Science, Service, Stewardship

2016 5-Year Review: Summary & Evaluation of Oregon Coast Coho Salmon

National Marine Fisheries Service
West Coast Region
Portland, OR

This page intentionally left blank

5-Year Review: Oregon Coast Species

Species Reviewed	Evolutionarily Significant Unit or Distinct Population Segment
Coho Salmon (*Oncorhynchus kisutch*)	*Oregon Coast Coho Salmon*

This page intentionally left blank

Table of Contents

This page intentionally left blank

Contributors
West Coast Region
(alphabetical)

Annie Birnie
1201 NE Lloyd Blvd, Suite 1100
Portland, OR 97232
503-230-5407
Annie.Birnie@noaa.gov

Nora Berwick
1201 NE Lloyd Blvd, Suite 1100
Portland, OR 97232
503-231-6887
Nora.Berwick@noaa.gov

Mitch Dennis
510 Desmond Drive SE, Suite 103
Lacey, WA 98503-1263
360-753-9580
Mitch.Dennis@noaa.gov

Shanna Dunn
1201 NE Lloyd Blvd, Suite 1100
Portland, OR 97232
503-231-2315
Shanna.Dunn@noaa.gov

Keith Kirkendall
1201 NE Lloyd Blvd, Suite 1100
Portland, OR 97232
503-230-5431
Keith.Kirkendall@noaa.gov

Lance Kruzic
2900 Stewart Parkway Northwest
Roseburg, OR 97471
541-957-3381
Lance.Kruzic@noaa.gov

Jeff Lockwood
1201 NE Lloyd Blvd, Suite 1100
Portland, OR 97232
503-231-2249
Jeffrey.Lockwood@noaa.gov

Michelle McMullin
2900 Steward Parkway Northwest
Roseburg, OR 97471
541-957-3378
Michelle.McMillin@noaa.gov

Jim B. Muck
2900 Stewart Parkway Northwest
Roseburg, OR 97471
541-957-3394
Jim.B.Muck@noaa.gov

Ken Phippen
2900 Stewart Parkway Northwest
Roseburg, OR 97471
541-957-3394
Ken.Phippen@noaa.gov

Scott Rumsey, PhD
1201 NE Lloyd Blvd, Suite 1100
Portland, OR 97232
503-872-2791
Scott.Rumsey@noaa.gov

Rob Walton
1201 NE Lloyd Blvd, Suite 1100
Portland, OR 97232
503-231-2285
Rob.Walton@noaa.gov

Chuck Wheeler
2900 Stewart Parkway Northwest
Roseburg, OR 97471
541-957-3379
Chuck.Wheeler@noaa.gov

Jeff Young
2900 Steward Parkway Northwest
Roseburg, OR 97471
541-957-3389
Jeff.Young@noaa.gov

Northwest Fisheries Science Center (alphabetical)

Chris Jordan
200 SW 35th Street
Corvallis, Oregon 97333
541-754-4629
Chris.Jordan@noaa.gov

Pete Lawson
2032 S.E. OSU Drive
Newport, OR 97365-5275
541-867-0430
Peter.W.Lawson@noaa.gov

Thomas Wainwright
2032 S.E. OSU Drive
Newport, OR, 97365-5275
Thomas.Wainwright@noaa.gov

Laurie Weitkamp
2032 S.E. OSU Drive
Newport, OR 97365-5275
541-867-0504
Laurie.Weitkamp@noaa.gov

Southwest Fisheries Science Center (alphabetical)

Nate Mantua
110 Shaffer Road
Santa Cruz, CA 95060
831-420-3923
Nate.Mantua@noaa.gov

This page intentionally left blank

1 · General Information

1.1 Introduction

Many West Coast salmon and steelhead (*Oncorhynchus* sp.) stocks have declined substantially from their historic numbers and now are at a fraction of their historical abundance. There are several factors that contribute to these declines, including: overfishing, loss of freshwater and estuarine habitat, hydropower development, poor ocean conditions, and hatchery practices. These factors collectively led to the National Marine Fisheries Service's (NMFS) listing of 28 salmon and steelhead stocks in California, Idaho, Oregon, and Washington under the Federal Endangered Species Act (ESA).

The ESA, under section 4(c)(2), directs the Secretary of Commerce to review the listing classification of threatened and endangered species at least once every five years. After completing this review, the Secretary must determine if any species should be: (1) removed from the list; (2) have its status changed from threatened to endangered; or (3) have its status changed from endangered to threatened. This document describes the results of the agency's five-year status review for ESA-listed Oregon Coast coho salmon.

1.1.1 Background on listing determinations

The ESA defines species to include subspecies and distinct population segments (DPS) of vertebrate species. A species may be listed as threatened or endangered. To identify distinct population segments of salmon species we apply the "Policy on Applying the Definition of Species under the ESA to Pacific Salmon" (56 FR 58612). Under this policy we identify population groups that are "evolutionarily significant units" (ESU) within their species. We consider a group of populations to be an ESU if it is substantially reproductively isolated from other populations, and represents an important component in the evolutionary legacy of the biological species. We consider an ESU as constituting a DPS and therefore a "species" under the ESA.

Artificial propagation programs (hatcheries) are common throughout the range of ESA-listed West Coast salmon and steelhead. Prior to 2005, our policy was to include in the listed ESU or DPS only those hatchery fish deemed "essential for conservation" of the species. We revised that approach in response to a court decision and on June 28, 2005, announced a final policy addressing the role of artificially propagated Pacific salmon and steelhead in listing determinations under the ESA (70 FR 37204) (hatchery listing policy). This policy establishes criteria for including hatchery stocks in ESUs and DPSs. In addition, it (1) provides direction for considering hatchery fish in extinction risk assessments of ESUs and DPSs; (2) requires that hatchery fish determined to be part of an ESU or DPS be included in any listing of the ESU or DPS; (3) affirms our commitment to conserving natural salmon and steelhead populations and the ecosystems upon which they depend; and (4) affirms our commitment to fulfilling trust and

treaty obligations with regard to the harvest of some Pacific salmon and steelhead populations, consistent with the conservation and recovery of listed salmon ESUs and steelhead DPSs.

To determine whether a hatchery program is part of an ESU or DPS, and therefore must be included in the listing, we consider the origins of the hatchery stock, where the hatchery fish are released, and the extent to which the hatchery stock has diverged genetically from the donor stock. We include within the ESU or DPS (and therefore within the listing) hatchery fish that are no more than moderately diverged from the local population.

Because the new hatchery listing policy changed the way we considered hatchery fish in ESA listing determinations, we completed new status reviews and ESA listing determinations for West Coast salmon ESUs on June 28, 2005 (70 FR 37160), and for steelhead DPSs on January 5, 2006 (71 FR 834). On June 20, 2011, we confirmed the threatened status of Oregon Coast coho salmon ESU after conducting a status review upon the species (76 FR 35755; Stout et al. 2012).

1.2 Methodology used to complete the review

On February 6, 2015, we announced the initiation of five year reviews for 17 ESUs of salmon and 11 DPSs of steelhead in Oregon, California, Idaho, and Washington (80 FR 6695). We requested that the public submit new information on these species that has become available since our original listing determinations or since the species' status was last updated. In response to our request, we received information from Federal and state agencies, Native American Tribes, conservation groups, fishing groups, and individuals. We considered this information, as well as information routinely collected by our agency, to complete these five year reviews.

To complete the reviews, we first asked scientists from our Northwest and Southwest Fisheries Science Centers to collect and analyze new information about ESU and DPS viability. To evaluate viability, our scientists used the Viable Salmonid Population (VSP) concept developed by McElhany et al. (2000). The VSP concept evaluates four criteria – abundance, productivity, spatial structure, and diversity – to assess species viability. Through the application of this concept, the science center considered new information for a given ESU or DPS relative to the four salmon and steelhead population viability criteria. They also considered new information on ESU and DPS composition. At the end of this process, the science team prepared reports detailing the results of their analyses (NWFSC 2015).

To further inform the reviews, we also asked salmon management biologists from our West Coast Region familiar with hatchery programs to consider new information available since the previous listing determinations. Among other things, they considered whether any hatchery programs have ended or new hatchery programs have started, any changes in the operation of existing programs, and scientific data relevant to the degree of divergence of hatchery fish from naturally spawning fish in the same area. They produced a report (Jones 2015) describing their findings. Finally, we consulted salmon management biologists from the West Coast Region who are familiar with hatchery programs, habitat conditions, hydropower operations, and harvest management. In a series of structured meetings, by geographic area, these biologists identified

relevant information and provided their insights on the degree to which circumstances have changed for each listed entity.

In preparing this report, we considered the best available scientific information, including the work of the Northwest Fisheries Science Center (NWFSC 2015); the report of the regional biologists regarding hatchery programs (Jones 2015); recovery plans for the species in question; technical reports prepared in support of recovery plans for the species in question; the listing record (including designation of critical habitat and adoption of protective regulations); recent biological opinions issued for Oregon Coast salmon; information submitted by the public and other government agencies; and the information and views provided by the geographically based management teams. The present report describes the agency's findings based on all of the information considered.

1.3 Background – Summary of Previous Reviews, Statutory and Regulatory Actions, and Recovery Planning

1.3.1 Federal Register Notice announcing initiation of this review

80 FR 6695; February 6, 2015

1.3.2 Listing history

In 1998, NMFS listed Oregon Coast (OC) coho salmon under the ESA as a threatened species (Table 1). In 2001, the *Alsea Valley Alliance v. Evans* U.S. District Court decision set aside the ESA listing. NMFS continued to include the OC coho salmon in its status reviews and proposed the ESU for threatened status in 2004. In 2006, NMFS decided that listing OC coho salmon was not warranted. In 2008, NMFS listed the OC coho salmon as threatened after its decision to not list the ESU was invalidated in U.S. District Court (*Trout Unlimited v. Lohn*). In 2011, the threatened status was retained and superseded by the new listing.

Table 1. Summary of the listing history under the Endangered Species Act for the Oregon Coast coho salmon ESU.

Salmonid Species	ESU/DPS Name	Original Listing	Revised Listing(s)
Coho Salmon (*O. kisutch*)	Oregon Coast coho salmon	**FR Notice:** 63 FR 42587 **Date:** 8/10/1998 **Classification:** Threatened	**FR Notice:** 69 FR 33102 **Date:** 6/14/2004 **Classification:** Proposed Listing **FR Notice:** 71 FR 3033 **Date:** 1/19/2006 **Classification:** Not warranted **FR Notice:** 73 FR 7816 **Date:** 2/11/2008 **Classification:** Threatened (court decision) **FR Notice:** 76 FR 35755 **Date:** 6/20/2011 **Classification:** Threatened

1.3.3 Associated rulemakings

The ESA requires NMFS to designate critical habitat, to the maximum extent prudent and determinable, for species it lists under the ESA. Critical habitat is defined as: (1) specific areas within the geographical area occupied by the species at the time of listing, if they contain physical or biological features essential to conservation, and those features may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species at the time of listing if the agency determines that the area itself is essential for conservation. We designated critical habitat for OC coho salmon in 2008 (Table 2). Section 9 of the ESA prohibits the take of species listed as endangered. The ESA defines take to mean harass, harm, pursue, hunt, shoot, wound, trap, capture, or collect, or attempt to engage in any such conduct. For threatened species, the ESA does not automatically prohibit take, but instead authorizes the agency to adopt regulations it deems necessary and advisable for species conservation including regulations that prohibit take (ESA section 4(d)). In 2000, NMFS adopted 4(d) regulations for threatened salmonids that prohibit take except in specific circumstances. In 2005, we revised our 4(d) regulations for consistency between ESUs and DPSs, and, to take into account our hatchery listing policy. These revised regulations were adopted when OC coho salmon were re-listed in 2008.

Table 2. Summary of rulemaking for 4(d) protective regulations and critical habitat for the Oregon Coast coho salmon ESU.

