Siletz, Coos, and Coquille hatchery programs are likely to be moderately impacted by interbreeding between hatchery and natural steelhead." DEIS at 432. Populations of steelhead associated with those rivers and programs have averaged pHOS estimates from 17-22%. DEIS at 4-31. Thus, NOAA is inherently assigning a "moderate" level of impact (a moderate level of impact is defined as "readily apparent", *see* DEIS at 5-27) to a pHOS level of 17-22%. The DEIS fails to cite scientific research and reports that support this assigned impact level and should do so. There are various publish papers and models that quantify potential impact levels in relation to reported pHOS levels (e.g., HSRG 2015, HSRG AHA Model, Ford Model, Chilcote 2011, 2013, EWS Sim). NOAA should report what expected level of impact on fitness or productivity these studies report for a pHOS level in the 17-22% range (taking into account pertinent factors suck a brood stock used, spawning overlap, etc.). #40

In addition, if NOAA considers a 17-22% pHOS level to result in "moderate" (readily apparent) impacts, what pHOS level corresponds to a "severe" impact? Would a 30% pHOS level (which is the CMP's target pHOS for certain populations) equate to a severe impact? Would the 63% pHOS level reported for the Necanicum constitute a "severe" impact?

The Puget Sound FEIS indicates that the Snoqualmie River steelhead population has demographic gene flow (Scott-Gill method) that is above 2% but below 5% and therefore has a low to moderate negative impact. NOAA 2016 at 62-63. The pHOS corresponding to this gene flow estimate (and impact level) appears to be 30% mean pHOS (with a 56% maximum pHOS). NOAA 2016 at B-23; *but see also* B-4 (indicating Snoqualmie pHOS of 13.5%). (These pHOS levels for the early-timed hatchery steelhead stock used in the Puget Sound are similar to pHOS levels reported for the early-timed hatchery steelhead stocks used in the Nehalem and Necanicum Rivers, although there are some significant differences between the stocks which may make direct comparisons misleading.) Please explain how the Puget Sound hatchery steelhead FEIS assignment of a "low to moderate negative impact" for 2-5% gene flow relates to the Oregon Coast hatchery DEIS assignment of a medium/moderate impact to 17-22% pHOS levels and a low impact to anything below 10% pHOS.

Please also address NOAA's conclusion that (1) the Ford Model may not accurately model the impacts resulting from the Puget Sound early-timed hatchery steelhead programs and how this applies to the Nehalem early-timed hatchery steelhead program; and (2) that reliance on pHOS levels alone may not accurately reflect gene flow, loss of fitness and other aspects of hatchery impacts. NOAA 2016 at B-7. *The gist of NOAA 2016 Appendix B appears to be that reliance on pHOS levels alone is not adequate – and may be misleading – in terms of evaluating and describing potential impacts of hatchery programs on natural populations. More sophisticated analysis methods are required, and are available, and thus should be employed.*

H. The DEIS suggests that if hatchery releases of Chinook are eliminated or lowered, that harvest of natural-origin Chinook would substantially increase. DEIS at 4-38. There are a number of mechanisms in place that regulate Chinook fisheries to maintain biologically acceptable harvest rates and to ensure adequate numbers of natural origin fish escape to spawn, including the Magnuson-Stevens Act and the recently adopted Oregon Coastal Multi-Species Management Plan. Indeed, the DEIS acknowledges that the applicable "fisheries management structure is based upon the status of natural-origin salmon and steelhead, and not on the abundance of hatchery fish." DEIS at 5-32. Moreover, large numbers of Oregon Coast Chinook are harvested in out-of-state, distant water, mix-stock fisheries, such as in Alaska and Canada. There is no evidence that these fisheries, which are governed by other state, federal/national and international processes (such as the Pacific Salmon Treaty) will alter exploitation rates to

#41

increase natural-origin Chinook harvest as a result of lower hatchery production in Oregon. While lower Chinook hatchery releases will likely result in lower overall Chinook harvest, especially in Oregon waters, it is speculative and inaccurate to suggest the harvest rates on natural-origin Chinook would be expected to substantially increase.

I. The DEIS fails to accurately describe the likely benefits to natural-origin steelhead populations that may result by the elimination of hatchery fish. The DEIS suggests that, other than for mid-coast streams, the benefits of elimination of hatchery fish would be only "low positive" because pHOS levels for those populations are low. DEIS at 4-41. This statement overlooks that the CMP provides for up to 30% pHOS for the Nestucca and Necanicum natural steelhead populations (two of the four North Coast populations), and that actual pHOS levels, at least for the Necanicum population, have historically been significantly above even this high level. Moreover, the benefits of reduced or eliminated hatchery releases might also be significantly greater than "low positive" for certain watersheds (i.e., population sub-areas) such as the N.F. Nehalem River, where hatchery fish also comprise a large percent of the natural spawning population. Here again, the DEIS's "big picture" approach to analysis of environmental consequences misses the mark with respect to assessing the local site-specific potential impacts of the alternatives proposed. NOAA must take a finer-grained approach to its analysis in order to comply with NEPA. Moreover, the DEIS analysis on this point fails to use the currently available best science to evaluate expected benefits. For example, the DEIS fails to utilize the analytical approaches and models outlined in Appendix B to NOAA 2016. #42

16. <u>Specific Comments Regarding the Nehalem steelhead HGMP</u>

A. The Nehalem steelhead HGMP (v. Oct. 2014 Update) indicates releases of hatchery steelhead will occur in locations low in the watershed and separate from primary natural produced steelhead juvenile rearing areas. Nehalem steelhead hatchery HGMP at 4. Please evaluate this statement carefully. Releases in the N.F. Nehalem primarily occur at the hatchery. Below the hatchery there lies significant habitat that to my eye appears quite useable to steelhead juveniles, such as riffles, ledge rock structure, deep pools, etc. Has anyone actually sampled this section to determine if steelhead juveniles use the area below the hatchery? #43

Similarly, on the Necanicum River hatchery steelhead are released up to RM 18 (according the HGMP), below which there lies a significant amount of habitat suitable for steelhead (and coho and cutthroat rearing), including a number of significant log jams that may

provide both summer and winter habitat. In addition, because both of these rivers have significantly reduced flows during late summer and fall, juveniles from upstream mainstem and tributary areas may utilize the lower parts of these rivers where flows are greater during that period.

B. The HMGP also states that hatchery operations will minimize straying to spawning grounds. *Id.* at 3. This is inaccurate. The HGMP notes considerable hatchery straying into the upper N.F. Nehalem above the hatchery[54] and does not even attempt to quantify the magnitude of hatchery fish spawning naturally in and around the hatchery reach or in downstream areas. In addition, with respect to the Necanicum, there is documented high numbers of hatchery fish spawning naturally and there are currently no acclimation or collection facilities that would aid in minimizing hatchery straying into natural steelhead spawning areas. In addition, hatchery plants are made in the Necanicum (and possibly the N.F. Nehalem) in areas near where natural spawning is known to take place. Thus the statement is not consistent with actual practices or documented results.

C. Table 1-3, p.9, appears incomplete because the SAR rate for hatchery smolts does not appear to include hatchery fish that returned but evaded capture in the sport fishery and potential spawned naturally in the Necanicum River. Hatchery steelhead spawning naturally were also not counted in Nehalem River figures, so reported return rates appear to be based on incomplete data. The actual hatchery SAR rate in the Necanicum is thus likely higher than that reported in the table.

D. The HGMP (at p. 4) indicates that pHOS rates will be consistent with the CMP. This is misleading. The CMP lists a 30% pHOS rate for the Necanicum River. However, the actual reported pHOS is significantly higher. Lindsay 2001. And, as discussed above, the CMP

[54] For example, the HGMP reports that from winter 1998/99 to 2007/08 natural adults in the upper N.F. Nehalem (above Waterhouse Falls) ranged from 228-809 fish. *Id. at* 11. During the same time frame, hatchery adults in the same area ranged from 136 to 1569 fish. *Id.* at 7. Based on these figures, it appears that a very high proportion of the spawning population above the falls is comprised of hatchery fish. And these figures do not even account for the hatchery fish spawning below the falls (where the hatchery is located). ODFW reports the estimated percent of hatchery spawners above Waterhouse Falls has ranged from 19-64% annually since 1999. Personal Communication, Robert Bradley, Assistant Regional Fish Biologist, ODFW, 2.12.16.

contains only aspirational plans of unknown effectiveness to reduce actual pHOS rather than a firm commitment to do so.

E. The HGMP needs updated information in a number of areas. *See e.g.*, p. 17 (coho spawning numbers only complete through 2000); *see also* p. 36, table 7-1.

17. <u>Incorporation by Reference</u>

All documents, reports, studies, materials and other sources referenced in my comments above are hereby incorporated by reference so that they may be included in the administrative record(s) for NOAA's record of decision(s) concerning this NEPA process. All but one of the sources cited herein should be readily available to NOAA; I therefore have not submitted copies along with my comments but will gladly provide copies if requested. I am submitting with these comments for the record one email exchange between an ODFW biologists and myself concerning pHOS levels for certain north Oregon Coast steelhead populations. Oct. 20, 2016 Bradley Email. In addition, I hereby incorporate by reference into these comments my scoping comments dated February 16, 2016 that I previously submitted to NOAA. Finally, I hereby incorporate by reference the below scientific publications that are relevant to the DEIS's evaluation of impacts. #44

- Araki, H., and C. Schmid 2010. Is hatchery stocking a help or harm?: evidence, limitations and future directions in ecological and genetic surveys. Aquaculture 308:S2–S11.
- Araki, H., W. R. Ardren, E. Olsen, B. Cooper, and M. S. Blouin 2007a. Reproductive success of captive bred steelhead trout in the wild: evaluation of three hatchery programs in the Hood River. Conservation Biology 21:181–190.
- Araki, H., B. Cooper, and M. S. Blouin 2007b. Genetic effects of captive breeding cause a rapid, cumulative fitness decline in the wild. Science 318:100–103.
- Araki, H., B. A. Berejikian, M. J. Ford, and M. S. Blouin 2008. Fitness of hatchery-reared salmonids in the wild. Evolutionary Applications 1:342–355.
- Araki, H., B. Cooper, and M. S. Blouin 2009. Carry-over effect of captive breeding reduces reproductive fitness of wild-born descendants in the wild. Biology Letters 5:621–624.

- Berejikian, B. A., and M. J. Ford 2004. Review of Relative Fitness of Hatchery and Natural Salmon. U.S. Dept. Commer, NOAA Tech. Memo. NMFS-NWFSC-61. 28 p. Northwest Fisheries Science Center, Seattle, WA.
- Carlson, S. M., and T. R. Seamons 2008. A review of quantitative genetic components of fitness in salmonids: implications for adaptation to future change. Evolutionary Applications 1:222–238.
- Chilcote, M. W., K. W. Goodson, and M. R. Falcy 2011. Reduced recruitment performance in natural populations of anadromous salmonids associated with hatchery-reared fish. Canadian Journal of Fisheries and Aquatic Sciences 68:511–522.
- Christie, M. R., M. L. Marine, and M. S. Blouin 2011a. Who are the missing parents? Grandparentage analysis identifies multiple sources of gene flow into a wild population. Molecular Ecology 20:1263– 1276.
- Christie, M. R., M. L. Marine, R. A. French, and M. S. Blouin 2011b. Genetic adaptation to captivity can occur in a single generation. Proceedings of the National Academy of Science 109:238–242.
- Crawford, B. A. 1979. The Origin and History of Trout Brood Stocks of the Washington Department of Game. Washington Dept. of Game, Olympia, WA.
- Dauer, M. B., T. R. Seamons, L. Hauser, T. P. Quinn, and K. A. Naish 2009. Estimating the ratio of hatchery-produced to wild adult steelhead on the spawning grounds using scale pattern analysis. Transactions of the American Fisheries Society 138:15–22.
- Kostow, K. 2009. Factors that contribute to the ecological risks of salmon and steelhead hatchery programs and some mitigating strategies. Reviews in Fish Biology and Fisheries 19:9–31.
- Kostow, K. E., A. R. Marshall, and S. R. Phelps 2003. Naturally spawning hatchery steelhead contribute to smolt production but experience low reproductive success. Transactions of the American Fisheries Society 132:780–790.
- Laikre, L., M. K. Schwartz, R. S. Waples, and N. Ryman 2010. Compromising genetic diversity in the wild: unmonitored large-scale release of plants and animals. Trends in Ecology & Evolution 25:520–529.
- Mobrand, L., J. Barr, L. Blankenship, D. Campton, T. Evelyn, T. Flagg, C. Mahnken et al. 2004. Hatchery reform: principles and recommendations of the HSRG. 1305 Fourth

Avenue, Suite 810, Seattle, WA 98101 (available from http://www.hatcheryreform.org): Long Live the Kings.