Salmonid Species	ESU Name	4(d) Protective Regulations	Critical Habitat Designations
Coho Salmon (*O. kisutch*)	Oregon Coast coho salmon	**FR notice:** 65 FR 42422 **Date:** 7/10/2000 **Revised:** 6/28/2005 (70 FR 37160)	**FR Notice:** 65 FR 7764 **Date:** 2/16/2000 **Type:** Final **FR Notice:** 73 FR 7816 **Date:** 2/11/2008 **Type:** Final

1.3.4 Review History

Table 3 lists the numerous scientific assessments of the status of OC coho salmon. These assessments include status reviews conducted by our Northwest Fisheries Science Center and technical reports prepared in support of recovery planning for this species.

Table 3. Summary of previous scientific assessments for the Oregon Coast coho salmon ESU.

Salmonid Species	ESU Name	Document Citation
Coho Salmon (*O. kisutch*)	Oregon Coast coho salmon	NWFSC 2015 Stout et al. 2012 Wainwright et al. 2008 Lawson et al. 2007 Good et al. 2005 NMFS 1997 Weitkamp et al. 1995

1.3.5 Species' Recovery Priority Number at Start of 5-year Review Process

On June 15, 1990, NMFS issued guidelines (55 FR 24296) for assigning listing and recovery priorities. For recovery plan development, implementation, and resource allocation, we assess three criteria to determine a species' recovery priority number from 1 (high) to 12 (low): (1) magnitude of threat; (2) recovery potential; and (3) conflict with development projects or other economic activity (NMFS 2009). Table 4 lists the recovery priority numbers for the subject species, as reported in NMFS 2015a.

1.3.6 Recovery Plan or Outline

Table 4. Recovery Priority Number and Endangered Species Act Recovery Plans for the Oregon Coast coho salmon ESU.

Salmonid Species	ESU Name	Recovery Priority Number	Recovery Plans/Outline
Coho Salmon (*O. kisutch*)	Oregon Coast coho Salmon	**9**	**Title:** Proposed ESA Recovery Plan for Oregon Coast Coho Salmon (*Oncorhynchus kisutch*) Available at: http://www.westcoast.fisheries.noaa.gov/protected_species/salmon_steelhead/recovery_planning_and_implementation/oregon_coast/oregon_coast_recovery_plan.html **FR Notice:** 80 FR 61379 **Date:** 10/13/2015 **Type:** Notice of Intent; request for comments

This page intentionally left blank

2 · Review Analysis

In this section, we review new information to determine whether species' delineations remain appropriate.

2.1 Delineation of species under the Endangered Species Act

Is the species under review a vertebrate?

ESU Name	YES	NO
Oregon Coast coho salmon	X	

Is the species under review listed as an ESU/DPS?

ESU Name	YES	NO
Oregon Coast coho salmon	X	

Was the ESU/DPS listed prior to 1996?

ESU Name	YES	NO	Date Listed if Prior to 1996
Oregon Coast coho salmon		X	N/A

Prior to this 5-year review, was the ESU/DPS classification reviewed to ensure it meets the 1996 DPS policy standards?

In 1991, NMFS issued a policy on how the agency would delineate DPSs of Pacific salmon for listing consideration under the Endangered Species Act (ESA) (56 FR 58612). Under this policy a group of Pacific salmon populations is considered an ESU if it is substantially reproductively isolated from other con-specific populations, and it represents an important component in the evolutionary legacy of the biological species. The 1996 joint NMFS-Fish and Wildlife Service (FWS) DPS policy (61 FR 4722) affirmed that a stock (or stocks) of Pacific salmon is considered a DPS if it represents an ESU of a biological species.

2.1.1 Summary of relevant new information regarding the delineation of the Oregon Coast coho salmon ESU.

ESU Composition

This section provides a summary of information presented in NWFSC 2015: Status review update for Pacific salmon and steelhead listed under the Endangered Species Act: Pacific Northwest.

We found no new information that would justify a change in the composition of the OC coho salmon ESU (NWFSC 2015).

Membership of Hatchery Programs

In preparing this report, our management biologists reviewed the available information regarding hatchery membership of this ESU and DPS (Jones 2015). They considered changes in hatchery programs that occurred since the last status review (e.g., some have been terminated while others are new) and made recommendations about the inclusion or exclusion of specific programs. They also noted any errors and omissions in the existing descriptions of hatchery population membership. NMFS intends to address any needed changes and corrections via separate rulemaking subsequent to the completion of these five-year status reviews.

The OC coho salmon ESU includes all naturally spawned coho salmon originating from coastal rivers south of the Columbia River and north of Cape Blanco. Also, coho salmon from one artificial propagation program: the Cow Creek Hatchery Program [Oregon Department of Fish and Wildlife (ODFW) Stock #18] (79 FR 20802). We have determined that these artificially propagated stocks are no more divergent relative to the local natural population(s) than what would be expected between closely related natural populations within the ESU (70 FR 37160). Jones (2015) did not recommend any further review of the existing programs identified as part of the OC coho salmon ESU.

2.2 Recovery Criteria

The ESA requires recovery plans be developed for each listed species. Recovery plans must contain, to the maximum extent practicable, objective measureable criteria for delisting the species, site-specific management actions necessary to recover the species, and time and cost estimates for implementing the recovery plan.

2.2.1 Does the species have a final, approved recovery plan containing objective, measurable criteria?

ESU/DPS Name	YES	NO
Oregon Coast coho salmon		X

2.2.2 Adequacy of recovery criteria

Based on new information considered during this review, are the recovery criteria still appropriate?

ESU/DPS Name	YES	NO
Oregon Coast coho salmon	N/A	N/A

Are all of the listing factors that are relevant to the species addressed in the recovery criteria?

ESU/DPS Name	YES	NO
Oregon Coast coho salmon	N/A	N/A

2.2.3 List the biological recovery criteria as they appear in the recovery plan

For the purposes of reproduction, salmon and steelhead typically exhibit a metapopulation structure (Schtickzelle and Quinn 2007, McElhany et al. 2000). Rather than interbreeding as one large aggregation, ESUs and DPSs function as a group of demographically independent populations separated by areas of unsuitable spawning habitat. For conservation and management purposes, it is important to identify the independent populations that make up an ESU or DPS. For recovery planning and development of recovery criteria, the Oregon and Northern California Coasts Technical Recovery Team (ONCC TRT) developed biological recovery criteria for OC coho salmon (NMFS 2015b). Because populations from rivers that are close together tend to be similar, the ONCC TRT identified five groupings of similar populations, termed "strata." The ONCC TRT determined the status of each individual stratum based on the status of its member populations, and then combined the status of the five strata to determine the status of the ESU. The ONCC TRT developed two principle goals within the biological recovery criteria: (1) most (more than half) of the independent populations in each stratum had to be sustainable and (2) all five strata had to be sustainable for the whole ESU to be sustainable (NMFS 2015b).

The OC coho salmon ESU includes all naturally spawned coho salmon originating from coastal rivers south of the Columbia River and north of Cape Blanco. Also, coho salmon from one artificial propagation program: the Cow Creek Hatchery Program (ODFW Stock #18) (79 FR 20802; Figure 1). Overall, the ESU is composed of 55 populations distributed among five strata: North Coast (13 populations), Mid-Coast (29 populations), Mid-South Coast (6 populations), Lake (3 populations), and Umpqua (4 populations). For the North Coast stratum, the recovery strategy aims to protect freshwater and estuarine reaches that currently contain high quality habitat, and restore reaches with potential for additional high quality habitat. For the Mid-Coast stratum, the recovery strategy is to protect current high quality summer and winter rearing habitat (including estuarine habitat) and strategically restore habitat quality in adjacent habitat for rearing and spawning (Beaver population). For the Mid-South Coast stratum, the recovery strategy aims to protect freshwater and estuarine reaches that currently contain high quality habitat, and restore reaches with potential for additional high quality habitat. For the Lake stratum, the recovery strategy is to greatly reduce summer predation rates by non-indigenous fish species. For the Umpqua stratum, the recovery strategy is to protect current high quality summer and winter rearing habitat and strategically restore habitat quality in adjacent habitat (NMFS 2015b).

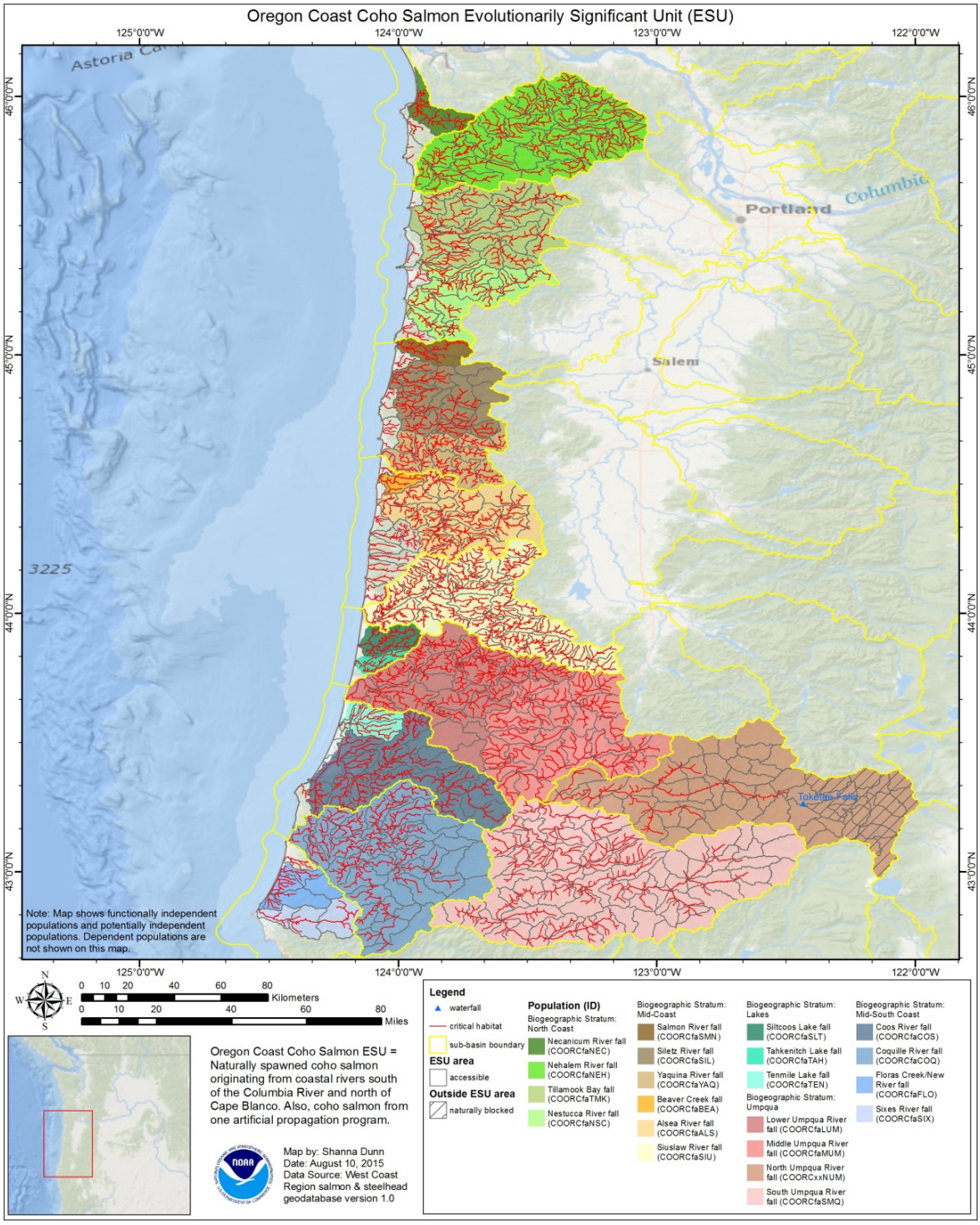

Figure 1. Oregon Coast coho salmon ESU population structure[1]

[1] The map above generally shows the accessible and historically accessible areas for the Oregon Coast coho salmon ESU. The area displayed is consistent with the regulatory description of the composition of the Oregon Coast coho salmon found at 50 CFR17.11, 223.102, and 224.102. Actions outside the boundaries shown can affect this ESU. Therefore, these boundaries do not delimit the entire area that could warrant consideration in recovery planning or determining if an action may affect this ESU for the purposes of the ESA.

2.3 Updated Information and Current Species' Status

In addition to recommending biological recovery criteria, the Northwest Science Center also assessed the current status of each population of the OC coho salmon ESU (NWFSC 2015). Each population was rated against the biological criteria identified in previous assessments.

2.3.1 Analysis of Viable Salmonid Population (VSP) Status

Information provided in this section is summarized from NWFSC (2015)—Status review update for Pacific salmon and steelhead listed under the Endangered Species Act: Pacific Northwest.

Updated Biological Risk Summary

Many positive improvements to OC coho salmon are described by ODFW (2015), including positive long-term abundance trends and escapement. Increases in ESU scores for persistence and sustainability also clearly indicate the biological status of the ESU is improving, due in large part to management decisions (reduced harvest and hatchery releases) and favorable environmental variation (i.e., high marine survival). However, as Lawson (1993) stated over two decades ago, "The true measure of success for such [stream restoration] projects is the continued survival of the population through subsequent episodes of low abundance" (Lawson 1993, p. 6), when discussing cycles in ocean productivity, habitat restoration, and the productivity of OC coho salmon. Lawson (1993) cautioned that variation in ocean productivity can mask the true benefits of stream restoration projects; increased abundances are incorrectly attributed to stream restoration when the increases resulted from high marine survival. Consequently, it is only when marine survival is low that it becomes apparent whether habitat quality and quantity are sufficient to support self-sustaining populations. With marine survival rates expected to decrease for OC coho salmon entering the ocean in 2014 (Peterson et al. 2014a and b), 2015, and 2016, it may be advisable to wait to observe how populations fare during this potential downturn before deciding to change their status (NWFSC 2015).

2.3.2 Five-Factor Analysis

Section 4(a)(1)(b) of the ESA directs us to determine whether any species is threatened or endangered because of any of the following factors: (A) the present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; or (E) other natural or human-made factors affecting its continued existence. Section 4(b)(1)(A) requires us to make listing determinations after conducting a review of the status of the species and taking into account efforts to protect such species. Below we discuss new information relating to each of the five factors as well as efforts being made to protect the species.

Listing Factor A: Present or threatened destruction, modification or curtailment of its habitat or range

Current Status and Trends in Habitat

Below, we summarize information for the four 'River' Strata (North Coast, Mid-Coast, Umpqua, and Mid-South Coast) and the Lakes Stratum on the **current status and trends in habitat** conditions since the 2012 status review (Stout et al. 2012). We specifically address: (1) the **key emergent or ongoing habitat concerns** (threats or limiting factors) focusing on the top concerns that potentially have the biggest impact on viability (NMFS 2015b); (2) **specific geographic areas of concern** about this ESU where habitat condition concerns remain (NMFS 2015b); (3) **key protective measures and major restoration actions** leading toward achieving the recovery plan viability criteria established by the NMFS Science Centers as efforts that substantially address a key concern noted above, or that represent a noteworthy conservation strategy; (4) **key regulatory measures** that are inadequate and contributing substantially to the key concerns summarized above; and (5) **recommended future actions**, including: key near-term restoration actions that would address the key concerns summarized above; projects to address monitoring and research gaps; fixes or initiatives to address inadequate regulatory mechanisms, and highlighting priority habitat areas that should be prioritized when sequencing restoration actions (NMFS 2015b).

North Coast Stratum

1) Key Emergent or Ongoing Habitat Concerns

The primary limiting factor is stream habitat complexity (all populations), and the secondary limiting factor is water quality (for Nehalem and Tillamook populations). The continuing loss of beavers whose damming activities improve coho salmon rearing habitat, primary productivity, nutrient retention/cycling, floodplain connectivity, and stream flow moderation remains an ongoing habitat concern (Reeves et al. 1989; Stout et al. 2012).

2) Specific Geographic Areas of Concern

- Low gradient valley bottomlands (agriculture lands)
- Riparian forests (timber lands)
- Estuaries

3) Key Protective Measures and Major Restoration Actions

Numerous restoration efforts associated with the implementation of the Oregon Plan for Salmon and Watersheds and the Oregon Coast Coho Conservation Plan (OCCCP) (ODFW 2007) have been funded by the Pacific Coast Salmon Restoration Fund (PCSRF)/Oregon Watershed Enhancement Board (OWEB), the National Oceanic and Atmospheric Administration (NOAA) Restoration Center, Federal Emergency Management Agency (FEMA) and others. The Southern Flow Corridor (Tillamook) and Winter Lake (Coquille Valley Wildlife Area) projects are noteworthy for their size and potential restorative value. Examples of types of projects include

large wood placement, riparian plantings, and culvert replacements implemented through the watershed councils with OWEB grants and partners (match dollars) (ODFW 2013).

4) Key Regulatory Measures

Various federal, state, county and tribal regulatory mechanisms are in place to reduce habitat degradation caused by human use and development. Many of these mechanisms have been improved and updated in the past five years, however, land use regulations which affect habitat remain a significant concern, and the implementation and effectiveness of regulatory mechanisms has not been adequately documented. See Listing Factor D: Adequacy & Inadequacy of Regulatory Mechanisms, and Protective Efforts in this document for details.

5) Recommended Future Actions

- Implement the strategies and actions in the 2015 Proposed OC Coho Salmon Recovery Plan (NMFS 2015b) and the OCCCP (ODFW 2007). The basic recovery strategy for the North Coast Stratum is to protect freshwater and estuarine reaches that currently contain high quality habitat and restore reaches with potential for additional high quality habitat.
- Increase the amount and quality of winter rearing habitat by improving stream and estuarine habitat complexity -- increase amounts of large wood and pool habitat, and to connect side channels, wetlands, and other off-channel areas.
- Improve water quality, especially by reducing summer water temperatures and agricultural runoff in the Tillamook population area.
- Systematically review and quantitatively analyze the amount of habitat addressed versus the priority watershed reaches targeted for protection and restoration activities in the Proposed OC Coho Salmon Recovery Plan (NMFS 2015b) in order to track progress against plan objectives.

Mid-Coast Stratum

1) Key Emergent or Ongoing Habitat Concerns

The primary limiting factors are stream complexity (Salmon, Siletz, Yaquina, Alsea and Siuslaw populations) and spawning gravel (Beaver population). The secondary limiting factors are stream complexity (Beaver population) and water quality (Salmon, Siletz, Yaquina, Alsea, and Siuslaw populations). The continuing loss of beavers whose damming activities improve coho salmon rearing habitat, primary productivity, nutrient retention/cycling, floodplain connectivity, and stream flow moderation remains an ongoing habitat concern, as does fish passage and access in the Yaquina, Alsea, and Siuslaw rivers and Beaver Creek estuaries (Reeves et al. 1989; Stout et al. 2012).

2) Specific Geographic Areas of Concern

- Private timber lands
- Low gradient valley bottomlands (agriculture lands)

- Riparian forests
- Federal lands
- Estuaries - Siletz, Yaquina, Alsea, and Siuslaw River estuaries

3) Key Protective Measures and Major Restoration Actions

Numerous acquisition and restoration efforts associated with the implementation of the Oregon Plan for Salmon and Watersheds and OCCCP (ODFW 2007) have been funded by PCSRF/OWEB, the NOAA Restoration Center, and others. Local councils, districts, and other organizations and landowners have implemented these efforts. Examples of types of projects include large wood placement, floodplain connectivity, road upgrades, riparian plantings, and culvert replacements implemented through the watershed councils with OWEB grants and partners (match dollars) (ODFW 2013).

4) Key Regulatory Measures

Various federal, state, county and tribal regulatory mechanisms are in place to reduce habitat degradation caused by human use and development. Many of these mechanisms have been improved and updated in the past five years, however, land use regulations which affect habitat remain a significant concern, and the implementation and effectiveness of regulatory mechanisms has not been adequately documented. See Listing Factor D: Adequacy & Inadequacy of Regulatory Mechanisms, and Protective Efforts in this document for details.

5) Recommended Future Actions

- Implement the primary recovery strategy for the populations in this stratum to protect current high quality summer and winter rearing habitat (including estuarine habitat) and strategically restore habitat quality in adjacent habitat for rearing and spawning (Beaver population).
- Restore ecological processes to improve water quality (temperature and dissolved oxygen), instream habitat/channel complexity, and spawning gravel conditions (Beaver population) by protecting from adverse timber management and agricultural practices, urbanization, and beaver control.
- Develop and implement a beaver conservation plan to reduce lethal control, improve public education and acceptance of beavers, and develop non-lethal management practices that provide a long-term ecological need to address winter and summer rearing habitat.
- Increase access to lowland habitats (i.e., side-channels, alcoves, and floodplains) to improve high flow refugia, estuarine productivity, and life-history diversity in the lower basins for outmigrating smolts from the upstream basin reaches.
- Systematically review and quantitatively analyze the amount of habitat addressed versus the priority watershed reaches targeted for protection and restoration activities in the Proposed OC Coho Salmon Recovery Plan (NMFS 2015b) in order to track progress against plan objectives.

Umpqua Stratum

1) Key Emergent or Ongoing Habitat Concerns

The primary limiting factors are stream habitat complexity (Lower and North Umpqua populations) and water quantity and quality (Middle and South Umpqua populations). The secondary limiting factors are water quality (Lower Umpqua population), water quality and quantity (North Umpqua population), and stream complexity (Middle and South Umpqua populations). The continuing loss of beavers whose damming activities improve coho salmon rearing habitat, primary productivity, nutrient retention/cycling, floodplain connectivity, and stream flow moderation remains an ongoing habitat concern, as does instream flow (e.g., protection of refugia and existing stream flows, stream flow restoration), along with fish passage and access in the Lower Umpqua and Smith river estuary (Reeves et al. 1989; Stout et al. 2012).

2) Specific Geographic Areas of Concern

- Low gradient valley bottomlands (agricultural lands)
- Riparian forests
- Federal lands
- Estuaries

3) Key Protective Measures and Major Restoration Actions

Numerous acquisition and restoration efforts associated with the implementation of the Oregon Plan for Salmon and Watersheds and the OCCCP (ODFW 2007) have been funded by PCSRF/OWEB, the NOAA Restoration Center, and others. Local councils, districts, and other organizations and landowners have implemented these efforts. Examples of types of projects include large wood placement, road maintenance and passage improvements, riparian plantings, and culvert replacements implemented through the watershed councils with OWEB grants and partners (match dollars) (ODFW 2013).

4) Key Regulatory Measures

Various federal, state, county and tribal regulatory mechanisms are in place to reduce habitat degradation caused by human use and development. Many of these mechanisms have been improved and updated in the past five years, however, land use regulations which affect habitat remain a significant concern, and the implementation and effectiveness of regulatory mechanisms has not been adequately documented. See Listing Factor D: Adequacy & Inadequacy of Regulatory Mechanisms, and Protective Efforts in this document for details.

5) Recommended Future Actions

- Implement the primary recovery strategy for this stratum to protect current high quality summer and winter rearing habitat and strategically restore habitat quality in adjacent habitat by improving instream flow, water temperature, and channel complexity through protection from adverse timber management and agricultural practices, and beaver control.

- Assess instream flows, and develop and implement a strategic instream flow restoration plan.
- Develop and implement a beaver conservation plan that includes reducing lethal control, improving public education and acceptance of beavers, and developing non-lethal beaver management practices to address winter and summer rearing habitat for this stratum.
- Increase access to lowland habitats (i.e., side-channels, alcoves, and floodplains) to improve high flow refugia, estuarine productivity, and life-history diversity in the lower basins for outmigrating smolts from the upstream basin reaches.
- Systematically review and quantitatively analyze the amount of habitat addressed versus the priority watershed reaches targeted for protection and restoration activities in the Proposed OC Coho Salmon Recovery Plan (NMFS 2015b) in order to track progress against plan objectives.

Mid-South Coast Stratum

1) Key Emergent or Ongoing Habitat Concerns

The primary limiting factor is stream habitat complexity (connectivity of tidal and freshwater wetlands and riparian buffers for all independent populations), and the secondary limiting factor is water quality (management of fine sediment for all independent populations). The continuing loss of beavers whose damming activities improve coho salmon rearing habitat, primary productivity, nutrient retention/cycling, floodplain connectivity, and stream flow moderation remains an ongoing habitat concern, as does instream flow (e.g., protection of refugia and existing stream flows, stream flow restoration), along with fish passage and access at dams, bridges, and culverts (Reeves et al. 1989; Stout et al. 2012).