- Mobrand, L. E., J. Barr, L. Blankenship, D. E. Campton, T. T. P. Evelyn, T. A. Flagg, C. V. W. Mahnken et al. 2005. Hatchery reform in Washington State: principles and emerging issues. Fisheries 30:11–23.
- Naish, K. A., J. E. Taylor Iii, P. S. Levin, T. P. Quinn, J. R. Winton, D. Huppert, and R. Hilborn 2008. An evaluation of the effects of conservation and fishery enhancement hatcheries on wild populations of salmon. Advances in Marine Biology 53:61–194.
- Seamons, T. R., P. Bentzen, and T. P. Quinn 2007. DNA parentage analysis reveals inter-annual variation in selection: results from 19 consecutive brood years in steelhead trout. Evolutionary Ecology Research 9:409–431.
- HSRG (Hatchery Scientific Review Group) – L. Mobrand (chair), J. Barr, L. Blankenship, D. Campton, T. Evelyn, T. Flagg, C. Mahnken, R. Piper, P. Seidel, L. Seeb, and B. Smoker. 2004. Hatchery Reform: Principles and Recommendations – April 2004. Available at http://www.lltk.org/hrp archive/HRP_Publications_HSRG_Recs.html
- HSRG. 2005. Hatchery reform in Washington State: principles and emerging issues. Fisheries 30(6): pages 1 to 23.
- HSRG. 2009. Columbia River hatchery reform system wide report. Available from, http://www.hatcheryreform.us/hrp/reports/system/welcome_show.action
- McElhany, P., M. H. Rucklelshaus, M. J. Ford, T. C. Wainwright, and E.P. Bjorkstedt. 2000. Viable salmonid populations and the recovery of evolutionarily significant units. U.S. Dept. of Commerce, NOAA Tech. Memo, NMFS-NWFSC-42.
- NMFS. 2014. Final Environmental Impact Statement to Inform Columbia River Basin Hatchery Operations and the Funding of Mitchell Act Hatchery Programs. NMFS Sustainable Fisheries Division. Lacey, Washington.
- ODFW (Oregon Department of Fish and Wildlife). 2002. Native Fish Conservation Policy. November 8, 2002. Revised September 12, 2003. Salem, Oregon. Available from http://dfw.state.or.us/fish/CRP/nfcp.asp.
- ODFW. 2005. Oregon Native Fish Status Report. Available from http://www.dfw.state.or.us/fish/CRP/native_fish_status_report.asp.

- ODFW. 2014a. Coastal Multi-Species Conservation and Management Plan. Public Review Draft (January 2014). Oregon Department of Fish and Wildlife, Salem, Oregon. Available from http://www.dfw.state.or.us/fish/CRP/coastal_multispecies.asp.
- Seamons, T. R., L. Hauser, K. A. Naish, and T. P. Quinn. 2012. Can interbreeding of wild and artificially propagated animals be prevented by using broodstock selected for a divergent life history? Evolutionary Applications 5(7):705-719.
- NOAA Fisheries, Final Environmental Impact Statement to Analyze Impacts of NOAA's National Marine Fisheries Service Proposed 4(d) Determination under Limit 6 for Five Early Winter Steelhead Hatchery Programs in Puget Sound (March 2016) (NOAA 2016)

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Thank you for your consideration of my comments. I would appreciate notification when a revised DEIS or final EIS is available for review, and also of any other opportunities for public participation in the NEPA and Rule 4(d) process. Please do not hesitate to contact me if you have any questions regarding my comments. #45

Best regards,

Brian McLachlan

NMFS Responses to Comments from Brian McLachlan, letter dated October 25, 2016.

Letter #	Comment #	NMFS Response
8	1	Noted.
8	2	Noted. See comments below for letter #8.
8	3	Noted. NMFS has relied on the best available science in preparing the EIS. The duty to verify the accuracy of available information means that where information is incomplete or inadequate, the agency shall include that understanding in its analysis and not rely on such information in any way that undermines the agency's work. Here, the main issue of the comment is existing analyses and data for steelhead is not adequate enough to determine the true status of wild steelhead at the population level and the levels of hatchery steelhead spawning in the wild for each population. After careful review of ODFW's information reports that were used in our EIS to provide available data on the abundance of hatchery and wild steelhead spawning in the wild, we believe the information is limited, but nonetheless useful for showing recent abundances of hatchery steelhead. It is important to note the research sampling is intentionally collected across multiple populations for a variety of reasons (primarily because it is cost prohibitive to derive annual estimates for each population). Thus, our reporting of this data is useful for our evaluation, even though the estimates are not for each population.
8	4	Noted
8	5	Noted. As stated above, NMFS' role in the EIS is not to evaluate the viability analyses conducted by ODFW in the CMP, but to disclose the environmental impacts of the submitted HGMPs and associated hatchery programs using the information available. Therefore, we are required to specifically look at the effects of the hatchery steelhead programs in areas where they occur. Since there are many natural populations along the Oregon Coast where there are no hatchery programs, NMFS took this into account for viability analyses at the ESU or DPS scale.
8	6	The counts of winter steelhead in the Salmonberry River and North Umpqua River have been conducted for decades and represent the longest datasets for returning winter steelhead in the Oregon Coast DPS. It is important to draw upon this long term dataset even though it may be limited in scope. It is important to recognize ODFW also conducts steelhead spawning surveys annually to supplement existing data. The spawning ground survey data reports the abundance of steelhead redds, and does not generate a population estimate because of the sampling protocol. However, the redd abundance information provides many years of data to evaluate the status and trends of winter steelhead throughout the DPS. There are a total of six monitoring areas along the Oregon Coast region where redd abundance information is generated, and NMFS believes this scale of information sufficiently describes the overall status

		of steelhead, even though it represents multiple populations from varied habitats.
8	7	The comment focuses on the assessment done by ODFW in the CMP for the diversity of steelhead. NMFS' role in the development of the EIS is quite different than the goals of the CMP. Therefore, NMFS is not commenting on the work done by ODFW in the CMP. In our EIS, we are called to evaluate the effects of the proposed hatchery programs, and in this case, on natural-origin steelhead populations. We have evaluated these effects on the diversity of steelhead in areas where hatchery fish are proposed to be released.
8	8	See response 8-7.
8	9	In our EIS, NMFS evaluated the ecological and genetic effects of hatchery fish released in the Necanicum River and reported the best available information on the status and abundance of hatchery and natural salmon and steelhead spawning in the wild. In addition, we included additional information in the FEIS with respect to the goals identified in the CMP. The Necanicum HGMP identifies the management actions that may be taken in the future in order to get this hatchery program in compliance with the CMP.
8	10	NMFS determined the Oregon Coast DPS did not warrant listing as threatened under the ESA, which means our determination at that time was the DPS was viable. For our EIS, we have assessed the best available information on the status and trends of the major population groups of natural steelhead along the Oregon Coast and recent pHOS estimates.
8	11	The comment asks for NMFS position on the viability of the Oregon Coast DPS. This is formally done by ESA status reviews. Our last status review for Oregon Coast DPS was in the late-1990's. If a comparison is made between the status of steelhead in the 1990's to the last five years, the abundance of steelhead recently is higher than in the 1990's. In the FEIS, there is new status and trend information to help inform the reader of recent status of steelhead. As previously discussed, NMFS is aware of the limitations of the ODFW CMP.
8	12	The DEIS describes the status of species in the action area adequately based on the best available science and information. However, in the FEIS we have included additional assessment and data on the status of Oregon Coast steelhead. The best long-term steelhead spawning escapement information is only available for major population groups comprised of several independent populations. This dataset does not represent individual populations, but is an indicator of population health throughout the Oregon Coast DPS. This information has been included in the final EIS in sections 3.4 and 4.4.
8	13	The population structure of steelhead along the Oregon Coast region has been described by several NMFS and ODFW documents. All of these documents are reasonably consistent in the population delineations

		because they are based upon biological and physical attributes. These sources of information are cited in section 3.4 of the EIS.
8	14	Disagree, the EIS explicitly used NOAA's VSP framework where applicable (McElhany et al. 2000). See section 3.4 of the EIS.
8	15	The EIS evaluates hatchery program impacts at the population level in areas where hatchery fish are released, as part of the proposed action. As noted above in responses 8-3, 8-5, and 8-6, the best available information on the current status of steelhead does not estimate population size abundances. Therefore, the current status of steelhead is evaluated at the major population group level. There are six monitoring areas for this along the Oregon Coast region.
8	16	A historical perspective on steelhead is described in Busby et al. (1996) and cited in the EIS. NMFS has not conducted any formal status reviews for Oregon Coast steelhead since the late 1990's. As previously discussed, NMFS relied upon the best available information currently available for steelhead. Updated abundance and pHOS information for steelhead is included in sections 3.4 and 4.4 of the FEIS.
8	17	Noted. NEPA requires NMFS to disclose the effects of the proposed hatchery programs on the human environment (in this case the Oregon Coast region) and that is what NMFS evaluated in the EIS. As previously discussed, this includes consideration of population-level impacts.
8	18	The EIS assesses the effects of the hatchery programs on the population, aggregations of populations (at the scale for abundance and pHOS monitoring information), and the entire DPS/ESU. Most of the emphasis of the NEPA evaluation was at the 1) population and 2) ESU/DPS scales.
8	19	Revisions to the EIS were made in response to this comment. Additional information on pHOS, pNOB, and PNI metrics were calculated and evaluated for every hatchery program. It is important to note the comparison between Oregon Coast and early winter steelhead in Puget Sound is not valid. All of the Oregon Coast programs are from local broodstocks within the ESU/DPS, with most broodstocks managed as integrated stocks with their local population. This is not the case for early winter steelhead in Puget Sound, and thus different analytical metrics and evaluations were used.
8	20	Noted. There were some additions to the EIS to further quantify expected impacts from the hatchery programs. These are included in the FEIS based upon these comments. Additional information is simply not available at this time for the Oregon Coast Region.
8	21	Noted. See responses 8-3, 8-5, and 8-6. The EIS describes the status and trends of salmon and steelhead using the best available information, including ODFW's CMP.
8	22	Noted. The cumulative impacts section evaluates the full range of impacts affecting identified resources (including salmon and steelhead). The population-specific effects (Chapter 4) coupled with cumulative impacts

		(Chapter 5) provides a reasonable evaluation of impacts necessary for the EIS.
8	23	Noted. See responses 8-3, 8-5, 8-6, 8-11, and 8-12. Our assessment in the EIS suggests Oregon Coast steelhead to be at higher abundance in recent years than in the 1990's. Section 3.4 of the EIS evaluates the four VSP parameters for steelhead and includes updated status information on spawner abundance estimates. The most recent long-term trends suggest steelhead are at higher abundances over the last decade than in the 1990's (see Jacobsen et al. 2015 citation in EIS).
8	24	Noted. Additional information on the goals for each hatchery program related to pHOS and the CMP were included in the final EIS, per this comment. The HGMPs identify potential actions to be taken for programs where pHOS is higher than the stated goals. Also see response 8-28.
8	25	Noted. ODFW's CMP and public review process identified the management goals for the hatchery programs. The HGMPs reflect the direction established in the CMP. NMFS is not required to evaluate the pHOS targets established in the CMP, but assess the effects of the proposed action under NEPA and ESA. The effects are assessed in the FEIS.
8	26	Noted. See response 8-25. Describing the proposed action as a "portfolio approach" does not create a separate category of impacts beyond what is analyzed in the FEIS. The impacts of having varying risk levels across the action area is considered in the FEIS.
8	27	Noted. Based upon this comment, there is additional information and analysis included in the final EIS regarding pHOS, pNOB, PNI, and quantification of hatchery fish interactions with natural fish. However, it should be noted much of the information and data to conduct the specific requested analyses is not available at this time.
8	28	For the Oregon Coast region, there are many natural populations that do not have any hatchery programs present in the watershed. The status of these populations can be compared to the status of natural populations with hatchery programs. As described in the EIS, there are no dramatic differences in the status of natural fish between no hatchery presence and hatchery presence. An important consideration for hatchery effects is that the hatchery program is masking the true status of natural steelhead where the hatchery program occurs. The available information does not suggest this is occurring. The updated status information for steelhead can be referenced in the EIS for more information.
8	29	Noted. NMFS did not assess whether future management actions are likely to be implemented by ODFW. Any assessment by NMFS would be speculative. Our assessment focused on the current status of steelhead and recent information on impacts of hatchery programs impacts of the proposed action, including reasonably foreseeable cumulative impacts, as required by NEPA.