2) Specific Geographic Areas of Concern

- Low gradient valley bottomlands (agricultural lands)
- Riparian forests
- Federal lands
- Estuary and tidal lands
- State lands

3) Key Protective Measures and Major Restoration Actions

Numerous acquisition and restoration efforts associated with the implementation of the Oregon Plan for Salmon and Watersheds and the OCCCP (ODFW 2007) have been funded by the PCSRF/OWEB, the NOAA Restoration Center, and others. Local councils, districts, and other organizations and landowners have implemented these efforts. Examples of types of projects include road maintenance, large wood placement and other instream restoration, riparian plantings, culvert replacements, and side channel reconnection implemented through the watershed councils with OWEB grants and partners (match dollars) (ODFW 2013).

4) Key Regulatory Measures

Various federal, state, county and tribal regulatory mechanisms are in place to reduce habitat degradation caused by human use and development. Many of these mechanisms have been improved and updated in the past five years, however, land use regulations which affect habitat remain a significant concern, and the implementation and effectiveness of regulatory mechanisms has not been adequately documented. See Listing Factor D: Adequacy & Inadequacy of Regulatory Mechanisms, and Protective Efforts in this document for details.

5) Recommended Future Actions

- Implement the basic recovery strategy for OC coho salmon populations in this stratum to protect freshwater and estuarine reaches that currently contain high quality habitat, and restore reaches with potential for additional high quality habitat.
- Increase the amount and quality of winter and summer rearing habitat by improving stream and estuarine habitat complexity ─ including increasing amounts of large wood and pool habitat, and connecting side channels, wetlands, and other off-channel areas.
- Improve water quality, especially by reducing summer water temperatures, increasing water availability by reducing water withdrawals, reducing fine sediment levels (e.g., Sixes population), and increasing the amount of, and connectivity to, tidal wetland habitat.
- Systematically review and quantitatively analyze the amount of habitat addressed versus the priority watershed reaches targeted for protection and restoration activities in the Proposed OC Coho Salmon Recovery Plan (NMFS 2015b) in order to track progress against plan objectives.

Lakes Stratum

1) Key Emergent or Ongoing Habitat Concerns

The primary limiting factor is non-indigenous fish species (all populations), and the secondary limiting factors for all populations are stream complexity (loss of rearing habitat) and water quality (heavy nutrient loading, high water temperatures, and sediment loading, especially in the arms of the lake) (Reeves et al. 1989; Stout et al. 2012).

2) Specific Geographic Areas of Concern

- Siltcoos, Tahkenitch, Tenmile, and Mercer Lakes for removal of non-indigenous fish species
- Siltcoos and Tenmile Lake for sediment and nutrient loading
- Private timber lands and state lands (e.g., Elliot State Forest/Ten Mile Lake population)
- Agriculture lands
- Private lake front lands
- Federal lands (e.g., Clear Lake)

3) Key Protective Measures and Major Restoration Actions

Numerous acquisition and restoration efforts associated with the implementation of the Oregon Plan for Salmon and Watersheds and the OCCCP (ODFW 2007) have been funded by the PCSRF/OWEB, the NOAA Restoration Center, and others. Local councils, districts, and other organizations and landowners have implemented these efforts. Examples of types of projects include riparian plantings and culvert replacements implemented through the watershed councils with OWEB grants and partners (match dollars) (ODFW 2013).

4) Key Regulatory Measures

Various federal, state, county and tribal regulatory mechanisms are in place to reduce habitat degradation caused by human use and development. Many of these mechanisms have been improved and updated in the past five years, however, land use regulations which affect habitat remain a significant concern, and the implementation and effectiveness of regulatory mechanisms has not been adequately documented. See Listing Factor D: Adequacy & Inadequacy of Regulatory Mechanisms, and Protective Efforts in this document for details.

5) Recommended Future Actions

- Implement the primary recovery strategy for the Lakes stratum to reduce summer predation rates by non-indigenous fish species.
- Implement the secondary recovery strategy for this stratum to protect current high quality summer and winter rearing habitat in the tributaries of the lakes, and strategically restore the quality of adjacent habitat by improving water temperature and channel complexity through protection from adverse timber management and agricultural practices, and beaver control.
- Develop and implement a beaver conservation plan that includes reducing lethal control, improving public education and acceptance of beavers, and developing non-lethal beaver management practices to address winter and summer rearing habitat for this stratum.
- Systematically review and quantitatively analyze the amount of habitat addressed versus the priority watershed reaches targeted for protection and restoration activities in the Proposed OC Coho Salmon Recovery Plan (NMFS 2015b) in order to track progress against plan objectives.

Listing Factor A Conclusion

New information available since the last status review indicates that a number of restoration and protection actions have been implemented in freshwater and estuary habitat throughout the range of OC coho salmon. However, at this time we do not have information that would reveal improvements in habitat quality, quantity, and function. Future status assessments would benefit from a systematic review and analysis of the amount of habitat addressed against those high priority strata identified in the NMFS 2015 Proposed Recovery Plan. We remain concerned about degraded habitat conditions throughout the range of the OC coho salmon ESU, particularly with regard to land use and development activities that affect the quality and accessibility of habitats and habitat-forming processes such as riparian condition and floodplain function as well

as water quality. Overall, we conclude that the risk to the species' persistence because of habitat destruction or modification has not changed since the last status review.

Listing Factor B: Overutilization for commercial, recreational, scientific, or educational purposes

Harvest

Oregon coast natural (OCN) coho salmon are part of the Oregon Production Index (OPI), and are harvested in ocean fisheries primarily off the coasts of Oregon and Washington. Historically they were also harvested in recreational and commercial troll fisheries from central California to the west coast of Vancouver Island. Canadian coho salmon fisheries were severely restricted in the 1990s to protect upper Fraser River coho salmon, and have remained so ever since. Ocean fisheries off California were closed to coho salmon retention in 1993 and have remained closed ever since. Ocean fisheries for coho salmon off of Oregon and Washington were dramatically reduced in 1993 in response to the depressed status of OCN coho salmon, and ocean fisheries have moved to primarily mark-selective fishing beginning in 1999. The consultation standard for management of ocean fisheries places caps on impact rates that vary with the stock status and have ranged from 8 percent to 30 percent. Overall exploitation rates regularly exceeded 60 percent in the 1980s, but have remained below 20 percent since 1993. As discussed above, Caldwell and Cramer (2015) argue that harvest rates on Oregon coho salmon were over-estimated by OPI during the 1950s and under-estimated by the OPI in the 1980s and 1990s. This does not affect the low harvest rates beginning in 1993 (NWFSC 2015).

Research and Monitoring

Much of the scientific research and monitoring being conducted for OC coho salmon is intended to fulfill managers' obligations under the ESA to ascertain the status of the species. For authorized scientific research and monitoring throughout the Pacific Northwest (PNW), authorized mortality rates are capped at no greater than 0.5 percent of any PNW ESA-listed salmonid ESU/DPS. In 2014, researchers were approved to take up to 726,133 naturally produced juvenile OC coho salmon with a 2.18 percent mortality rate. For the vast majority of scientific research permits, history has shown that researchers generally take far fewer salmonids than the allotted number of salmonids every year (12.35 percent of requested take and 11.07 percent of requested mortalities were used in PNW Section 10a1A permits from 2008 to 2014). The majority of the requested nonlethal take of juvenile coho salmon have been and are expected to continue to be captured with screw traps (61.3 percent), incline plane traps (23.3 percent), electrofishing units (6.7 percent), beach seines (5.8 percent), and fyke nets (1.9 percent) (NMFS APPS database; https://apps.nmfs.noaa.gov/). Our records from the past nine years indicate that mortality rates for screw traps are typically less than 1 percent and backpack electrofishing typically less than 3 percent. Researchers deploy screw traps from late winter through early summer to capture juvenile salmon during their annual outmigration. Managers use the data collected from screw traps to derive estimates of outmigration abundance. Backpack electrofishing is used to capture juvenile fish for abundance estimates, tagging and marking, and

tissue samples. However, a small number of the naturally produced adult fish may die as an unintended result of the research.

Because the majority of fish that researchers capture and release recover shortly after handling with no long-term ill effects, the effect of the action we consider here is the potential mortality. When compared to the abundance of the ESU, the potential mortality levels are typically low. These effects would be spread out over various rivers and tributaries along the Oregon Coast. Thus, no population is likely to experience a disproportionate amount of these losses. Therefore, the research would likely have only a very small impact on abundance, a similarly small impact on productivity, and no measureable effect on spatial structure or diversity.

Listing Factor B Conclusion

Since the 2011 five-year status review, research impacts have remained mostly constant (NMFS APPS database: https://apps.nmfs.noaa.gov/), and the trend in low harvest rates beginning in 1993 continue (NWFSC 2015). The risk to the species' persistence because of overutilization remains essentially unchanged since our previous status review.

Listing Factor C: Disease or predation

Non-indigenous Fish Predation

The Biological Review Team (BRT) voiced more concern about predation on OC coho salmon from introduced warm water fishes such as smallmouth bass (*Micropterus dolomieu*) and largemouth bass (*Micropterus salmoides*) (NMFS 2015b). These predatory fish are more abundant in the lakes and the lower, middle, and south Umpqua River populations. Non-indigenous fish predation of juvenile coho salmon occurs primarily during summer rearing in the lake populations reducing survival rates to the smolt stage. The BRT concluded that predation and competition from exotic fishes, particularly in light of the warming water temperatures from global climate change, could seriously affect the lake and slow-water rearing life history of Oregon Coast coho salmon by increasing predation (Stout et al. 2012). Further, ODFW's conservation plan recognizes that coho salmon populations in the Lakes stratum (Tahkenitch, Siltcoos, and Tenmile) are primarily limited by interactions (including predation) with exotic (warm water) fish species. The OCCCP identifies predation as one of eight high priority topics for research and evaluation related to coastal coho salmon (NMFS 2015b).

Since ESA listing, ODFW has liberalized size and bag limits on smallmouth bass in the Umpqua River Basin. In 2016 and beyond, there are no limits on the harvest of smallmouth bass throughout the basin. In addition, there are no limits on smallmouth bass that were illegally introduced in the Coquille Basin (NMFS 2015b).

Bird and Marine Mammal Predation

The BRT identified several bird species and marine mammals that prey on OC coho salmon, but concluded that avian and mammalian predation may not have been a significant factor for decline when compared with other factors. More recent work showing predation by birds and

marine mammals has raised concerns for some coho salmon populations in the ESU. The proposed Recovery Plan recommends monitoring the predation by birds and marine mammals, and if research and monitoring shows significant threats to population viability, working with ODFW, FWS, and others to develop and implement appropriate responses (NMFS 2015b).

Disease

The BRT determined that, as many of the streams coho salmon juveniles inhabit are already close to lethal temperatures during the summer months, and with the expectation of rising stream temperatures due to global climate change, increases in infection rates of juvenile coho salmon by parasites may become an increasingly important stressor both for freshwater and marine survival (Stout et al. 2012). In addition, disease and infection of juvenile coho salmon in the first few months of ocean residence is also a key concern (NMFS 2015b).

Listing Factor C Conclusion

Predation from introduced warm water fishes, such as smallmouth bass and largemouth bass, continues to present a threat to OC coho salmon. The ONCC TRT and BRT identified these species as a limiting factor in the Lakes stratum and with increasing water temperatures; these can be factors in the warmer river reaches as well. Disease currently poses a lesser threat to ESU viability. Recent research by the BRT, however, suggests risk of disease may become a larger threat to the species in the future. Many streams inhabited by coho salmon are already approaching lethal temperatures and the fish may be at increased risk of disease if water temperatures rise further due to climate change (NMFS 2015b).

Listing Factor D: Adequacy & Inadequacy of Regulatory Mechanisms and Protective Efforts

Various Federal, state, county and tribal regulatory mechanisms are in place to reduce habitat loss and degradation caused by human use and development and harvest impacts. New information available since the last status review indicates that the adequacy of a number of regulatory mechanisms has improved slightly. Examples of regulatory mechanisms for **Habitat** and for **Harvest** are listed below followed by our conclusion and bulleted summary of concerns regarding the current adequacy of existing regulatory mechanisms.

Habitat

Federal Energy Regulatory Commission (FERC)-licensed Hydropower Facilities and Dams

There are two FERC-licensed dams found in the range of the OC coho salmon on the Umpqua River – Winchester and North Umpqua. The Winchester Dam has a functioning fish ladder and counting station staffed by ODFW personnel. The fish ladder does not meet NMFS standards but passes fish with minimal evidence of injury and delay.[2] The North Umpqua hydroelectric project is an eight dam hydroelectric project. Improvements (license requirements) since 2012 include:

- Adult fish passage over Soda Springs Dam, juvenile fish screening of the Soda Springs

[2] http://www.westcoast.fisheries.noaa.gov/fish_passage/ferc_licensing/rogue_umpqua/winchester.html

powerhouse flow and the 2012 completion of the tailrace barrier at the Slide Creek powerhouse. Shortly after completion, the juvenile screens at Soda Springs Dam collapsed due to excessive debris loading and were shut down for repairs and upgrades. The adult ladder remained functional but did not have the full attraction flow because the juvenile screens were shut down. In 2014, repairs and upgrades to the juvenile screens were completed. Since 2014, the screens and ladder have been undergoing testing and evaluations.

- Construction of the Rock Creek (a tributary to the North Umpqua River) adult fish ladder (including count station and trap) and juvenile fish screens.

Federal Land Management

According to NMFS 2015 Geographic Information System (GIS) database,[3] the majority of the range of OC coho salmon is in private ownership (64 percent), with the remaining 36 percent under Federal ownership [approximately 20 percent U.S. Forest Service (USFS) and 16 percent Bureau of Land Management (BLM) with small percentage ownership by the Bureau of Indian Affairs, United States Coast Guard, and United States Army Corps of Engineers (USACE)]. Most of the landscape in Federal ownership is high quality USFS headwater habitats located in the higher elevations of the Coast mountain range and is vital to the conservation of the OC Coho ESU.

Northwest Forest Plan

Since 1994, land management on USFS and BLM lands in Western Oregon has been guided by the Federal Northwest Forest Plan (USDA and USDI 1994; NMFS 2015b). The aquatic conservation strategy contained in this plan includes elements such as designation of riparian management zones, activity-specific management standards, watershed assessment, watershed restoration, and identification of key watersheds (USDA and USDI 1994; NMFS 2015b).

Although much of the habitat with high intrinsic potential to support the recovery of OC coho salmon is on lower-elevation, private lands, federal forest lands contain much of the current high-quality habitat for this species (Burnett et al. 2007). Relative to forest practice rules and practices on many non-federal lands, the Northwest Forest Plan has large riparian management zones (1 to 2 site-potential tree heights) and relatively protective, activity-specific management standards (USDA and USDI 1994). As discussed in the proposed rule, we consider the Northwest Forest Plan, when fully implemented, to be sufficient to provide for the habitat needs of OC coho salmon habitat on federal lands. Although maintaining this high quality habitat on federal lands is necessary for the recovery of OC coho salmon, the recovery of the species is unlikely unless habitat can be improved in streams with high-intrinsic-potential on non-federal lands (Burnett et al. 2007, quoted in Stout et al. 2012; NMFS 2015b).

Currently, uncertainty exists regarding the future of the aquatic conservation strategy associated with the Northwest Forest Plan. The BLM is undergoing a western Oregon plan revision process that will replace the Northwest Forest Plan in 2016, and NMFS is a cooperating agency in the

[3] http://www.westcoast.fisheries.noaa.gov/maps_data/maps_and_gis_data.html

effort. BLM's adopted final proposed action will determine the management of riparian forest stands, conservation efforts, and practices on BLM administered lands within the OC coho salmon ESU. Until this new plan is adopted, the future conservation role of BLM administered land will be unknown. The USFS continues to manage under the Northwest Forest Plan. We continue to rely on both federal land management agencies to provide for the habitat needs of OC coho salmon. To do this, both agencies must ensure their actions protect existing high quality habitat and implement actions to restore ecological process in the short-term and long-term (NMFS 2015b).

Clean Water Act

Several sections of the Federal Clean Water Act, such as section 401, (water quality certification), section 402 (National Pollutant Discharge Elimination System), and section 404 (discharge of fill into waters of the United States), regulate activities that might degrade salmon habitat (NMFS 2015b). Despite the existence and enforcement of this law, a significant percentage of stream reaches in the range of the OC coho salmon do not meet current water quality standards. For instance, many of the populations of this ESU have degraded water quality identified as a secondary limiting factor (ODFW 2007). Forty percent of the stream miles inhabited by OC coho salmon are classified as temperature impaired (Stout et al. 2012). Although programs carried out under the Clean Water Act are well funded and enforcement of this law occurs, it is unlikely that programs are sufficient to protect coho salmon habitat in a condition that would provide for sustainable populations during good and poor marine conditions (NMFS 2015b).

Gravel mining occurs in various areas throughout the freshwater range of OC coho salmon but is most common in the South Fork Coquille, Nehalem, Nestucca, Trask, Kilchis, Miami, and Wilson Rivers (NMFS 2015b). The USACE issues permits under section 404 of the Clean Water Act and section 10 of the Rivers and Harbors Act for gravel mining in rivers in the southern extent of the OC coho salmon's range. Although gravel mining activities using similar methods occur across this ESU's range, the USACE currently does not always issue permits for these activities. It is unclear why fewer permits are issued in some areas than in others. The Oregon Department of State Lands issues similar permits under both the Removal-Fill Law and the State Scenic Waterway Law (NMFS 2015b).

Improperly managed gravel mining can have potential adverse effects on OC coho salmon habitat. Gravel mining results in less complex streambed with reduced refuge areas for juvenile coho salmon. Gravel mining can alter salmonid food webs and reduce the amount of prey available for juvenile salmonids. Removal of riverbed substrates may also alter the relationship between sediment load and shear stress forces and increase bank and channel erosion. This disrupts channel form, and can also disrupt the processes of channel formation and habitat development (Lagasse et al. 1980; Waters 1995). Operation of heavy equipment in the river channel or riparian areas can result in disturbance of vegetation, exposure of bare soil to erosive forces, and spills or releases of petroleum-based contaminants. Although gravel mining has ceased in some areas occupied by this ESU, gravel mining in the South Fork Coquille and

Tillamook basins remains a concern. ESA and Magnuson-Stevens Fishery Conservation and Management Act consultations indicate that, in some cases, the measures governing sand and gravel mining are inadequate to provide for OC coho salmon habitat capable of producing sustainable populations during good and poor marine conditions (NMFS 2015b).

Non-Federal Tributary Land Management

State Forest Practices Act

Management of riparian areas on private forest lands within the range of OC coho salmon is regulated by the Oregon Forest Practices Act (OFPA) and Forest Practice Rules (FPR) (ODF 2005). These rules require the establishment of riparian management areas (RMA) on certain streams that are within or adjacent to forestry operations (NMFS 2015b). The RMA widths vary from 10 feet (3.05 meters) to 100 feet (30.48 meters) depending on the stream classification, with fish-bearing streams having wider RMA than streams that are not fish-bearing. Although the OFPA and the FPR generally have become more protective of riparian and aquatic habitats over time, significant concerns remain (Everest and Reeves 2007; ODF 2005; IMST 1999), including:

- The applied widths of RMAs likely are not sufficient to fully protect riparian functions, water quality, and stream habitats from forestry operations;
- Rules concerning road maintenance, particularly with respect to so-called "legacy" roads not being treated and stabilized before closure; and
- Since there are no limitations on cumulative watershed effects, road density on private forest lands, which is high throughout the range of this ESU, is unlikely to decrease (NMFS 2015b).

State Forest Lands

Approximately 567,000 acres (2,295 square kilometers) of forest land within the range of OC coho salmon are managed by the Oregon Board of Forestry (ODF 2005). The majority of these lands are managed under the Northwest Oregon Forest Management Plan and the Elliot Forest Management Plan (NMFS 2015b).

The proposed OC coho salmon Recovery Plan (NMFS 2015b) is concerned over whether the current and proposed protective measures are sufficient to conserve OC coho salmon and their habitat now and in the future. Specifically, the Recovery Plan is concerned about the strength of these measures to provide stream shade, woody debris recruitment, and stream habitat complexity. It remains unclear that the Elliot State and the Northwest Oregon Forest Management Plans provide for OC coho salmon habitat that is capable of supporting populations that are sustainable during both good and poor marine conditions (NMFS 2015b).

State Agricultural Lands

Across all populations, agricultural lands occupy up to 20 percent of lands adjacent to OC coho salmon habitat (Burnett et al. 2007). Much of this habitat is considered to have high intrinsic potential (low gradient stream reaches with historically high habitat complexity) but has been degraded by past management activities (Burnett et al. 2007; NMFS 2015b).

Analyses by the proposed Recovery Plan (NMFS 2015b) indicate that the degree of protection afforded to OC coho salmon habitat by state and federal programs ─ agricultural water quality programs, state water quality management plans for confined animal feeding operation, state pesticide programs, federal pesticide labeling program, and irrigation and water availability regulations ─ are only partially effective at protecting OC coho salmon habitat. Concern remains that while many of the agricultural actions that have the greatest potential to degrade coho salmon habitat, such as management of animal waste, application of toxic pesticides, and discharge of fill material, have some protective measures in place that limit their adverse effects on aquatic habitat, the deficiencies in these programs limit their effectiveness at protecting OC coho salmon habitat. In particular, the riparian rules of the water quality management program lack clear criteria for riparian condition and this will continue to make the requirements of this program difficult to enforce. Levees and dikes can be maintained and left devoid of riparian vegetation regardless of their proximity to a stream. The lack of streamside buffers in the state's pesticide program have likely resulted in water quality impacts from the application of pesticides. In addition, although new requirements from ESA section 7 consultations on federal pesticide registration may afford more protection to OC coho salmon, these requirements will only apply if the ESU remains listed. Although a water leasing program is available, there is much uncertainty about how this program will result in increased instream flow. The available information leads us to conclude that it is likely that the quality of OC coho salmon habitat on private agricultural lands may improve slowly over time or remain in a degraded state; however, it is unlikely that, under the current programs, the coho salmon habitat will recover to the point that it can produce sustainable populations during both good and poor marine conditions (NMFS 2015b).

State Regulatory mechanisms affecting beaver management

Beavers were once widespread across Oregon. There is general agreement that beavers are a natural component of the aquatic ecosystem and beaver dams provide ideal habitat for overwintering coho salmon juveniles. Some scientists argue that restoring beavers and beaver ponds would be the single most effective habitat action that we could take to rebuild OC coho salmon populations (NMFS 2015b).

Nevertheless, currently beavers in Oregon are (as a rodent) classified as a predatory species on private land by statute (ORS 610.002), so there is no closed season or bag limit - they may be killed at any time they are encountered. On public land, beavers are classified as a protected furbearer (ORS 496.004 and OAR 635-050-0050) and ODFW manages a trapping season for beavers. All current protective efforts are voluntary, and there is low certainty they will be fully implemented (NMFS 2015b).

Harvest

Pacific Fisheries Management Council Harvest Management

Since 1977, salmon fisheries in the exclusive economic zone (EEZ) (three to 200 miles offshore) off Washington, Oregon, and California have been managed under salmon Fishery Management Plans (FMPs) of the Pacific Fishery Management Council (PFMC). While all species of salmon

fall under the jurisdiction of the current plan (PFMC 2014), it currently contains fishery management objectives only for Chinook salmon, coho salmon, pink salmon (odd-numbered years only), and any salmon species listed under the ESA that is measurably impacted by PFMC fisheries. The current FMP contains no fishery management objectives for steelhead. The PFMC does not manage fisheries for these species and incidental catches are inconsequential (low hundreds of fish each year) to very rare (PFMC 2014). In the event this situation should change, management objectives for these species could be developed and incorporated by plan amendment. The incidental harvest of these salmon species can be allowed or restricted under existing federal fishery regulations.