8	30	Noted. Chapter 3 and Chapter 5 provide our assessment on habitat conditions that affect coho salmon and other salmon and steelhead species.
8	31	Noted. The only definitive way to identify whether steelhead offspring are from hatchery and/or natural fish parents is pedigree analysis. This information is not currently available for Oregon Coast populations. Therefore, it is unknown the extent to which offspring from hatchery fish may be competing with natural fish offspring. In this situation, the potential impact of this is expected to be low overall due to the limited areas throughout the Oregon Coast region where pHOS is elevated to such a degree that hatchery offspring would be prominent. However, in populations with elevated pHOS, hatchery fish are likely producing offspring that would interact with offspring of natural-origin by natural-origin crosses (sections 3.4 and 4.4 of the EIS).
8	32	Noted. Most of the assessment focused on PNI, which incorporates the likely degree of exposure natural populations may have from domestication impacts of hatchery fish. In some populations PNI values are low (<0.3) and therefore these populations are at higher risk for changes to life history traits from hatchery fish. The CMP directs management actions to reduce hatchery program risks to natural populations. In addition, increasing PNI values will reduce hatchery effects, increase natural fish in the broodstock; which will reduce potential selection for early timed hatchery steelhead and focus more on natural fish life history characteristics.
8	33	There are many different factors that affect size and age at return for Chinook salmon. Most factors are not related to hatcheries. NMFS has included additional information on pHOS, pNOB, and PNI in the final EIS to assess the role hatchery programs may be exerting on the natural characteristics of salmon and steelhead populations. See sections 3.4 and 4.4 of the final EIS.
8	34	Noted. Corrected.
8	35	Noted. Based upon this comment, NMFS included an additional alternative in the final EIS based upon biological considerations to eliminate the highest risk hatchery programs and implement additional hatchery reforms in remaining programs.
8	36	Noted. See responses 8-3, 8-5, and 8-6.
8	37	Noted. The EIS utilizes the CMP for the steelhead assessment because it is the latest steelhead assessment, with acknowledgment that the information is not complete. If ODFW did not update a steelhead population in this review, then the 2005 status review was used.
8	38	Noted.
8	39	Noted. ODFW's CMP provides the justification for observing hatchery fish spawning at a higher rate near hatchery release locations than throughout the entire population area. This is a common occurrence for hatchery programs throughout the region.

8	40	The best available information reports pHOS for steelhead across multiple populations. The level of gene flow from hatchery steelhead to natural steelhead is not available, and so it is not possible to quantify actual genetic effects. Therefore pHOS is used as a reasonable proxy. It is important to note, the steelhead hatchery programs are managed as integrated stocks with their local populations.
8	41	Noted. NMFS still believes the EIS assessment is correct in that harvest impacts on natural salmon and steelhead could increase if hatchery programs are terminated. Even though Magnuson-Stevens Act and Oregon's CMP provide a fisheries framework, there is flexibility in the allowable harvest rates.
8	42	The EIS evaluates a range of alternatives from proposed hatchery programs to termination of all hatchery programs. The effects of these alternatives are in Chapter 4. NMFS believes the full range of effects is considered regarding the no-hatchery scenario for the Oregon Coast region.
8	43	Noted. Corrections to HGMP.
8	44	Noted.
8	45	Noted.

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October 13, 2016

NMFS, Oregon Coast Hatchery DEIS
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via: OregonCoastHatcheryEIS.wcr@noaa.gov

Re: Draft Environmental Impact Statement to Analyze Impacts of NOAA's National Marine Fisheries Service Proposed Approval of the Continued Operation of 10 Hatchery Facilities for Trout, Salmon, and Steelhead along the Oregon Coast, as Described in Oregon Department of Fish and Wildlife Hatchery and Genetic Management Plans, Pursuant to Section 4(d) of the Endangered Species Act

Thank you for the opportunity to comment on the referenced DEIS. The three signatories to this letter have worked in parallel for over thirty years providing fisheries economic analysis professional services. In general, we view the document incomplete and inadequate. #1

The DEIS alternatives do not cover the spectrum of salmonid production possibilities. The alternatives are crafted for more or less artificial production and do not consider replacement production from water quality/habitat improvements, predation resolutions, or changes to fishery management regimes. Given the increasing body of science showing deleterious impacts of hatchery production on wild stocks, it is only reasonable that natural replacement scenarios be included (NMFS 2016). Recent studies have shown favorable cost effectiveness for habitat improvements versus artificial production. For example, Ogston, et. al. 2015 concludes that in some cases habitat improvements are less expensive per returning adult harvestable fish than hatchery production. #2

The DEIS alternatives do not address the wider array of ocean fishery management issues that, with adjustments, can be used to maintain Oregon fisheries access opportunities. We understand that the analysis of individual hatchery operation plans through ODFW's development of HGMPs must assume existing management regimes. However, we look to NMFS as the ESA lead agency to approve the collection of HGMPs as well as sort out what might be done at the federal fisheries management level to hold harmless regional fisheries and promote salmonid species conservation through natural production. #3

We believe NOAA has misinterpreted the tiered application of NEPA. The DEIS should be at a programmatic level and not project level. This dimensional approach is also an economic issue as many Oregon coastal hatchery anadromous fish production programs show negative benefit-cost analysis (BCA) results. A principal determinate for achieving positive BCA results based #4

on Oregon fisheries is addressing West Coast, Alaska, and British Columbia ocean intercepts of fish that were artificially propagated or naturally produced in Oregon. The DEIS reader is not provided background or information regarding what can be done with fisheries management regimes in lieu of current artificial production levels.

Predation management should be a DEIS discussion topic. For example, how does Columbia River Cormorant, Caspian Tern, and pinniped management affect Oregon Coast production and harvest opportunities? Can additional Oregon Coast smolt predation reduction programs be used to offset artificial production levels? #5

The Oregon Salmon and Trout Enhancement Program (STEP) program is active in many basins on the Oregon Coast, yet no discussion of it appears in the DEIS. The STEP program is a cost-effective technique for artificial propagation used for fisheries augmentation (TRG 2015). Data available from this program (number of releases, survival to harvestable fish, and effect on native stocks) should be discussed and used in the accounting of differing levels of artificial production. #6

A better description of the life cycle of each basin and species should be included to highlight the effect of the alternatives on the status of sub-population. West Coast fisheries are managed based on intended ratios of species-to-species and/or of wild-to-hatchery fish. For example, an analysis by ODFW in the 1990's observed that in times of low abundance, each additional wild coho available off the Oregon Coast would allow about six additional Chinook to be harvested. Moreover, there should be basin wild fish return threshold levels as is done for Washington coastal streams. Cross-basin aggregate harvest level targets that include streams with hatchery production can overfish natural production on streams that are without hatchery production. #7

The DEIS relies on erroneous BCA literature in the economic analysis discussions. The DEIS addresses hatchery plans that will affect fish production and fish management for many years into the future. As such, investments with long life cycles need to be an included cost (fixed or capital) along with variable costs (Naish 2008). Variable costs are items such as feed, labor and utilities (power, water) needed to run hatchery operations as well as headquarter administration costs. These variable cost items are stated in the DEIS in the per-unit measurements which were borrowed from a cited study. However, what are missing are the costs required to build and conduct periodic heavy maintenance of facilities. Carter et. al. 2010 is an example hatchery economic evaluation study that does include total costs. The study show that headquarter administration and long term capital costs can be as high as 50% of total costs. This means that the per unit measurements used in the DEIS are approximately 50% too high (i.e., benefits are overstated by a factor of two). #8

NMFS should sponsor their own net economic valuation analysis to be used in the DEIS that includes all policy-related hatchery benefits and costs. The benefit side of the equation should #9

account for not only direct fisheries benefits, but also non-use conservation benefits, plus account for the negatives of hatchery production, such as diminished natural production due to weakened genetics, crowding, concentrated predation, etc. In addition to variable costs, the cost side of the equation must include the aforementioned long-term capital costs.

We could not follow the regional economic analysis in this DEIS. The studies cited above and others included in the bibliography, below (e.g., Seung and Waters 2006) describe proper procedures and data to be used in estimating the local and state economic impacts of fish harvesting and primary processing. We are mystified by both the arithmetic and the logic of including DEIS Table 9 on page 3-42. The table shows some economic impact measures for all of the sport fisheries in Oregon, including the trout and warmwater fisheries. The trout fishery in particular attracts the greatest number of anglers, and supports the greatest number of angler days (typically over 50 percent of total angler days), however it has little to do with Oregon coastal salmon. The table makes little or no sense and is at best a red herring having no place in this document. #10

On DEIS page 5-26, lines 5-8 it states *"However, none of the alternatives would affect the overall trend in cumulative effects on socioeconomics because the range of production levels under the alternatives would result in a small fraction of the total harvestable salmon and steelhead in the analysis area, and, therefore, would provide a small fraction of the overall economic benefits derived from salmon and steelhead harvest in the analysis area"*. If this statement were actually true, and the effects of proposed action be deemed so trivial, then why should the State be involved in hatchery production of salmon at all? #11

We hope NMFS will address these mentioned omissions and re-issue the proper NEPA documentation for approving Oregon Coast artificial production programs. #12

Sincerely,

Hans D. Radtke, Ph.D. Chris Carter, Ph.D. Edward Waters, Ph.D.

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NMFS Responses to Comments from Hans D. Radtke, Ph.D., letter dated October 13, 2016.

Letter #	Comment #	NMFS Response
9	1	Noted.
9	2	Noted. The EIS evaluated a range of alternatives from the proposed action (implementation of the submitted HGMPs) to termination of all hatchery programs along the Oregon Coast (essentially the evaluation the commentors were looking for). In the FEIS we have added a further alternative that focuses on reducing programs where the risk is highest. NMFS believes this range of alternatives meets the standards of NEPA.
9	3	Noted. The proposed action is to evaluate the submitted HGMPs under our obligations of limit 5 of the ESA 4(d) Rule. NMFS sets fisheries management policy through a variety of other actions which are not part of the proposed action here.
9	4	Noted. NMFS has discretion on the scope of assessment in an EIS, but in this case the scope of the proposed action is defined by NMFS regulations at 50 CFR 223.203 and the applications received under this rule. In the case of Oregon Coast hatchery programs, we are analyzing submitted HGMPs for all of the hatchery programs on the coast under the ESA, and thus, it makes sense to conduct our assessment under NEPA encompassing the same area.
9	5	Noted. ODFW's CMP evaluated predation by wildlife species and recommended management actions in section "Predation Actions" (page 78). These actions are part of the affected environment under NEPA. The purpose of the EIS was to evaluate impacts of the hatchery programs on the human environment.
9	6	Noted. The STEP program is managed under the jurisdication of ODFW and hatchery production is included in ODFW's HGMPs subject to this assessment.
9	7	Noted.
9	8	Noted. In the EIS, NMFS reported the actual costs and manpower needed to operate the hatchery programs based upon data provided in the HGMPs. We also used the BCA results from various studies as cited in the EIS. We believe these estimates are accurrate, and represent the best available information.
9	9	Noted. See response 9-8. In preparing an EIS the agency is supposed to rely on the best available information.
9	10	Noted. Arithmetic errors in Table 9 of the EIS corrected based upon comment.
9	11	Noted.
9	12	Noted.

October 24, 2016

Sent via email to: OregonCoastHatcheryEIS.wcr@noaa.gov

National Marine Fisheries Service
Oregon Coast Hatchery DEIS
2900 NW Stewart Parkway
Roseburg, OR 97471

RE: Comments on Oregon Coast Hatchery Draft Environmental Impact Statement

To Whom It May Concern:

Trout Unlimited (TU), the nation's oldest and largest coldwater fisheries conservation organization dedicated to protecting and restoring our nation's trout and salmon resources and the watersheds that sustain them, appreciates the opportunity to comment on the Oregon Coast Hatchery Programs Draft Environmental Impact Statement (DEIS). #1 TU's comments primarily address steelhead with a particular focus on the Siletz River wild steelhead population, one of the most important wild winter and summer steelhead populations and fisheries in the mid-coast. #2 Additionally, we discuss specific concerns related to hatchery impacts on salmon populations in the Elk River.