The constraints on take of ESA-listed species evaluated under incidental take statements and reasonable, prudent alternatives are collectively referred to as consultation standards. These constraints take a variety of forms including FMP conservation objectives, limits on the time and area during which fisheries may be open, ceilings on fishery impact rates, and reductions from base period impact rates. NMFS may periodically revise consultation standards and annually issues a guidance letter reflecting the most current information (e.g., Stelle 2015). Currently, OC coho salmon under this FMP are limited to an exploitation rate of 15 percent (Stelle 2015).

Listing Factor D Conclusion

In summary, positive changes in the regulation and management of fisheries and hatchery production have manifested increases in coho abundance for the ESU (NMFS 2015b). Benefits from these regulatory changes will likely continue. As stated in the final listing determination for OC coho salmon in 2011 (76 FR 35755): “These (harvest and hatchery regulations) are unlikely to be weakened in the future.”

However, despite these positive factors, we do not have confidence in the ability of current land use regulations to protect species viability over the long term and there remain a number of concerns regarding existing regulatory mechanisms, including:

- Lack of documentation or analysis of the effectiveness of existing land-use regulatory mechanisms and land-use management plans.
- Local land-use and water pollution decisions that are likely to affect listed species habitat, but because of no Federal nexus there is no ESA Section 7 consultation.
- Development within floodplains continues to be a regional concern. This frequently results in stream bank alteration, stream bank armoring, and stream channel alteration projects to protect private property that do not allow streams to function properly and resulting in degraded habitat. It is important to note that, where it has been analyzed, floodplain development that occurs consistently with the National Flood Insurance Program’s minimum criteria has been found to jeopardize listed salmonids and the endangered Southern Resident killer whale DPS. A NMFS biological opinion and reasonable and prudent alternative for the Federal Emergency Management Agency’s floodplain management program in Oregon was finalized on April 14, 2016.

Listing Factor E: Other natural or manmade factors affecting its continued existence

Climate Change (NWFSC 2015)

The Intergovernmental Panel on Climate Change (IPCC) and U.S. Global Change Research Program recently published updated assessments of anthropogenic influence on climate, as well as projections of climate change over the next century (IPCC 2013; Melillo et al. 2014). Reports from both groups document ever increasing evidence that recent warming bears the signature of rising concentrations of greenhouse gas emissions. There is moderate certainty that the 30 year average temperature in the Northern Hemisphere is now higher than it has been over the past 1,400 years. In addition, there is high certainty that ocean acidity has increased with a drop in pH of 0.1 (NWFSC 2015).

Projected Climate Change

Trends in warming and ocean acidification are highly likely to continue during the next century (IPCC 2013). In winter across the west, the highest elevations (e.g. in the Rocky Mountains) will shift from consistent longer (>5 months) snow-dominated winters to a shorter period (3-4 months) of reliable snowfall (Klos et al. 2014); lower, more coastal or more southerly watersheds will shift from consistent snowfall over winter to alternating periods of snow and rain ("transitional"); lower elevations or warmer watersheds will lose snowfall completely, and rain-dominated watersheds will experience more intense precipitation events and possible shifts in the timing of the most intense rainfall (e.g., Salathe et al. 2014). Warmer summer air temperatures will increase both evaporation and direct radiative heating. When combined with reduced winter water storage, warmer summer air temperatures will lead to lower minimum flows in many watersheds. Higher summer air temperatures will depress minimum flows and raise maximum stream temperatures even if annual precipitation levels do not change (e.g., Sawaske and Freyberg 2014) (NWFSC 2015).

Higher sea surface temperatures and increased ocean acidity are predicted for marine environments in general (IPCC 2013). However, regional marine impacts will vary, especially in relation to productivity. The California Current is strongly influenced by seasonal upwelling of cool, deep, water that is high in nutrients and low in dissolved oxygen and pH. An analysis of 21 global climate models found that most predicted a slight decrease in upwelling in the California Current, although there is a latitudinal cline in the strength of this effect, with less impact toward the north (Rykaczewski et al. 2015; NWFSC 2015).

Impacts on Salmon

Studies examining the effects of long term climate change to salmon populations have identified a number of common mechanisms by which climate variation is likely to influence salmon sustainability. These include direct effects of temperature such as mortality from heat stress, changes in growth and development rates, and disease resistance. Changes in the flow regime (especially flooding and low flow events) also affect survival and behavior. Expected behavioral responses include shifts in seasonal timing of important life history events, such as the adult migration, spawn timing, fry emergence timing, and the juvenile migration (NWFSC 2015).

Climate impacts in one life stage generally affect body size or timing in the next life stage and can be negative across multiple life stages (Healey 2011; Wade et al. 2013; Wainwright and Weitkamp 2013). Changes in winter precipitation will likely affect incubation and/or rearing stages of most populations. Changes in the intensity of cool season precipitation could influence migration cues for fall and spring adult migrants, such as coho salmon and steelhead. Egg survival rates may suffer from more intense flooding that scours or buries redds. Changes in hydrological regime, such as a shift from mostly snow to more rain, could drive changes in life history, potentially threatening diversity within an ESU (Beechie et al. 2006). Changes in summer temperature and flow will affect both juvenile and adult stages in some populations, especially those with yearling life histories and summer migration patterns (Quinn 2005; Crozier and Zabel 2006; Crozier et al. 2010). Adults that migrate or hold during peak summer temperatures can experience very high mortality in unusually warm years. For example, in 2015 only 4% of adult Redfish Lake sockeye salmon survived the migration from Bonneville to Lower Granite Dam after confronting temperatures over 22°C in the lower Columbia River. Marine migration patterns could also be affected by climate induced contraction of thermally suitable habitat. Abdul-Aziz et al. (2011) modeled changes in summer thermal ranges in the open ocean for Pacific salmon under multiple IPCC warming scenarios. For chum salmon, pink salmon, coho salmon, sockeye salmon, and steelhead, they predicted contractions in suitable marine habitat of 30-50% by the 2080s, with an even larger contraction (86-88%) for Chinook salmon under the medium and high emissions scenarios (A1B and A2) (NWFSC 2015).

Terrestrial and Ocean Conditions and Marine Survival (NWFSC 2015)

Environmental conditions in both fresh and marine waters inhabited by Pacific Northwest salmon are influenced, in large part, by two ocean-basin scale drivers, the Pacific Decadal Oscillation (PDO; Mantua et al. 1997) and the El Niño-Southern Oscillation (ENSO). Starting in late 2013, however, abnormally warm conditions in the Central NE Pacific Ocean known as the "warm blob" (Bond et al. 2015) has also had a strong influence on both terrestrial and marine habitats (NWFSC 2015).

The Warm Blob

Marine waters in the North Pacific ocean have been warmer than average since late fall 2013, when the "warm blob" first developed in the central Gulf of Alaska (Bond et al. 2015). The warm blob was caused by lower than normal heat loss from the ocean to the atmosphere and of relatively weak mixing of the upper ocean, due to unusually high and persistent sea level pressure. Temperature anomalies of the near-surface (upper ~100 m) waters exceeded 3°C in January 2014, or 4 standard deviations (Freeland and Whitney 2014). These anomalies were the greatest observed in this region and season since at least the 1980s and possibly as early as 1900 (Bond et al. 2015; NWFSC 2015).

Pacific Decadal Oscillation

The PDO describes the most prominent mode of variability in the North Pacific sea surface temperature (SST) field (Mantua et al. 1997). Positive PDO values are characterized by warm SSTs along the West Coast of North America and cold SSTs in the central North Pacific and are

associated with warm and dry PNW winters (especially for the Interior Columbia River Basin) and low snowpack. Negative PDO value have the opposite pattern (cold along the coast and warm in the central North Pacific) and are associated with cold wet winters throughout the PNW (high snowpack) (Mantua et al. 1997). Because the PDO is a measure of SSTs and the eastern North Pacific Ocean has been extremely warm, it has been positive since January 2014 (NWFSC 2015).

El Niño-Southern Oscillation

The ENSO is a tropical phenomenon that influences climate patterns around the globe. Much like the PDO, the warm phase (El Niño) is characterized by warm SSTs along the West Coast of North America, while negative values (La Niña) produce cold SSTs along the coast. Like the PDO, ENSO also influences terrestrial environments, and PNW winter snowpack is low during warm El Niño events and high during cool La Niña years. The latest ENSO forecasts point to a strong to very strong El Niño persisting into spring 2016, with some models predicting that this event will be comparable to the exceptional 1997/98 event (NWFSC 2015).

Freshwater Environments

Sea surface temperatures across the Northeast Pacific Ocean are anomalously warm which has contributed to above average terrestrial temperatures in the PNW (Bond et al. 2015). Mean air temperatures for Washington, Oregon, and Idaho were the warmest on record for the 24 month period ending in August 2015 (from a 120 year record starting in 1895). In contrast, precipitation in the PNW was slightly above average during 2014. Since January 2015, however, precipitation has been below average and the 8 month period from January to August was the 11th driest on record. The exceptionally warm air during the winter of 2014/2015 and below average precipitation from January-April resulted in anomalously low snow pack conditions in the Olympic and Cascade Mountains, with most areas having less than 25% of average snow pack in April 2015 (compared to the 1981-2010 record). The combined effects of low flows and high air temperatures are expected to result in higher than normal stream temperatures and reports of fish kills of salmon and sturgeon in the Willamette and mainstem Columbia Rivers in late June and July 2015 (NWFSC 2015).

Marine Survival

Ocean conditions important for PNW salmon became unusually warm early in 2014, and are currently at or near record warm temperatures for much of the northeast Pacific Ocean. There is an abundance of evidence highlighting impacts on coastal marine ecosystems, including sea bird die offs, range shifts for subtropical fish and plankton, etc. Juvenile salmon entering the coastal ocean in 2015 may have experienced especially poor ocean conditions. The expected impacts of the 2015/16 El Niño include intense winter downwelling, increased northward moving currents, increased upper ocean stratification, and overall reduced productivity. These conditions will likely prime the PNW's coastal ocean for very poor productivity in spring 2016. Combining the expected El Niño effects over the next 6 to 8 months with existing warm ocean conditions will likely lead to poor or perhaps very poor early marine survival for PNW salmon going to sea in spring 2016 (NWFSC 2015).

Pacific salmon are a cold water species: they flourish in cold streams and cold and productive marine ecosystems, such as those present in the early 2010s, resulting in record returns for many ESUs. The exceptionally warm marine waters in 2014 and 2015 (and associated warm-water food webs) and warm stream temperatures observed during 2015 were unfavorable for high marine or freshwater survival. West Coast salmon entering the ocean in 2016 will likely encounter subtropical foodwebs that do not promote high survival. The full impact of these unusual environmental conditions will not be known until adults return beginning this fall and continuing for the next few years (NWFSC 2015).

Hatchery Effects

Caldwell and Cramer (2015) advocate that declining productivity of OC coho salmon during the last half-century is not due exclusively to freshwater habitat degradation, but also reflects management practices of high hatchery releases and harvest rates. They argue that these management practices allowed hatchery fish to dominate naturally-spawning populations, which decreased population productivity. Since the 1990s, greatly reduced harvest rates, with almost complete elimination of hatchery fish, has allowed the productivity of OC coho salmon to rebound. The direct observation of the consistently upwards trends in the proportion of natural spawners is straightforward to interpret and perhaps the highest of any threatened or endangered salmonid ESU. The State of Oregon made an unprecedented effort to reduce hatchery influence in wild OC coho salmon populations by greatly reducing the production of hatchery coho salmon along the coast. The result of this action is all but one independent population in the OC coho salmon ESU currently have a 5-year average of >98 percent of wild spawners. The sole exception is the North Umpqua, which has greatly reduced hatchery influence compared to previous reviews, but still has a 5-year average of 88 percent wild spawners. Like the abundance data, this minimal level of hatchery influence occurs across all strata in the OC coho salmon ESU (NWFSC 2015).