TU's primary concern with the DEIS is its analysis of hatchery effects on non-ESA listed steelhead. This analysis is insufficient as it fails to adequately address the potential #3 environmental effects associated with stray hatchery steelhead and the potential for high stray levels in some watersheds. TU understands that the National Marine Fisheries Service (NMFS) does not have the authority pursuant to Endangered Species Act (ESA) section 4(d) to order changes as a condition of approval of the Hatchery Genetic Management Plans (HGMPs). However, TU is concerned that the DEIS draws conclusions regarding hatchery impacts on wild populations that cannot and will not be substantiated by the HGMPs proposed monitoring activities. More robust monitoring plans are necessary to accurately determine whether hatchery programs are achieving their goals and to what extent the programs are influencing the sustainability of wild steelhead and the fisheries they provide. These points are addressed in more detail below.

Environmental Impacts

I. <u>The DEIS does not contain adequate analysis regarding the potentially significant effect of hatchery programs on wild steelhead.</u> #4

TU recommended in its scoping comments (Attachment A) that the DEIS evaluate the potentially significant effect of each NEPA alternative on wild steelhead populations using the best available scientific information. While TU appreciates that the DEIS includes more recent

data on the steelhead hatchery programs than was provided in the scoping document, we remain concerned about the adequacy of the data – even the current information – for evaluating the effects of steelhead hatchery programs on wild steelhead populations. For example, many assumptions are based on the redd surveys conducted by the Oregon Department of Fish and Wildlife (ODFW) and the associated reports (e.g., Jacobsen et al. 2015). Although the sample design may be statistically robust enough to generate estimates of redds at the regional scale, it is not clear how effective the surveys are for estimating the ratio of wild and hatchery steelhead on the spawning grounds. Nonetheless, the DEIS draws conclusions about the effects of hatchery steelhead based on the data from those surveys.

As discussed below, the DEIS should more thoroughly address the impacts of hatchery steelhead on wild steelhead, particularly in those places that have high levels of hatchery steelhead straying onto the spawning grounds. The DEIS could be improved by vetting the ability of the ODFW's sample design to accurately estimate the extent of hatchery strays and fully considering the extent to which hatchery effects (e.g., interbreeding, predator attraction) depress the productivity of wild steelhead, particularly in the Siletz River basin. This type of information is needed to make informed decisions about which alternative best ensures both the future of wild steelhead and the fisheries they provide.

a. The DEIS should describe how steelhead hatcheries will be operated to minimize harm on wild steelhead populations.

The Hatchery Genetic Management Plans (HGMPs) and DEIS allude to operating steelhead hatcheries in a way that minimizes harm on wild steelhead populations. TU agrees this is an important goal of hatchery management. However, it is unclear whether the operations are achieving or can achieve this goal because the DEIS does not include any criteria for steelhead hatchery programs in relation to wild steelhead. For example, one goal of hatcheries is to produce steelhead for harvest while reducing the amount of hatchery steelhead that spawn in the wild. However, the proportion of hatchery steelhead on the spawning grounds was quite high in some of the management areas, including 17% in the mid-south coast and 22% in the mid-coast (which includes the Siletz River) (Jacobsen et al. 2015). The percentage in the Siletz, a river we are particularly concerned about, easily exceeds the 10% threshold posited by ODFW in the Coastal Multi-Species Conservation and Management Plan (ODFW 2014). Regardless, these estimates are based exclusively on the spawning ground surveys conducted by ODFW. They do not utilize older data that was included in the scoping document such as the fish traps in the Siletz River that found a hatchery stray rate of 34-70% from 1998-2007. #5

If available, more recent fish trap data on steelhead stray rates in the Siletz should be included in the DEIS to ensure an adequate analysis of the impacts of the hatcheries on wild steelhead populations. Use of spawning ground surveys alone could underestimate the proportion of hatchery steelhead spawning in nature and thus understate the significance of the HGMPs effects on wild steelhead populations.

b. The DEIS should analyze the potentially significant effects of hatchery interaction with wild fish including possible reductions in productivity.

The DEIS claims that the relative magnitude of hatchery interaction with wild fish is low in the Siletz (DEIS, Table 12, p. 4-15). This conclusion, however, is inconsistent with the data produced from spawning ground surveys and fish traps both which suggest a high level of stray hatchery steelhead found in the Siletz. The DEIS also does not address how the productivity of wild steelhead declines as the proportion of hatchery fish increases (Chilcote 2004, Chilcote et al. 2011). Based on Chilcote 2004 and Chilcote et al. (2011) – which included many Oregon streams analyzed in the DEIS – the wild steelhead population in the Siletz with 22% hatchery fish on the spawning grounds would be approximately 35-40% less productive than without any hatchery fish. If the hatchery stray rate is 34-70%, as indicated in older data in the scoping document, the wild population would be 40-70% less productive. This represents a substantial and significant reduction in productivity of wild fish, yet the potential loss of productivity is not addressed in the DEIS. This potentially significant effect should be analyzed in the DEIS especially considering that the Siletz River wild steelhead population is one of the most important wild winter and summer steelhead populations and fisheries in the mid-coast. #6

c. The DEIS should provide information regarding the extent of residual hatchery steelhead and analyze the effect of these steelhead on the productivity of wild steelhead populations.

The DEIS effects analysis contains no discussion of the extent of residual hatchery steelhead that do not migrate to the ocean and remain in freshwater and their potential to breed with wild steelhead (e.g., McMillan et al. 2007; Christie et al. 2011). The DEIS does mention that residualism is most common in steelhead compared to the salmon species, but the issue is mostly discussed in terms of competition for food and space, not mating. This point is important because mature resident males from hatcheries increase the already high level of hatchery fish on the spawning grounds in the Siletz River and thus influence the productivity of the wild steelhead populations. #7

d. The DEIS should analyze the effects of hatchery and wild steelhead interaction during the smolt-migration period on the survival and productivity of wild steelhead smolts.

While the DEIS mentions the potential for interactions between hatchery and wild steelhead during the smolt-migration period, there is little discussion about potential correlations between releases of large-numbers of hatchery smolts and reduced survival (Moore et al. 2015) or productivity (Nickelson 2003) of wild smolts. Research in Puget Sound by Moore et al. (2015) found that the lowest period of marine survival for wild steelhead smolts coincided with the two-week window in which most hatchery steelhead and coho were released. The potential for similar effects in Oregon should be analyzed given the large releases of hatchery steelhead smolts. #8

II. The DEIS does not contain adequate analysis regarding the potentially significant effect of hatchery programs on the coho and wild fall Chinook populations in the Elk River.

#9

The coho run in the Elk River is at "high risk of extinction." (Elk River HGMP, p. 12.) Recent abundance estimates range from 184 to 616 coho spawners. ODFW has recognized problems at Elk River Hatchery in terms of negative impacts on wild fall Chinook but has called only for reductions in smolt releases from the hatchery from 325,000 to 275,000. This is still too many hatchery smolts for a system with wild escapement of around 2,000 Chinook and the resulting effects on wild coho populations should be analyzed in the DEIS. The ODFW goal for percentage hatchery Chinook on spawning grounds (pHOS) is 30% in the Elk River yet the 9-year running average (2006-2014) is 50.8%. ODFW should reduce hatchery releases into the Elk River to minimize detrimental impacts to coho and wild fall Chinook populations.

Socioeconomic Analysis

I. The DEIS does not adequately analyze the effects of each NEPA alternative on wild steelhead catch-and-release fisheries.

#10

The DEIS addresses the value of fisheries provided by hatcheries but does not include any evaluation of the economic and social benefits provided by catch-and-release (C&R) fisheries for wild steelhead. This is a glaring omission. As mentioned in TU's scoping comments, C&R fisheries for wild steelhead are some of the most popular and sustainable fisheries on the West Coast, and the same is true in Oregon. This is important because as the Hatchery Scientific Review Group (HSRG 2016) recently stated, "It is now clear that the widespread use of traditional hatchery programs has actually contributed to the overall decline of wild populations." In other words, the hatchery operations in this DEIS are likely reducing opportunity for C&R on wild steelhead. The extent of effects likely varies among populations, with the risks of the hatchery depending on the overall value of the C&R wild steelhead fishery. The DEIS should provide analysis regarding the economic contributions of different types of wild steelhead fisheries as compared to the hatchery harvest fisheries and how the economic contribution will be effected by the proposed alternatives.

HGMP Requirements

I. Operation of steelhead hatcheries should depend on development and implementation of region-wide monitoring.

#11

As noted above, TU is concerned that several conclusions drawn in the DEIS regarding hatchery impacts to wild steelhead populations are unsubstantiated or based on minimal science and therefore should be confirmed with robust monitoring by the hatchery programs. TU appreciates ODFW's sample design and efforts to monitor steelhead however there are some remaining issues that should be addressed before long-term decisions are made about hatchery operations.

First, the overall sample design for estimating steelhead redd totals at the regional-scale is based on surveys from a very small proportion of the overall habitat (e.g., Jacobsen et al. 2015). While this may be adequate for coarse-scale evaluations, it hinders the DEIS's ability to draw conclusions about steelhead in specific basins – such as the Siletz and Nehalem Rivers, two of the more important wild steelhead fisheries on the Oregon coast. Given the data on hatchery strays collected in fish traps, which are higher than those reported in the spawning survey reports, there is a need to determine which of these data are most representative of what is actually occurring. Second, according to the DEIS, there have been few to no steelhead surveys in much of the Rogue and South Coast management areas and surveys in the Lower Gorge (Columbia River) and Hood River will no longer be conducted. TU is concerned about further reductions in steelhead surveys, particularly given that the surveys already only cover a small proportion of the available habitat.

TU suggests that ODFW seek ways to ameliorate the above concerns. The first could be solved by implementing a more intensive survey design in 1-2 watersheds to better quantify the spatial distribution of spawning steelhead, the number of redds and the proportion of hatchery steelhead on the spawning grounds. The Siletz River is an ideal candidate for this type of monitoring (please refer to TU's scoping comments for suggestions on monitoring the extent of hatchery and wild steelhead). Second, we do not support further reductions in survey efforts for steelhead. TU understands that surveys are costly and labor intensive. Nonetheless, the future of the steelhead and the fisheries they provide depends on having quality monitoring data to make inferences about the status of wild steelhead populations on the Oregon Coast. The latter could be partly resolved by working with NGO's, such as TU, to further expand Citizen Science efforts in the less-sampled watersheds. This is already being done by ODFW in places like the Salmonberry and Smith Rivers. Increasing such efforts could help potentially fill gaps in the steelhead monitoring efforts.

II. The DEIS should provide more information regarding the consequences of the hatchery programs not meeting the HGMP requirements, including plans to bring existing "out-of-compliance" hatcheries into compliance. #12

The DEIS will facilitate the approval of several HGMPs in Oregon. However, HGMPs are meaningless if hatchery programs do not comply with their terms. For example, the Elk River Hatchery is not in compliance with the terms of its HGMP. The pHOS has exceeded the 30% goal contained in the HGMP in 13 years of last 16 (years 2000 to 2015). The DEIS should describe how the HGMPs are remedying compliance issues. In the case of the Elk River HGMP, TU recommends that OFDW consider an improved pHOS goal (such as 10-15%).

Conclusion

Oregon's wild coastal salmon and steelhead populations are some of the most abundant and diverse populations in the lower-48. They are not only important culturally to anglers and citizens, but they also provide critical economic benefits to many rural economies. The DEIS #13

should ensure an adequate evaluation of the potentially significant effect of its proposed alternatives on wild steelhead populations using the best available scientific information.

Thank you for consideration of these comments. If you have any questions about this request, please contact me at 916-214-9731 or cferrari@tu.org. Thank you.

Chandra Ferrari
OR Water Policy Advisor

John McMillan
Science Director, Wild Steelhead Initiative

Attachment A:
Trout Unlimited Oregon Coast Hatchery EIS Scoping Comments (March 17, 2016)

References

Chilcote, M.W. 2004. Relationship between natural productivity and the frequency of wild fish in mixed spawning populations of wild and hatchery steelhead (*Oncorhynchus mykiss*). Canadian Journal of Fisheries and Aquatic Sciences 60: 1057-1067.

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Hatchery Scientific Review Group (HSRG). 2015. Annual Report to Congress on the Science of Hatcheries. A. Appleby, H.L. Blankenship, D. Campton, K. Currens, T. Evelyn, D. Fast, T. Flagg, P. Kline, C. Mahnken, B. Missildine, L. Mobrand, G. Nandor, P. Paquet, S. Patterson, L. Seeb, S. Smith, and K. Warheit. www.hatcheryreform.us

Jacobsen R., J. Nott, E. Brown, M. Weeber and M. Lewis. 2015. Assessment of Western Oregon Adult Winter Steelhead and Lamprey – Redd Surveys 2015. Monitoring Program Report Number OPSWODFW- 2015-09. Oregon Department of Fish and Wildlife, Salem, Oregon.

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Moore, M.E., Berejikian, B.A., Goetz, F.A., Berger, A.G., Hodgson, S.S., Connor, E.J., and T.P. Quinn. 2015. Multi-population analysis of Puget Sound steelhead survival and migration behavior. Marine Ecology Progress Series 537:217-232.

Nickelson, T. 2003. The influence of hatchery coho salmon (*Oncorhynchus kisutch*) on the productivity of wild coho salmon populations in Oregon coastal basins. Canadian Journal of Fisheries and Aquatic Sciences 60:1050–1056.

Oregon Department of Fish and Wildlife. 2014. Coastal Multi-Species Conservation and Management Plan. June 2014. Oregon Department of Fish and Wildlife, Salem, Oregon.

March 17, 2016

Sent via email to: OregonCoastHatcheryEIS.wcr@noaa.gov

National Marine Fisheries Service
Sustainable Fisheries Division
2900 NW Stewart Parkway
Roseburg, OR 97471

RE: Oregon Coast Hatchery EIS Scoping Comments

To Whom It May Concern:

Trout Unlimited (TU), the nation's oldest and largest coldwater fisheries conservation organization dedicated to protecting and restoring our nation's trout and salmon resources and the watersheds that sustain them, appreciates the opportunity to comment regarding the scope of the Oregon Hatchery and Genetic Management Plans Environmental Impact Statement (EIS). TU's comments primarily address steelhead and consequently focus on the Hatchery Genetic Management Plans (HGMP) for the Siletz, Umpqua and Nehalem Rivers as these rivers contain strong populations of wild steelhead.

Generally speaking, TU believes that the scoping document has captured many of the most important aspects of hatchery operations and effects, particularly for Endangered Species Act (ESA) listed coho salmon. However, it is difficult to adequately evaluate the hatchery programs due to the significantly dated nature of the data being utilized. Additionally, the scoping document's description and the HGMPs analyses of hatchery effects on non-ESA listed steelhead are quite limited, especially as compared to coho salmon. This analysis should be expanded. Specifically, the EIS should address the potential environmental effects associated with stray hatchery steelhead and the potential for high stray levels in some watersheds. The HGMPs should also include a more detailed monitoring plan to determine whether hatchery programs are achieving their goals and to what extent the programs are influencing the sustainability of wild steelhead and the fisheries they provide. These points are addressed in more detail below.

<u>Environmental Impacts</u>

The DEIS should include a rigorous analysis of the potential significant effect of hatchery programs on wild steelhead

The EIS should evaluate the potentially significant effect of each NEPA alternative on wild steelhead populations. The HGMPs allude to implementing the hatchery steelhead programs in a way that "minimizes harm" to wild steelhead. However, the language describing the hatchery indicators for the HGMPs in the Siletz, Nehalem and Umpqua Rivers only discuss hatchery effects on run timing and the proportion of hatchery fish spawning in nature and such effects and indicators are discussed only briefly. While the effects mentioned in the HGMPs are important, there may be a wide array of other effects,

ranging from interbreeding to competition and predator attraction. These effects are evaluated in detail for the ESA-listed coho salmon, but they are not even mentioned for wild steelhead.

The DEIS should address several other potential effects to wild steelhead in addition to effects on run timing and proportion of hatchery fish on the spawning grounds, such as:

- What are the genetic effects of the hatchery steelhead program on the wild steelhead populations?
- Has/does the productivity of the wild steelhead populations declined/decline in relation to the proportion of hatchery steelhead in the system (e.g., Chilcote 2004, Chilcote et al. 2011)?
- Is there a correlation between releases of large-numbers of hatchery smolts and reduced survival (Moore et al. 2015) or productivity (Nehlsen 2003) of wild smolts?
- What is the extent of residual hatchery steelhead that do not migrate to the ocean and remain in freshwater and what is their potential to breed with wild steelhead (e.g., McMillan et al. 2007; Christie et al. 2011)?

Without discussing the aforementioned questions, it is not possible to fully account for the effects of the hatchery programs on wild steelhead. Answers to the questions, and others, are necessary to understand the potential for wild steelhead populations and the fisheries that they provide and complete a thorough NEPA analysis.

The HGMPs and DEIS should ensure they are utilizing the best available scientific information to evaluate the steelhead hatchery programs

The majority of HGMPs, excluding most of the Umpqua steelhead hatchery HGMP, rely heavily on relatively old information to measure current performance standards and indicators. For example, the Siletz River winter steelhead HGMP uses harvest data from 1988-2002, which is over a decade old, and uses data from 1998-2007 to determine the proportion of hatchery fish that do not return to the hatchery and spawn in the wild. Similarly, the Siletz River summer steelhead HGMP relies on harvest data from 1993-2005, and the Nehalem River winter steelhead HGMP uses data from 1990-2000 to evaluate fishery contributions and uses data from 1999-2007 to measure indicators about various features of the hatchery fish. If available, more current scientific information and data should be used. If more recent information is not available, then the HGMPs and DEIS should be careful about drawing definitive conclusions based only on old information. The several concerns we have regarding the use of outdated data is contained below.

- First, although older data is useful for tracking status and trends – if combined with contemporary data – as standalone information it makes it impossible to understand whether the hatchery is meeting production goals and standards.
- Second, a lack of current data hinders our ability to measure performance indicators, such as the extent of hatchery fish spawning in the wild and whether the proportion of hatchery fish spawning in the wild exceeds the 10% threshold adopted by the Department. For example, fish traps in the Siletz River basin found a hatchery stray rate of 34-70%, but the information is from 1998-2007 (Siletz winter steelhead HGMP, pg. 1-6). The hatchery stray levels suggest that the program may be easily exceeding the 10% threshold, and yet, there is little discussion or evaluation of how such high levels of hatchery straying are inconsistent with the hatchery goal of minimizing effects on wild fish (Siletz winter steelhead HGMP, pg. 1-3). TU recommends that the HGMPs describe any steps taken to try to reduce the proportion of hatchery strays and whether there is more current information on hatchery strays.

- Third, we appreciate the inclusion of a potential option for expanding the monitoring of hatchery steelhead spawning in the wild in the Siletz River basin (Siletz summer steelhead HGMP, pg. 7). Nonetheless, given the potential for extensive hatchery straying into the wild, and the associated negative effects on wild steelhead, we believe such a program needs to be expanded into multiple rivers with a rigorous sample design (see more detail below). Without this type of information, it is very difficult to adaptively manage the hatchery programs through the HGMP process.

Socioeconomic Analysis

The DEIS should evaluate the effects of each NEPA alternative on wild steelhead catch-and-release fisheries and should describe the beneficial values of such fisheries.

The HGMPs contain no analysis of the benefits provided by wild steelhead catch-and-release (CnR) fisheries. CnR fisheries for wild steelhead are some of the most popular and sustainable fisheries on the West Coast, and the same is true in Oregon. This is important because as the Hatchery Scientific Review Group (HSRG 2016) recently stated, "It is now clear that the widespread use of traditional hatchery programs has actually contributed to the overall decline of wild populations." In other words, the hatchery operations described in these HGMPs are likely reducing opportunity for CnR on wild steelhead. The extent of effects likely vary among populations, with the risks of the hatchery depending on the overall value of the CnR wild steelhead fishery. The DEIS and HGMPs should include analysis regarding the economic contributions of different types of wild steelhead fisheries and compare it to the economic costs and contributions of hatchery harvest fisheries. The DEIS should also describe how each NEPA alternative will affect CnR wild steelhead fishing opportunity.

HGMP Criteria

The HGMPs should contain adequate monitoring and evaluation plans that focus on determining the extent of hatchery steelhead that spawn in the wild.

The Siletz River basin HGMP for summer steelhead includes an option for expanding the monitoring of hatchery steelhead spawning in the wild in the Siletz River basin (pg. 7). This is an important part of the scoping process given the high levels of stray hatchery steelhead that were captured in traps in the Siletz River basin. The expansion right now only includes an option for an additional fish trap, however. While the trap would provide additional data, it seems that there is already ample trap data to draw upon. Hence, we suggest that the HGMPs for the Siletz be expanded to include monitoring of genetics (e.g., DNA samples) and behavior (e.g., stray hatchery fish counted via snorkeling) to address the issue of interbreeding and determine which parts of the basin, if any, that hatchery steelhead are more likely to stray to.

Similar monitoring would be beneficial to decision-making if conducted in at least a few other systems with an appropriate sample design. There are examples of some of this in the HGMPs. For instance, information on the distribution of hatchery fish was provided in the Umpqua River basin HGMP, as was a more detailed list of indicators and potential approaches for quantifying the indicators (pgs. 6-9). We agree with the Department that it is not easy or simple to monitor hatchery effects, but, it is being done in other states (e.g., Nielsen et al. 2009, Warheit 2014c) where it has provided valuable information. Of course, genetics are only part of the question, and

other methods will be necessary to evaluate all the indicators in the HGMPs. It is unlikely that all questions can be answered immediately, so we suggest that the HGMPs prioritize the questions in order of importance to the fish and the fisheries, and include an appropriate level of detail so that there is a clear path forward for addressing hatchery effects.

Conclusion

Thank you for consideration of these comments. TU looks forward to its continued participation in this process as it moves forward. If you have any questions about this request, please contact me at 916-214-9731 or cferrari@tu.org. Thank you.

Chandra Ferrari
OR Water Policy Advisor

References

Chilcote, M.W. 2004. Relationship between natural productivity and the frequency of wild fish in mixed spawning populations of wild and hatchery steelhead (*Oncorhynchus mykiss*). Canadian Journal of Fisheries and Aquatic Sciences 60: 1057-1067.

Chilcote, M.W., Goodson, K.W., and M.R. Falcy. 2011. Reduced recruitment performance in natural populations of anadromous salmonids associated with hatchery-reared fish. Canadian Journal of Fisheries and Aquatic Sciences 68:511-512.

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Warheit, K. I. 2014c. Summary of hatchery-wild introgressive hybridization for northern Puget Sound steelhead (*Oncorhynchus mykiss*) populations affected by segregated hatchery programs. March 2014. Washington Department of Fish and Wildlife, Olympia, Washington.

NMFS Responses to Comments from Trout Unlimited, letter dated October 24, 2106.

Letter #	Comment #	NMFS Response
10	1	Noted.
10	2	Noted.
10	3	Noted. The EIS evaluates a range of alternatives from the proposed action to termination of all hatchery programs. This range shows the effects of hatcheries, including the effects of straying by hatchery fish, along the Oregon Coast. This analysis has been supplemented by additional information in the FEIS.
10	4	Noted. Though we acknowledge the limitations of the available data, NMFS has evaluated the data and reports used in the EIS and found it to be credible and informative to our analyses. Using the data and cited reports provides a better understanding on the effects of hatchery programs than not using the information.
10	5	The purpose of the EIS is to provide an assessment on the effects of hatchery programs on the human environment. We have included additional information and analyses in the final EIS that may help address this comment. Relevant information is also included in ODFW's HGMPs.
10	6	Noted. See responses 10-3 and 10-4. In addition, we have included additional information on pHOS, pNOB, and PNI in the final EIS (section 3.4 and 4.4) to help inform the associated impacts of the hatchery programs on Siletz steelhead.
10	7	Noted. Edits made to EIS. Additional assessment included in sections 3.4 and 4.4 of the final EIS describing ecological interactions between hatchery and natural steelhead.
10	8	Noted. This was evaluated in the EIS in sections 3.4 and 4.4 It is important to note total hatchery production on the Oregon Coast is substantially less than in other regions like Puget Sound; equating to much different potential for density-dependent negative interactions between hatchery steelhead and natural steelhead.
10	9	Noted. Additional information and analyses is provided in the final EIS related to this comment.
10	10	Noted. The comment asks for analysis of the economic benefits of catch-and-release fisheries for wild steelhead, but these were not part of the proposed action or an effect of the proposed action. Our focus was to disclose the effects of the hatchery programs in areas where they occur.
10	11	Noted. The HGMPs describe the extensive monitoring program included, which was analyzed in the FEIS in sections 3.4 and 4.4. Long-term data sets exist for estimating the abundance, distribution, pHOS for coho salmon and steelhead, and more limited for fall Chinook salmon. This region has some of the best available information to evaluate hatchery programs for the West Coast. In many other areas, no long-term datasets exist. Therefore, we have confidence in the EIS assessment for the Oregon Coast.