Listing Factor E Conclusions

Climate Change

Trends in warming and ocean acidification are highly likely to continue during the next century (IPCC 2013). Analysis of ESU specific vulnerabilities to climate change by life stage will be available in the near future, upon completion of the West Coast Salmon Climate Vulnerability Assessment. In summary, both freshwater and marine productivity tend to be lower in warmer years for most populations considered in this status review. These trends suggest that many populations might decline as mean temperature rises. However, the historically high abundance of many southern populations is reason for optimism and warrants considerable effort to restore the natural climate resilience of these species (NWFSC 2015).

Terrestrial and Ocean Conditions and Marine Survival

It is clear that current anomalously warm marine and freshwater conditions have been and will continue to be unfavorable for Pacific Northwest salmon. How extreme the effects will be is difficult to predict, although decreased salmon productivity and abundance observed during prior

warm periods provide a useful guide. How long the current conditions will last is also unknown, but NOAA's coupled forecast system model (CFS version 2) suggests that the warm conditions associated with the strengthening El Niño will persist at least through spring 2016. The model currently predicts temperature anomalies during the March-April-May 2016 period will exceed 2°C at the equator and 0.5-2°C in the NE Pacific. Unfortunately, longer forecasts are not available (NWFSC 2015).

On a positive note, after previous strong El Niño events (e.g., 1982/83 and 1997/98), there was a rapid transition from warm to cold conditions along the West Coast, which resulted in greatly improved marine survival for Pacific salmon for several years following the El Niño. Whether a similar rapid transition to cold conditions will occur with this El Niño is not known or presently forecast, but is within the realm of possibility (NWFSC 2015).

Pacific salmon are a cold water species: they flourish in cold streams and cold and productive marine ecosystems, such as those present in the early 2010s, resulting in record returns for many ESUs. The exceptionally warm marine waters in 2014 and 2015 (and associated warm-water food webs) and warm stream temperatures observed during 2015 were unfavorable for high marine or freshwater survival. West Coast salmon entering the ocean in 2016 will likely encounter subtropical foodwebs that do not promote high survival. The full impact of these unusual environmental conditions will not be known until adults return beginning this fall and continuing for the next few years (NWFSC 2015).

Hatchery Effects

Since ESA listing, threats posed by hatchery practices have largely been addressed (NMFS 2015b). ODFW has taken numerous steps to minimize adverse impacts of hatcheries on the OC coho salmon ESU. Consequently, the BRT found that hatchery practices that were detrimental to the long-term viability of this ESU have been eliminated (Stout et al. 2012). Changes in ODFW hatchery management, including the termination of coho releases from the Salmon River and North Umpqua hatcheries, have resulted in substantial decreases in the proportion of hatchery fish on the spawning grounds in the North Coast, Mid-Coast, and Umpqua Strata since 2008, the proportion of hatchery-origin coho has stabilized to very low levels for individual strata and the ESU as a whole (NMFS 2015b).

ODFW's Coastal Multi-Species Conservation and Management Plan (ODFW 2014) discusses hatchery production levels. Hatchery coho releases are limited to the basins supporting the Nehalem, Tillamook and South Umpqua populations. Chinook and/or steelhead, however, are being released varying numbers in the basins supporting the Necanicum, Nehalem, Tillamook, Nestucca, Siletz, Yaquina, Siuslaw, Umpqua, Tenmile, Coos Bay, and Coquille populations (NMFS 2015b).

Efforts being made to Protect the Species

When considering whether to list a species as threatened or endangered, section 4(b)(1)(A) of the ESA requires that NMFS take into account any efforts being made to protect that species.

Throughout the range of salmon ESUs and steelhead DPSs, there are numerous Federal, state, tribal and local programs that protect anadromous fish and their habitat. The proposed listing determinations for West Coast salmon and steelhead (69 FR 33102) reviewed these programs in detail.

In our above five-factor analysis, we note the ongoing voluntary restoration associated with the OCCCP and some improvements in regulatory measures for habitat that have occurred in the past five years. We currently are working with our Federal, state, and tribal co-managers to develop monitoring programs, databases, and analytical tools to assist us in tracking, monitoring, and assessing the effectiveness of these improvements.

2.4 Synthesis

The ESA defines an endangered species as one that is in danger of extinction throughout all or a significant portion of its range, and a threatened species as one that is likely to become an endangered species in the foreseeable future throughout all or a significant portion of its range. Under ESA section 4(c)(2), we must review the listing classification of all listed species at least once every five years. While conducting these reviews, we apply the provisions of ESA section 4(a)(1) and NMFS' implementing regulations at 50 CFR part 424.

To determine if a reclassification is warranted, we review the status of the species and evaluate the five factors identified in ESA section 4(a)(1): (1) the present or threatened destruction, modification, or curtailment of its habitat or range; (2) overutilization for commercial, recreational, scientific, or educational purposes; (3) disease or predation; (4) inadequacy of existing regulatory mechanisms; and (5) other natural or man-made factors affecting a species continued existence. We then make a determination based solely on the best available scientific and commercial information, taking into account efforts by states and foreign governments to protect the species.

The updated status reviews completed by our Northwest Fisheries Science Center indicate that the biological status of the ESU has improved, including positive long-term abundance trends and escapement (NWFSC 2015). Increases in ESU scores for persistence and sustainability also clearly indicate the biological status of the ESU is improving, due in large part to management decisions (reduced harvest and hatchery releases) and favorable environmental variation (i.e., high marine survival). However, OC coho salmon abundance is strongly correlated with marine survival rates and with the apparent changes in marine conditions this year, the following statement from the 2012 status review (Stout et al. 2012) of OC coho salmon is worth repeating:

"The BRT was particularly concerned that the long-term loss of high value rearing habitat has increased the vulnerability of the ESU to near-term and long-term climate effects. In the short term, the ESU could rapidly decline to the low abundance seen in the mid-1990s when ocean conditions cycled back to a period of poor survival for coho salmon." With marine survival rates expected to decrease for OC coho salmon entering the ocean in 2014 (Peterson et al. 2014a and

b), 2015 and 2016, it may be advisable to wait to observe how populations fare during this potential downturn before deciding to change their status (NWFSC 2015).

Our analysis of the ESA section 4(a)(1) factors indicates that the collective risk to the OC coho salmon ESU persistence has not changed significantly since the 2012 status review (Stout et al. 2012). The implementation of sound management actions in each H—habitat, hydropower, hatcheries, and harvest—is essential to the recovery of the OC coho salmon and must continue. The biological benefits of habitat restoration and protection efforts, in particular habitat restoration, have yet to be fully expressed and will likely take another five to 20 years before we would expect to see measurable improvements to population viability. We need to continue to implement actions that address the factors limiting population survival and monitor the effects of the action over time such that restoration efforts meet the biological needs of each species and, in turn, contribute to the recovery of these ESUs and DPS. The proposed ESA Recovery Plan for OC coho salmon (NMFS 2015b) is the primary guide for identifying future actions to target and address limiting factors and threats for these listed species. Over the next five years, it will be important continue to implement these actions and monitor our progress.

2.4.1 ESU Delineation and Hatchery Membership

The Northwest Fisheries Science Center's review found that no new information has become available that would potentially justify a change in the composition of the OC coho salmon ESU.

The West Coast Regional Office's review of new information to inform the ESU/DPS membership status of various hatchery programs (Jones 2015) made no changes to the OC coho salmon hatchery membership.

2.4.2 ESU Viability and Statutory Listing Factors

- The Northwest Fisheries Science Center's review of updated information does not indicate a change in the biological risk category for the OC coho salmon ESU since the time of their last status review (NWFSC 2015).
- Our analysis of the ESA section 4(a)(1) factors indicates that the collective risk to the persistence of OC coho salmon has not changed significantly since our final listing determination in 2011 (76 FR 35755).

This page intentionally left blank

3 · Results

3.1 Classification

Listing status:

Based on the information identified above, we determine that no reclassifications for OC coho salmon ESU are appropriate. Therefore:

- The OC coho salmon ESU should remain listed as threatened.

ESU/DPS delineation:

The Northwest Fisheries Science Center's review (NWFSC 2015) found that no new information has become available that would justify a change in the composition of for the OC coho salmon ESU.

Hatchery membership:

No changes were made or recommended for the OC coho salmon ESU hatchery membership (Jones 2015).

3.2 New Recovery Priority Number

Since the previous five year plan, NMFS revised the recovery priority numbers from one (NMFS 2009) to new recovery priority number of nine for the OC coho salmon ESU (NMFS 2015a) as listed in Table 4 of this document.

This page intentionally left blank

4· Recommendations for Future Actions

In our review of the listing factors we identified several actions critical to improving the status of the OC coho salmon ESU. While we recognize and will continue to support recovery actions that improve the status of contributing and sustaining salmonid populations of the Oregon Coast, we will continue to emphasize efforts that benefit primary populations in need of the greatest acceleration in viability to support delisting of the OC coho salmon ESU. These efforts will be directed according to recovery criteria, the best available scientific information concerning ESU status, the role of the populations in meeting ESU recovery goals and stratum viability, the limiting factors and threats recognized at the population level, and the likelihood of action effectiveness to guide our recommendations for future actions. NMFS will continue to coordinate with the Federal, state, tribal, and local implementing entities during this prioritization process to ensure that identified risk factors and actions are taken.

On October 13, 2015, NMFS released the "Proposed Endangered Species Act (ESA) Recovery Plan for Oregon Coast Coho Salmon (Proposed Plan)" for public review and comment (80 FR 61379). As required under the ESA, the Proposed Plan contains objective, measurable delisting criteria, site-specific management actions necessary to achieve the Proposed Plan's goals, and estimates of the time and costs required to implement recovery actions. Listed below are the recommended actions presented in the Proposed Recovery Plan (NMFS 2015b):

- Revise local regulatory mechanisms to increase protection and restoration of watershed processes that promote winter and summer rearing habitats including Oregon's Agricultural Water Quality Management Act, Oregon Forest Practices Act, FEMA National Floodplain Insurance Program, and state beaver statutes and administrative rules.

- Develop and approve scientifically credible, thorough Strategic Action Plans consistent with ESU-level common framework.

- Implement the Strategic Action Plans to protect and restore ecosystem processes and functions and coho salmon habitats. Activities should include restoring habitat capacity for rearing juvenile coho salmon by increasing large wood loading, beaver habitat, and wetland/off-channel connectivity, and by increasing native riparian vegetation to provide bank stability and shade stream reaches during warm summer months.

- Collaborate with governmental and non-governmental organizations and others to identify, and implement, actions that will protect and restore watershed processes, provide stream complexity for juvenile rearing, increase shading to reduce stream temperatures, connect side channels, wetland and off-channel habitats, and reduce fine sediment levels.

- Coordinate with state agencies to improve water quality, especially water temperatures, to increase carrying capacity and provide high quality spawning, and juvenile summer rearing habitat.

- Collaborate with Soil and Water Conservation Districts, Oregon Department of Agriculture, and others to increase effectiveness of current agricultural water quality area rules and plans in order to meet water quality goals in the Tillamook population area.
- Provide and support public outreach, education, and volunteer actions to protect and restore ecosystem process and functions and improve juvenile coho salmon rearing habitats.
- Improve wood recruitment to support long-term increases in habitat complexity by improving timber harvest activities and agricultural practices.
- Increase habitat complexity by increasing large wood, boulders, or other instream structure and conducting riparian planting projects.
- Improve floodplain connectivity by increasing beaver abundance and reducing or limiting development of channel confining structures, including roads and infrastructure.

Additional recommendations emanating from our current 2016 analysis of the ESA section 4(a)(1) factors include:

- Continuing low harvest rates that began in 1993.
- Controlling predation from introduced warm water fishes, such as smallmouth bass and largemouth bass, considered a primary limiting factor in the Lakes stratum by the both the ONCC TRT and BRT.
- Systematically reviewing and quantitatively analyzing the amount of habitat addressed versus the priority watershed reaches targeted for protection and restoration activities in the Proposed OC Coho Salmon Recovery Plan (NMFS 2015b) in order to track progress against plan objectives.
- Documenting and analyzing the effectiveness of existing land-use regulatory mechanisms and land-use management plans.
- Continuing to minimize adverse impacts of hatcheries on the OC coho salmon ESU.