10	12	Noted. The EIS does not speculate about future compliance issues, but NMFS regulations at 50 CFR 223.203 include compliance provisions, as will the biological opinion to be issued before NMFS takes final action.
10	13	Noted.

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
620 SW Main Street, Suite 201
Portland, Oregon 97205-3026

IN REPLY REFER TO:
9043.1
ER16/0482

October 25, 2016

Lance Kruzic
NMFS Sustainable Fisheries Division, West Coast Region
2900 NW Stewart Parkway
Roseburg, Oregon 97471

Dear Mr. Kruzic:

The Department of the Interior has reviewed the Draft Environmental Impact Statement (DEIS) on 10 Hatchery and Genetic Management Plans for Trout, Salmon and Steelhead Hatchery Facilities along the Oregon Coast. The Department has no comments on the document at this time. #1

We appreciate the opportunity to comment.

Sincerely,

Allison O'Brien

Allison O'Brien
Regional Environmental Officer

NMFS Responses to Comments from U.S. Department of the Interior, letter dated October 25, 2016.

Letter #	Comment #	NMFS Response
11	1	Noted.

October 25, 2016

NMFS, Oregon Coast Hatchery DEIS
2900 NW Stewart Parkway
Roseburg, Oregon 97471

via: OregonCoastHatcheryEIS.wcr@noaa.gov

Re: Draft Environmental Impact Statement to Analyze Impacts of NOAA's National Marine Fisheries Service Proposed Approval of the Continued Operation of 10 Hatchery Facilities for Trout, Salmon, and Steelhead along the Oregon Coast, as Described in Oregon Department of Fish and Wildlife Hatchery and Genetic Management Plans, Pursuant to Section 4(d) of the Endangered Species Act.

To whom it may concern:

Thank you for the opportunity to comment on the referenced DEIS. Below we provide detailed comments and concerns related to the information and analysis included in the DEIS. #1

Major Comments:

1. One of our primary concerns regarding this assessment is that the preferred alternative of NMFS (Alternative 2) would, by the agencies own words, "continue to pose short- and long-term risks" to wild salmon populations. Alternative 1 (no action) would "pose short- and long-term risks" to wild populations. This action, with regard to the substance of the HGMPs (only absent the legal decision to adopt them), is the same for both Alternative 1 and Alternative 2. It, therefore, appears that NMFS has prepared a preferred alternative (2) that would also continue to pose said risks to wild salmon populations. We are concerned that a wider range of alternatives were not considered. #2

The four proposed Alternatives are flawed in the following ways:

a. Alternative 1 is not a legal action. It allows the continued operation of the hatcheries without an ESA permit.

b. Alternative 2 provides a blanket approval of all the HGMPs. However, the EIS does not evaluate whether the individual HGMPs are, in fact, consistent with ESA and the protection of other environmental resources. No rational for approval is given. There is no consideration or demonstration of whether or not the management actions in HGMPs in fact contain or sufficiently mitigate recognized biological risks to salmon and steelhead, to other species, and to other environmental factors. #3

c. Alternative 3 provides a blanket rejection of all the HGMPs without consideration whether some individual HGMPs may, in fact, be sufficient to contain biological risks.

d. Alternative 4 arbitrarily reduces hatchery production in all programs by 50% without demonstrating that this action would, in fact, improve risk containment, or that this reduction is actually necessary. Since NMFS does not have the authority to order this kind of change (see page iv, first full paragraph), this alternative essentially rejects all the HGMPs and requires the state to revise and resubmit them but with only this specific action included. Different actions to reduce risk could not be considered.

2. NMFS needs to consider an Alternative 5 by which the individual HGMPs are evaluated and approved or rejected based on their individual merits. NMFS already recognizes that each HGMP needs to be individually assessed and found to be consistent (or not) with the requirements of the ESA (see page 1-1, starting at line 20 and also page 5-6, starting on line 20 where NMFS agrees that adverse effects depend on individual hatchery programs). Some of the submitted HGMPs might be satisfactory as is, others may not be. Specific criteria should be provided as part of this Alternative so that the rational for approval or rejection of each HGMP can be demonstrated to be scientifically sound, well-reasoned, and consistent with decisions made about other HGMPs. The criteria should: #4

a. Comprehensively address biological risk factors;

b. Be based on the best available science;

c. Provide benchmarks that clearly define when biological risks are, or are not, sufficiently contained so that hatchery operations are consistent with recovery and conservation of native species;

d. Provide guidelines and suggested strategies for the kinds of Best Management Practices to include in an HGMP that would sufficiently contain risks.

This alternative should allow the state to revise and resubmit any rejected HGMPs without limiting revisions to the specific action required under Alternative 4, or let the state choose to eliminate the hatchery program.

3. The DEIS is lacking in empirical analysis and what little assessment is provided is simplistic, not defended by best science, and is often arbitrary and inconsistent. Some examples include: #5

a. The analysis is entirely qualitative. A qualitative analysis might be acceptable if the rational for how the available information is used to reach the stated decisions is clearly presented. However, there is no rational provided in the draft EIS.

b. Expected "medium" benefits due to nutrient enhancement by straying hatchery adults appear to be exaggerated. As noted in Section 4 (page 4-38, starting at line 2) habitat productivity is reduced compared to historic conditions, even though hatchery fish were not present historically. Lack of hatchery fish is not the cause of this reduction. Straying hatchery fish are not a solution to decreased habitat productivity. Any potential benefits due to nutrient enhancement would need to be balanced against potential genetic and ecological impacts due to the stray hatchery fish. This determination also assumes there could be no nutrients provided by increases in natural production (although contrarily, this possibility is recognized, see page 4-38, lines 3-5), or that excess hatchery fish carcasses from other programs in the state might be available. #6

c. The analysis for Alternative 4 is generally troubling. The expected linear relationship between a 50% reduction in production and a 50% reduction in water use, water quality impacts, hatchery staffing, biological impacts, etc. is simplistic and poorly reasoned. The effects of a 50% reduction in production #7

would depend on how individual hatcheries are operated. NMFS essentially recognizes this (see page 2-4, starting with line 19).

d. Inconsistent information is provided. A good example is a comparison of misleading Figure 5 (page 3-13, purporting to show the number of hatchery programs in different areas of the coast) and Figures 13 – 20 (pages 4-16 through 4-23, showing river reaches effected by hatchery programs). Also compare the acknowledgement of hatchery risks on page 4-23 and the inconsistent conclusions for various species starting on page 4-34 (for example page 4-35 line 27 for coho that eliminating these risks would provide "little to no benefits"). #8

e. Critical information for addressing hatchery risks is often missing. For example, the HGMP Best Management Practices listed on page 2-2 address compliance with clean water regulations and good hatchery husbandry practices. However, they completely fail to list and address the biological risks to wild populations that are caused by hatchery programs, nor do they provide specific actions for addressing such risks. Likewise, Table 6 (page 3-17) fails to identify the full range of hatchery effects. The effects of hatchery programs on wild populations is well documented in the scientific literature, especially in the hundreds of peer-reviewed publications since 1995. Thus the information that NMFS needs to do a credible job addressing the risks is readily available. #9

f. Use of average effects of hatchery programs across an entire ESU is misleading since the actual effects are on the local populations. For example, if one seriously risky hatchery program is averaged with areas that have no hatchery effects, the hatchery effects on the affected local population are masked and NMFS reaches an over-optimistic conclusion. What if the seriously affected wild population is critical to the conservation of the ESU? See for example the SONC coho, where the hatchery effect is in the Rogue, while hatchery fish are absent everywhere else, but also the strong-hold wild coho population in Oregon's portion of this ESU is also in the Rogue (page 3-22). #10

g. What is the rational for the "high", "medium" and "low" conclusions in Table 12? No discussion is provided of what these qualitative categories mean. Further, if a wild-hatchery interaction is deemed "high" (or "low") how does that influence the decision to adopt an HGMP, or not? #11

This is not a comprehensive list, some further examples are noted in the Specific Comments, below.

4. The EIS provides a valuable contribution by addressing the biological effects of hatchery programs on other fish and wildlife species, and on other environmental resources, that would not otherwise be addressed under the ESA. However, it is unlikely that the HGMPs address the effects on these non-ESA resources, or they may address them inadequately. NMFS must therefore do a good job of assessing the effect of the hatchery programs on these other resources in this EIS. As NMFS points out in the Cumulative Effects section, management of cumulative impacts across the environment depends largely on the effective implementation of various environmental regulations, and that includes the effective use of NEPA. #12

5. NMFS provides a very general (if not comprehensive) discussion of the genetic and ecological effects of hatchery programs, by species, starting on page 4-24. However, the EIS never addresses how the HGMPs, the adoption of which is the proposed action, would affect these hatchery effects. Do the proposed actions in the HGMPs lessen these effects? Is there a strategy? What criteria are to be met to #13

show the effects are sufficiently lessened? What is the proposed monitoring to demonstrate that the actions are effective?

6. Regarding Cumulative Impacts (Section 5, starting on page 5-1): The discussion entirely disregards the historic, and ongoing, relationship between hatchery programs and habitat degradation. For example, as discussed in length by Jim Lichatowich in Salmon without Rivers (1999)1, the provision of hatchery programs in lieu of habitat protection was followed throughout the Pacific Northwest. The argument was that hatcheries would continue to produce fish, even while habitat was lost to development. This is a serious cumulative impact of hatcheries and it is not discussed anywhere in this EIS. #14

7. It is appropriate, as stated on page 1-12 starting at line 3, that future revisions of the coastal HGMPs might warrant additional NEPA and ESA review. #15

Specific Comments:

1. Comments on the Glossary (pages xiii to xvii):

a. A better definition of "fingerling" is required since fry, smolts, pre-smolts, are also "juvenile fish"; or consider refining the terms used in the EIS to avoid ambiguity. #16

b. Under "incidental fishing effects" clarify that the impacts are due to fish that are not targeted, but are captured, whether released or retained.

c. Under "integrated hatchery program" clarify that differences between hatchery and wild fish are intended to be minimized by this strategy, but recognize that the actual extent to which this occurs is currently assumed but not known.

d. A better definition of the Oregon Coast Region is needed. The current definition apparently does not include the entire marine range of salmon and steelhead that are produced in Oregon coastal rivers.

e. A better definition of "residuals" is required. A better definition should be available from the scientific literature.

f. The provided definition of "stock" is the same as that of "population". However, fishery managers use the word "stock" quite differently. For example, "Oregon Natural

1 Lichatowich, J. 1999. Salmon without Rivers: A History of the Pacific Salmon Crisis. Island Press, Washington DC.

Production Index coho" is a fishery "stock" that includes all of the wild "populations" within the Oregon Coastal Coho ESU. "Stock" may also be used to refer to a hatchery stock that is not associated with any wild population.

g. "Take" for hatchery activities also needs to include the risks to wild populations that are caused by hatchery fish ("take" includes "to harass and harm").

2. Information about other ESA listed species provided on page 1.1 line 7 and 1-6 line 13 is inconsistent. Possibly a better definition of the Oregon Coast Region would be helpful. #17

3. Page 1-9, criteria for HGMPs, number 5 (genetic and ecological effects, line 4) should include a good scientifically-sound discussion of the biological risks, the criteria for determining the extent of and #18

containment of the risks, and some management methods that have been shown to decrease the risks. Without such a discussion, the rational for how NMFS determines whether the risks are sufficiently contained or not, is lacking. Also presumably, NMFS also expects the HGMP to provide specific management actions that contain the risks (as opposed to simply having them "determine" the effects).

4. The relationship between, and separate purposes of, an HGMP under ESA, the EIS and a biological opinion need further clarification. Is there a biological opinion for the Oregon Coast hatcheries, because the discussion on page 1-9 implies there is or will be? #19

5. Page 1-14, starting at line 26: This section seems to trivialize the role of the HGMP ("the only action identified …. was to develop HGMPs …). The purpose of the HGMP should be to comprehensively analyze the biological risks to wild populations posed by the hatchery program and develop and propose specific actions to contain the risks. Monitoring actions should be included to demonstrate that the proposed actions were implemented and are effective. This is not a trivial action. #20

6. Page 2.2: NMFS needs to demonstrate, by a scientifically sound analysis, that the submitted HGMPs are consistent with the ESA and with the protection of other environmental resources under this EIS. The Coastal Multi-Species Conservation and Management Plan likely contains substantial information and perhaps analysis that would assist NMFS's own analysis. NMFS's own analysis needs to be well reasoned, scientifically sound, consistent with the analysis for other HGMPs, and well documented. #21

7. The list of Best Management Practices on page 2-2 sufficiently address compliance with clean water regulations and good hatchery husbandry practices. However, it completely fails to list and address the biological risks to wild populations that are caused by hatchery programs, nor does it provide similar specific actions for addressing such risks. #22

8. Page 2-5 first bullet: The claim that the elimination of 2.86 million hatchery fish "would have little to no beneficial effect on ESA-listed species" is unsubstantiated. #23

9. Page 2-5, third bullet: alternative, non-hatchery Federal mitigation actions could be considered and implemented. #24

10. Page 3-2: it is agreed that all water permits need to be in place and in good standing. #25

11. Page 3-5, footnotes to Table 3. There should be a better way to measure the distance between water intakes and discharges. #26

12. Page 3-6: NMFS should document that all permits are in place and in good standing. For example have any of the hatchery facilities failed their water quality monitoring tests over the last ten years? #27

13. Page 3-6: Do NPDES permits provide criteria or standards for pathogens from hatchery facilities? #28

14. Table 5, pages 3-10 and 3-11: The "life stages" are vague and the sources of these information are geographically variable and not necessarily comparable. However, the information shows that hatchery fish appear to be generally released at larger sizes than wild fish. What is the implication of this? NMFS fails to discuss the potential risks caused by this difference, nor does it propose actions that could decrease the risks. #29

15. Figure 5, page 3-13 is misleading. Take the Umpqua Basin as a specific example: Five hatchery programs release fish in the Mid, North or South Umpqua. All of the released fish must pass through the #30

Lower Umpqua in order to reach the ocean. Yet the figure claims the Lower Umpqua has no hatchery programs. In fact, it has fish from five hatchery programs moving through it. Since this figure is often used to demonstrate how many populations have no hatchery programs, this misleading information provides an over-optimistic conclusion (see for example page 4-13, line 31).

16. Pages 3-15 and 3-16: Lines 31-32: why is it of interest to "precisely estimate the effects of fishing on hatchery fish"? Isn't the question about the effects of fishing on wild fish and how that might change when hatchery fish are present? Also the statement about incidental effects of catch-and-release fishing is unclear. Are the numbers given release mortality rates (percent of fish that are handled that are mortalities) or harvest rates (the percent of the total population that are fishing mortalities (number of mortalities / number of mortalities + escapement))? #31

17. Table 6, page 3-17 and associated discussions severely under represents the genetic and ecological risks to wild fish due to hatchery programs. These risks are well described in the scientific literature and there is no justification for NMFS's failure to comprehensively consider them. #32

a. Genetic risks include: Decreased effective population size (Ne), introduction of novel genetic traits, modified life history traits, relaxed natural selection, domestication selection, loss of local adaptations, changes in age structure, altered mate selection, changes in behavior, changes in fecundity, reduced diversity, genetic swamping, increased inbreeding, loss of genetic variation, and increased genetic load in the wild population, all resulting in a loss of fitness in the stream environment.

b. Ecological risks include: Increased density-dependent mortality, decreased access to habitat, displacement from cover, decreased productivity, increased competition, increased predation, increased harvest, direct injury, increased stress, decreased growth, decreased survival, decreased condition, disturbance of redds, premature emigration, increased exposure to disease, decreased size of feeding territories, and displacement from feeding territories, all resulting in the decreased productivity and survival of wild populations. #33

18. Page 3-18 and in numerous other locations: NMFS definitively declares that "hatchery programs have benefitted natural-origin salmon and steelhead by providing additional hatchery fish returns to the freshwater ecosystem, thereby enhancing the amount of marine-derived nutrients available" without providing any analysis to support this statement. NMFS then goes on to include these purported benefits throughout the EIS. #34

19. Page 3-19 discussion about marine nutrient enhancement, NMFS must distinguish between screened carcasses and straying hatchery fish. Screened carcasses may be beneficial and may also be provided from other sources even if all hatchery programs were terminated on the Oregon coast. Potential benefits of stray hatchery fish as nutrient enhancement need to be balanced against demonstrated genetic and ecological risks due to stray hatchery fish. #35

20. Page 3-19 and 3-20: Agree that NMFS should address how hatchery programs might affect Essential Fish Habitat for Pacific Salmon. #36

21. Page 3-22: among the "Essential features" of coho salmon habitat is that carrying capacity of the basin (measured by in a productivity analysis in order to capture the demographics of the population within its physical and ecological environment) must meet or exceed the viable or recovery population #37

size. If it does not, the basin is not capable of supporting a viable population without recovery actions. Hatchery programs may influence ▯.

22. Figures 7 and 8, page 3-24 and 3-25: Abundance information needs to be provided for individual populations. This combined figure is misleading because it masks small population trends. #38

23. Page 3-25: What is a "remnant run"? Provide a definition in the Glossary. #39

24. Page 3-26: NMFS reports very risky pHOS values for Chinook in several coastal streams. But what is the plan to address these? Are there actions proposed in the HGMPs? (also see page 4-28). #40

25. Pages 3-26 and 3-27: The discussion about chum fails to include the ecological effects of hatchery programs particularly for coho, steelhead and yearling Chinook. #41

26. Page 3-27, as an example: There are numerous examples of providing misleading information by averaging abundance or hatchery effects across entire ESUs. This discussion starting on line 29 is an example where the abundance information provided masks the low abundance of summer steelhead in the Siletz. Also see, for example, page 4-14, line 6. #42

27. Figures 9 and 10, pages 3-28 and 2-29: These figures lack context in the EIS and are not informative. Either explain what they mean or provide the necessary context. #43

28. The discussion about "other fish" (starting on page 3-29) fails to consider the ecological effects of hatchery fish on forage fish species that are important to other fish (and also to some wildlife, starting on page 3-34). #44

29. Page 3-31, line 6: Current fish screens may not be designed to protect lamprey. #45

30. Table 7, pages 3-31 and 3-34: The "Types of Interaction with Hatchery Fish" is entirely speculative and undocumented, and therefore essentially meaningless. For example, how would lamprey "compete" with salmon and steelhead for food and space when they are so different ecologically? #46

31. Table 7, page 3-33: benefits to non-native species need to be listed as impacts to native species, not as benefits. #47

32. Page 3-34: what is the effect of hatchery fish on the forage fish for marbled murrelet? #48

33. Starting on page 3-34, the EIS fails to consider the effect of hatchery fish, due to their uniform, concentrated, surface-oriented behavior, to artificially attract and concentrate mammal and avian predators. The EIS also fails to consider the effects of hazing activities that are implemented along the Oregon coast, largely to protect hatchery fish. Also see sections 4.6, which further fails to address this concern. #49

34. Starting on page 3-34, the EIS fails to consider that hatchery fish may prey on or otherwise disturb amphibians. #50

35. Page 3-39: Economic benefit:cost ratios can be tricky. For example, are expenditures for hatchery staff a benefit or a cost (also see page 3-42 and 4-61)? Are the costs of harvest planning, analysis, management forum meetings, harvest staff, etc., included in the costs? These issues are not clear in the EIS, although NMFS does offer a reference. #51

36. Figure 12 page 3-41, Table 9 page 3-42. Is catch or effort the best way to measure benefits of recreational fisheries? What exactly is the relationship between the number of hatchery fish released and catch or effort? If fisheries are managed according to wild-fish impact rates – and most of them are now (see page 5-22 starting at line 21) – what is the benefit of excess hatchery fish (fish left to be caught after fisheries are shut down because wild impacts have been met)? How would the values in Table 9 differ at different hatchery releases? Might all-wild fisheries be more valuable than hatchery fish-dependent fisheries? NMFS does not discuss any of these pertinent points. #52

37. Page 4-3, line 20: Is the diversion of 39% of low stream flow really "negligible"? (also see page 4-7, line 11). Does the diversion point matter (for example, compare a diversion that is low in the basin below most spawning habitat vs at the base of an impassible dam) (also see page 4-8, line 17)? #53

38. Page 4-4: Water outflow from Lost Creek Dam could be managed independently of Cole Rivers Hatchery. #54

39. Table 11, page 4-5 and associated discussion: The analysis surrounding Alternative 4 is troubling throughout. A 50% reduction in production is treated as if it always means a 50% reduction in everything else: water use, water quality, staffing, hatchery risks etc. The actual outcome would depend on how the hatchery facilities are utilized. Regarding water use, perhaps a 50% decrease in production means that fish will be reared at lower densities and the same amount of water used. See also the discussion in section 4.4.4 starting page 4-42. #55

40. Table 12, page 4-15 and 16: What is the rational for the "high", "medium" and "low" conclusions in this table? No discussion is provided of what these qualitative categories mean. What criteria are used to differentiate "high" vs "low"? What are the critical risks considered? There is no rational provided at all. Further, if a wild-hatchery interaction is deemed "high" (or "low") how does that influence the decision to adopt an HGMP, or not? #56

41. Figures 13 – 20 provide contradictory information compared to Figure 5. The Figures 13-20 are a better representation of the likely hatchery-wild interactions but they also fail to depict areas where hatchery fish occur on natural spawning grounds. In addition, there is no indication of hatchery-wild interactions in the near shore or ocean environment. Consequently, these maps greatly underestimate the full spatial extent of hatchery-wild fish interactions. #57

42. There seems to be a serious typo on page 4-23. #58

43. On page 4-23 starting at line 14, Alternative 1 would "… continue to pose short- and long-term risks" to wild populations. Since the action with regard to the substance of the HGMPs (only absent the legal decision to adopt them) is the same for both Alternative 1 and Alternative 2, it appears that NMFS agrees that their preferred alternative (2) would also "… continue to pose short- and long-term risks" to wild populations. Given this, how does NMFS justify a blanket adoption of the HGMPs under Alternative 2, as their preferred alternative (see material starting on page 4-33 line 30). #59

44. Starting on page 4-24 line 10 and continuing through the various species, NMFS provides a very general discussion of the genetic and ecological effects of hatchery programs. Although sometimes misleading (for example, lines 15-16 on page 4-24, where average pHOS is reported), this discussion is generally not inaccurate, although it is also not comprehensive or thorough. However, the EIS never addresses how the HGMPs, the adoption of which is the proposed action, would affect these hatchery #60

risks. Do the proposed actions in the HGMPs lessen these effects? Is there a strategy? What criteria need to be met to show the effects are sufficiently lessened? What is the proposed monitoring to demonstrate that the actions are effective?

45. Page 4-26 line 27: Hatchery steelhead (and coho and yearling Chinook) also prey on chum. #61

46. Page 4-27 starting on line 7: After discussing some of the hatchery effects, NMFS seems to conclude that competition effects are "low" as long as the hatchery fish do not residualize. This conclusion overlooks all of the other potential ecological effects of hatchery fish (see comment number 17). #62

47. Page 4-28, line 31: "locally-derived" should mean from within the local population, not from generally within the ESU. #63

48. Page 4-30 starting at line 22: Up to 1 million hatchery fish, all possible predators on chum, are released into tributaries of Tillamook Bay. What is proposed in the HGMPs to decrease these potential impacts? NMFS does not say. #64

49. Page 4-32 line 25: hatchery fish that are released into mainstem reaches are more likely to stray. NMFS does not consider this event. #65

50. Page 4-34 starting at line 13, and specifically for example line 27 on page 4-35). Previously NMFS acknowledged that the hatcheries pose risks (see page 4-23), and yet here NMFS argues that eliminating all of those risks would provide "little to no benefits". The benefits of eliminating risks are further dismissed on page 4-36 lines 9-10. In contrast, the "risk" to nutrient enrichment of eliminating hatchery fish is strongly emphasized throughout (for example, page 4-36 lines 33-34). #66

51. Page 4-41 starting on line 13, the discussion seems to equate genetic hatchery risks to natural stray rates, disregarding the multitude of genetic hatchery risks that may occur (see comment 17). #67

52. Page 4-44 line 14: if hatchery carcasses are needed for out planting, excess hatchery adult carcasses can be made available from elsewhere in the state. #68

53. Page 4-50, line 27: Predator species might benefit, not would benefit. #69

54. The effects on marine species (for example on page 4-56) fails to consider the full marine range of the salmon and steelhead from the Oregon coast. This seems to be the result of an inappropriate definition of the affected area. For example, see Figure 21, page 4-57: Rather than reporting, as this figure does, which Chinook are caught along the Oregon Coast, NMFS should report where Oregon coastal Chinook are caught. Their conclusions about effects on marine species would likely change. #70

55. Page 4-61 line 8: do the hatchery programs provide the stated socioeconomics benefits, or do the fisheries provide these benefits? NMFS needs to more thoroughly analyze the relationship between hatchery releases and fisheries, particularly where the fisheries are managed according to wild fish impact regulations (see page 5-6 starting at line 7, also page 5-22 starting at line 21). See also page 4-62, effects of terminating hatchery releases and starting on page 4-63, effects of reduced hatchery releases. A better analysis is needed. #71

56. Page 4-63 line 15: the loss of hatchery staff would only occur if entire hatchery facilities were closed. #72

57. Several statements about Environmental Justice effects are an exaggeration, starting on page 4-64: #73

a. Page 4-65 line 8: how many goods and services are actually locally-sourced? Many of them are centrally purchased through headquarters in Salem.

b. Lines 10-11: How many current coastal hatchery employees actually come from a local environmental justice community?

c. Line 18: How many guides are actually from local minority or low-income communities?

58. Page 5-1 line 14: it is unlikely cumulative effects are merely additive. #74

59. Page 5-15, starting at line 3: This discussion assumes several things that may not be true, for example that there are never any water diversions upstream of hatcheries, and that there are no anticipated effects on water quantity due to climate change (compare line 8 with page 5-12 line 31). #75

60. Page 5-23 line 24. There are no bull trout along the Oregon coast. #76

61. Table 15, starting on page 5-28: Again, the criteria for the qualitative "low", "moderate" etc. categories are not presented. #77

We hope that NMFS will address these critical concerns regarding the DEIS. #78

Sincerely,

Matthew R Sloat

Dr. Matthew R. Sloat

Director of Science

Wild Salmon Center

NMFS Responses to Comments from the Wild Salmon Center, letter dated October 25, 2016.

Letter #	Comment #	NMFS Response
12	1	Noted.
12	2	Noted. The FEIS includes a range of alternatives to the proposed action, including several different ways to design hatchery programs. However, the underlying action is for NMFS to accept or reject the HGMPs submitted pursuant to 50 CFR 223.203.
12	3	Noted. NMFS believes evaluating a range of alternatives informs our decision making under NEPA even if the alternative is contrary to NMFS' authority. The no-action alternative is NMFS' best assessment of what would happen in the absence of agency action, which is that programs which have been in existence for some time would remain operational. The Commenter's suggestion about consistency with the ESA will be addressed in the decision documents and the biological opinion; NEPA's mandate is for the agency to disclose impacts to the environment from the proposed action. Finally, an additional alternative has been added to the FEIS which focuses on risk containment.
12	4	Agree. NMFS included an additional alternative in the final EIS that eliminated the highest risk hatchery programs and implemented additional reforms for the remaining programs. The comment suggests an evaluation of each HGMP in the EIS, however this evaluation will occur through the ESA §4(d) process and be documented in NMFS' final decision, along with the biological opinion which will form the basis of those individual decisions.
12	5	Noted. The analyses includes both quantitative and qualitative assessments, depending upon the resource, available data, and metrics being evaluated. The final EIS includes more quantitative measurements of certain factors (e.g., hatchery fish densities) to help clarify our analyses.
12	6	Noted.
12	7	Noted. It is often speculative to say how much water use would be reduced when a program is reduced. However, the range of alternatives show the impacts to water quantity and water quality themselves range from status quo to complete elimination. Therefore, NMFS' review of impacts is best served by making probable assumptions about changes in impacts that fall within the range of impacts assessed in an alternative which itself proposes a partial reduction in the action. Where more information is available about the likely changes in water use for each alternative, those were included.
12	8	Noted. The figures do not report false information. The intent is to show different aspects of a complex hatchery situation throughout the entire Oregon Coast region, showing the location of the hatcheries, locations where hatchery fish are released, and the numbers of hatchery fish released. All of this information cannot be shown in one figure.

12	9	Noted. The best management practices described in the EIS are ways the HGMPs help reduce impacts on natural salmon and steelhead. An additional Alternative 5 was included in the final EIS that specifically evaluates the termination of the highest risk hatchery programs to natural salmon and steelhead to address this comment.
12	10	Disagree. There is no averaging of effects across the Oregon Coast region. All of the hatchery programs are evaluated at the population level. Some of the analyses is then reconsidered at the ESU level to disclose threats to listed species at the species level. For example the percent of habitat affected by hatchery fish releases.
12	11	Noted. Changes made to final EIS to quantify the low, medium, and high impacts based upon densities of hatchery fish in freshwater and estuarine habitats. Comparatively low densities were equated to low impact, etc.
12	12	Noted.
12	13	The comment is confusing, because approving the HGMPs is the proposed action, so if the FEIS has analyzed the effects of the proposed action, then it necessarily has analyzed the effects of the HGMPs. Additional information is found in the HGMPs themselves concerning applicable goals, standards and criteria.
12	14	Noted. The cumulative effects chapter 5 describes previous land and hatchery management. See response 12-13 for the history of hatchery management.
12	15	Noted.
12	16	Noted.
12	17	Noted.
12	18	Noted. The analysis of effects (Chapter 4) provides the assessment of biological risks of hatchery programs. Page 1-9 is intended to be a summary.
12	19	Noted. A biological opinion will be prepared prior to any decision.
12	20	Noted. NEPA requires agencies to disclose the impacts of the action. The HGMPs themselves are required to prepare plans to minimize risks. The extent to which this was done is analyzed in the ESA §4(d) determination. To the extent a NEPA document responds to potential risks of environmental impacts, it is through the preparation and analysis of a range of alternatives that demonstrate the relative risk in a variety of potential actions.
12	21	Noted. This task is performed by the preparation of a biological opinion and 4(d) determination.
12	22	Noted. These actions are best management practices that reduce effects in general. More specific analysis is found in Chapter 5.
12	23	Noted. The analysis of the alternative that proposes the termination of all hatchery programs describes the effects on ESA-listed coho salmon.
12	24	Noted.
12	25	Noted.
12	26	Noted.

12	27	Noted. The purpose of NEPA is to disclose impacts to the environment. The legal standing of various actions does not result in environmental impacts. There is no requirement for an EIS to include documentation of an applicant's standing with respect to any applicable permits.
12	28	The EIS discusses impacts to water quality of the proposed action, as required by NEPA. Criteria or standards for NPDES permits are set by the applicable authority under the Clean Water Act. Questions as to how statutory or regulatory requirements apply here should be directed to the Oregon Department of Environmental Quality, which administers the Clean Water Act program for Oregon.
12	29	Noted. NMFS analyses show the likely effects from different size hatchery fish on natural salmon and steelhead in sections 3.4 and 4.4 of the final EIS.
12	30	Noted. See the legend on Figure 5 for explanation.
12	31	Our NEPA analysis shows the socioeconomic and biological effects of the different alternatives. That includes fishing for hatchery and wild salmon and steelhead under the different alternatives. NEPA requires consideration of all environmental impacts, not just impacts to wild salmonids, though of course that is an important issue regarding hatcheries in general.
12	32	Noted. The EIS discloses these particular impacts in sections 3.4 and 4.4.
12	33	Noted. See response 12-32. These effects are evaluated in sections 3.4 and 4.4 of the final EIS.
12	34	Noted. Hatchery fish carcasses decomposing in the wild provide nutrient benefits similar to wild fish. The primary ecosystem benefit from salmon carcasses are the addition of marine-derived nutrients, and hatchery fish See peer reviewed literature on marine-derived nutrients from salmon (e.g. Quinn 2005).
12	35	Noted.
12	36	Noted.
12	37	Noted.
12	38	Noted. The status of a population depends upon four VSP factors. When available, our assessment tried to report overall health and not just abundance.
12	39	Noted.
12	40	Noted. ODFW's CMP and HGMPs provide the management actions to be taken to get into compliance with their management goals.
12	41	Noted. Our analysis concludes that interaction of hatchery fish with chum salmon along the Oregon Coast region is very limited.
12	42	ODFW's CMP provides an analysis of the current status of salmon and steelhead populations in the Oregon Coast ESU/DPS. There are some limitations of the available datasets for the Oregon Coast region, but the CMP provides the latest status assessment for these stocks.
12	43	Noted.

12	44	Noted. Disagree the assessment describes ecological interactions in sections 3.5 and 4.5 of the final EIS.
12	45	Noted.
12	46	Noted. Lamprey can interact with salmon and steelhead on the spawning grounds (particularly winter winter) due to overlap in spawn timing and area.
12	47	Noted. Disagree. The EIS considers both how hatchery fish provide benefits to many non-native fish species as well as how the proposed action impacts native species.
12	48	Noted. Murrelet and hatchery fish can consume the same prey items in the ocean, and thus can interact. The potential interactions are disclosed in sections 3.6 and 4.7.
12	49	Noted.
12	50	Noted.
12	51	Noted. NMFS relied upon the methods used in the reports cited. See cited reports for details.
12	52	Noted. The socioeconomic studies reported in the EIS base the benefits of the hatchery programs from fishing effort and not catch. Of course, more effort will occur if catch increases in most cases, thus leading to higher economic benefits. The studies reported were based upon the existing hatchery programs and recent release numbers. The changes to socioeconomics are evaluated for the range of alternatives in the final EIS.
12	53	Noted. See explanation in the text of the different risks the diversions have along the Oregon Coast with respect to protecting the natural environment. Each diversion has unique set of risks.
12	54	Noted. Agree.
12	55	Noted. See response 12-7.
12	56	Noted. See response 12-11.
12	57	Noted. The maps show the interaction areas of hatchery and wild fish in freshwater to the ocean.
12	58	Noted. Corrected.
12	59	Noted. The Commenter appears to ask how there can be a proposed action that contains risks, and the answer is that the proposed action is defined by the applicant and the underlying HGMPs. NMFS' authority in reviewing HGMPs is to determine whether or not they meet the standards for an exemption from the take prohibitions in §9. This is a required regulatory determination, and the proposed action/preferred alternative reflects this. There are additional alternatives that examine reduced or eliminated risks to natural salmonid populations.
12	60	Noted. New information was added to the FEIS on ODFW's CMP goals for each hatchery program and pHOS, pNOB, and PNI metrics for each population where a hatchery program occurs. Analysis of the proposed action/preferred alternative is analysis of the HGMPs, since their acceptance is the proposed action.
12	61	Noted.

12	62	Noted. Many of the ecological effects in these particular circumstances of hatchery fish on wild salmon and steelhead are low. See sections 3.4 and 4.4 of the final EIS for ecological impacts.
12	63	Noted. Agree.
12	64	Noted. The EIS describes the interaction effects on chum salmon. For more details on how the program operates, see the HGMPs.
12	65	Noted. Disagree. It depends on the specifics of the program. Many releases in the mainstem are associated with unique water sources to maintain homing fidelity.
12	66	Noted. The purpose of the EIS is to disclose the effects of the different alternatives on affected resources. We believe our analyses provides an objective assessment of impacts, without bias towards the status quo hatchery programs.
12	67	Noted. pHOS is the surrogate measure of genetic risk, not stray rate. pHOS is a measure of the proportion of spawning fish that are hatchery origin. Stray rate can mean a variety of things, including stray of hatchery fish to adjacent populations, the percentage of hatchery fish that do not return to the hatchery and thus "stray". We use pHOS metrics in our analyses and the benefits of eliminating hatchery programs are accurately captured in the effects of Alternative 3.
12	68	Noted.
12	69	Noted.
12	70	Noted. The affected environment is defined by the area where impacts of the preferred alternative and other alternatives can be meaningfully detected. Since the core marine area for Oregon Coast hatchery fish is the Oregon Coast, our analysis focused on this marine area.
12	71	Noted. See the economic studies for more information on methods used to calculate benefits.
12	72	Noted.
12	73	Noted. NMFS used the best available information to decipher environmental justice impacts that would arise from the proposed action and alternatives.
12	74	Noted.
12	75	Noted. The text speaks for itself. None are known.
12	76	Noted.
12	77	Noted. Edits made.
12	78	Noted.