This page intentionally left blank

5 · References

5.1 Federal Register Notices

June 15, 1990 (55 FR 24296). Notice: Endangered and Threatened Species; Listing and Recovery Priority Guidelines.

November 20, 1991 (56 FR 58612). Notice of Policy: Policy on Applying the Definition of Species Under the Endangered Species Act to Pacific Salmon.

February 7, 1996 (61 FR 4722). Notice of Policy: Policy Regarding the Recognition of Distinct Vertebrate Population Segments Under the Endangered Species Act.

August 10, 1998 (63 FR 42587). Final Rule: Endangered and Threatened Species; Threatened Status for the Oregon Coast Evolutionarily Significant Unit of Coho Salmon.

February 16, 2000 (65 FR 7764). Final Rule: Designated Critical Habitat: Critical Habitat for 19 Evolutionarily Significant Units of Salmon and Steelhead in Washington, Oregon, Idaho, and California.

July 10, 2000 (65 FR 42422). Final Rule: Endangered and Threatened Species; Final Rule Governing Take of 14 Threatened Salmon and Steelhead Evolutionarily Significant Units (ESUs).

June 14, 2004 (69 FR 33102). Final Rule: Endangered and Threatened Species: Proposed Listing Determinations for 27 ESUs of West Coast Salmonids.

June 28, 2005 (70 FR 37160). Final Rule: Endangered and Threatened Species: Final Listing Determinations for 16 ESUs of West Coast Salmon, and Final 4(d) Protective Regulations for Threatened Salmonid ESUs.

June 28, 2005 (70 FR 37204). Final Policy: Policy on the Consideration of Hatchery-Origin Fish in Endangered Species Act Listing Determinations for Pacific Salmon and Steelhead.

January 5, 2006 (71 FR 834). Final Rule: Endangered and Threatened Species: Final Listing Determinations for 10 Distinct Population Segments of West Coast Steelhead.

January 19, 2006 (71 FR 3033). Proposed Rule/Withdrawal: Endangered and Threatened Species: Withdrawal of Proposals to List and Designate Critical Habitat for the Oregon Coast Evolutionarily Significant Unit (ESU) of Coho Salmon.

February 11, 2008 (73 FR 7816). Final Rule: Endangered and Threatened Species: Final Threatened Listing Determination, Final Protective Regulations, and Final Designation of Critical Habitat for the Oregon Coast Evolutionarily Significant Unit of Coho Salmon.

June 20, 2011 (76 FR 35755). Final Rule: Listing Endangered and Threatened Species: Threatened Status for the Oregon Coast Coho Salmon Evolutionarily Significant Unit.

April 14, 2014 (79 FR 20802). Final Rule: Endangered and Threatened Wildlife; Final Rule To Revise the Code of Federal Regulations for Species Under the Jurisdiction of the National Marine Fisheries Service.

February 6, 2015 (80 FR 6695). Notice of Initiation of 5-year Reviews: Endangered and Threatened Species; Initiation of 5-Year Reviews for 32 Listed Species of Pacific Salmon and Steelhead, Puget Sound Rockfishes, and Eulachon.

October 13, 2015 (80 FR 61379). Notice of availability; request for comments: Endangered and Threatened Species; Recovery Plans.

5.2 Literature Cited

Abdul-Aziz, O.I., N.J. Mantua, and K.W. Myer. 2011. Potential climate change impacts on thermal habitats of Pacific salmon (*Oncorhynchus spp.*) in the North Pacific Ocean and adjacent seas. Canadian Journal of Fisheries and Aquatic Sciences. 68:1660-1680.

Beechie, T., E. Buhle, M. Ruckelshaus, A. Fullerton, and L. Holsinger. 2006. Hydrologic regime and the conservation of salmon life history diversity. Biological Conservation. 130:560-572.

Bond, N.A., M.F. Cronin, H. Freeland, and N. Mantua. 2015. Causes and impacts of the 2014 warm anomaly in the NE Pacific. Geophysical Research Letters. 42:3414-3420.

Burnett, K.M., G.H. Reeves, D.J. Miller, S. Clarke, K. Vance-Borland, and K.R. Christiansen. 2007. Distribution of salmon-habitat potential relative to landscape characteristics and implications for conservation. Ecol. Appl. 17:66−80.

Caldwell L. and S. Cramer. 2015. Oregon Coast Coho ESU Status Review Comments. Analysis of historical data and alternate hypotheses for estimating population dynamics.

Crozier, L.G. and R.W. Zabel. 2006. Climate impacts at multiple scales: evidence for differential population responses in juvenile Chinook salmon. Journal of Animal Ecology. 75:1100-1109.

Crozier, L., R.W. Zabel, S. Achord, and E.E. Hockersmith. 2010. Interacting effects of density and temperature on body size in multiple populations of Chinook salmon. Journal of Animal Ecology. 79:342-349.

Everest, F. H. and G. H. Reeves. 2007. Riparian and aquatic habitats of the Pacific Northwest and southeast Alaska: Management history and potential management strategies. General Tech. Rep. PNW-GTR-692. U.S. Forest Service, Portland, OR.

Freeland, H. and F. Whitney. 2014. Unusual warming in the Gulf of Alaska. PICES press. 22:51-52.

Good, T.P., R.S. Waples and P. Adams (Editors). 2005. Updated Status of Federally Listed ESUs of West Coast Salmon and Steelhead. U.S. Dept. Commerce, NOAA Tech. Memo. NMFS-NWFSC-66, 598 p.

Healey, M. 2011. The cumulative impacts of climate change on Fraser River sockeye salmon (*Oncorhynchus nerka*) and implications for management. Canadian Journal of Fisheries and Aquatic Sciences. 68:718-737.

IMST (Independent Multidisciplinary Science Team). 1999. Recovery of wild salmonids in western Oregon forests: Oregon Forest Practices Act rules and the measures in the Oregon Plan for Salmon and Watersheds. Tech. rep. 1991-1 to the Oregon Plan for Salmon and Watersheds. Governor's Natural Resources Office, Salem, OR.

IPCC (Intergovernmental Panel on Climate Change). 2013. Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press. Available from: http://www.climatechange2013.org/ Cambridge, United Kingdom and New York, NY, USA.

Jones, R. 2015. 2015 5-Year Review – Updated Evaluation of West Coast Hatchery Programs in 28 Listed Salmon Evolutionarily Significant Units and Steelhead Distinct Population Segments for listing under the Endangered Species Act. Memorandum to Chris Yates.

Klos P.Z., T.E. Link, and T.J. Abatzoglou. 2014. Extent of the rain-snow transition zone in the western U.S. under historic and projected climate. Geophysical Research Letters. 41:4560-4568.

Lagasse, P.F., D.B. Simons, and B.R. Winkley. 1980. Impact of Gravel Mining on River System Stability. Journal of the Waterway, Port, Coastal and Ocean Division, Vol. 106, No. 3, August 1980, pp. 389-404.

Lawson, P.W. 1993. Cycles in Ocean Productivity, Trends in Habitat Quality, and the Restoration of Salmon Runs in Oregon. Fisheries. 18:6-10.

Lawson, P.W., E.P. Bjorkstedt, M.W. Chilcote, C.W. Huntington, J.S. Mills, K.M. Moores, T.E. Nickelson, G.H. Reeves, H.A. Stout, T.C. Wainwright, and L.A. Weitkamp. 2007. Identification of historical populations of coho salmon (*Oncorhynchus kisutch*) in the Oregon coast evolutionarily significant unit. U.S. Dept. of Commerce, NOAA Tech. Memo., NMFS-NWFSC-79, 129 p.

Mantua, N.J., S.R. Hare, Y. Zhang, J.M. Wallace, and R.C. Francis. 1997. A Pacific interdecadal climate oscillation with impacts on salmon production. Bulletin of the American Meteorological Society. 78:1069-1079.

McElhany, P., M. Ruckleshaus, M.J. Ford, T. Wainwright, and E. Bjorkstedt. 2000. Viable Salmon Populations and the Recovery of Evolutionarily Significant Units. U. S. Department of Commerce, National Marine Fisheries Service, Northwest Fisheries Science Center, NOAA Technical Memorandum NMFS-NWFSC-42. 156 p. http://www.nwfsc.noaa.gov/publications/techmemos/tm42/tm42.pdf

Melillo, J.M., T.C Richmond, and G.W. Yohe. 2014. Climate Change Impacts in the United States: The Third National Climate Assessment. U.S. Global Change Research Program.

NMFS (National Marine Fisheries Service). 1997. Status review update for coho salmon from the Oregon and northern California coasts. West Coast Coho Salmon Biological Review Team, 28 March 1997. (Available from L. Weitkamp, NWFSC Newport Research Station, 2032 SE OSU Drive, Newport, OR 97365.)

NMFS (National Marine Fisheries Service). 2009. Biennial Report to Congress on the Recovery Program for Threatened and Endangered Species – October 1, 2006 - September 30, 2008. 184 pp. Available at: http://www.nmfs.noaa.gov/pr/pdfs/laws/esabiennial2008.pdf

NMFS (National Marine Fisheries Service). 2015a. Species in the Spotlight: Survive to Thrive – Recovering Threatened and Endangered Species FY 2013-2014 Report to Congress. 37 p. Available at: http://www.nmfs.noaa.gov/pr/laws/esa/final_biennial_report_2012-2014.pdf

NMFS (National Marine Fisheries Service). 2015b. Proposed Recovery Plan for Oregon Coast Coho Salmon Evolutionarily Significant Unit. National Marine Fisheries Service, West Coast Region, Portland, Oregon. 198 pp. Available at: http://www.westcoast.fisheries.noaa.gov/protected_species/salmon_steelhead/recovery_planning_and_implementation/oregon_coast/oregon_coast_salmon_recovery_domain.html

NWFSC (Northwest Fisheries Science Center). 2015. Status Review Update for Pacific Salmon and Steelhead Listed under the Endangered Species Act: Pacific Northwest. December 21, 2015.

ODF (Oregon Department of Forestry). 2005. Forest Practice Administrative Rules and Forest Practices Act.

ODFW (Oregon Department of Fish and Wildlife). 2007. Oregon Coast Coho Conservation Plan.

ODFW (Oregon Department of Fish and Wildlife). 2013. Oregon Coast Coho Conservation Plan 2011-2012 Annual Report. August 2013.

ODFW (Oregon Department of Fish and Wildlife). 2014. Coastal Multi-Species Conservation and Management Plan. June 6, 2014

ODFW (Oregon Department of Fish and Wildlife). 2015. Letter from Bruce McIntosh, Deputy Fish Division Administrator – Inland Fisheries to Scott Rumsey, NMFS. With comments on the 5-Year Reviews for 32 Listed Species of Pacific Salmon and Steelhead, with attachment. May 7, 2015.

Peterson, W.T., J.L. Fisher, J.O. Peterson, C.A. Morgan, B.J. Burke, and K.L. Fresh. 2014a. Applied Fisheries Oceanography Ecosystem Indicators of Ocean Condition Inform Fisheries Management in the California Current. Oceanography. 27:80-89.

Peterson, W.T., C.A. Morgan, J.O. Peterson, J.L. Fisher, B.J. Burke, and K. Fresh. 2014b. Ocean Ecosystem Indicators of Salmon Marine Survival in the Northern California Current. Unpublished report. Available at: http://www.nwfsc.noaa.gov/research/divisions/fe/estuarine/oeip/documents/Peterson_etal_2014.pdf

PFMC (Pacific Fishery Management Council). 2014. Pacific Coast Salmon Fishery Management Plan for Commercial and Recreational Salmon Fisheries off the Coasts of Washington, Oregon, and California as Amended through Amendment 18. PFMC, Portland, OR. 91 p.

Quinn, T.P. 2005. The Behavior and Ecology of Pacific Salmon and Trout. University of Washington Press, Seattle, Washington.

Reeves, G., F. Everest, and T. Nickelson. 1989. Identification of physical habitats limiting the production of coho salmon in western Oregon and Washington. Gen. Tech. Rep. PNW-GTR245. U.S. Forest Service, Pacific Northwest Research Station, Portland, OR.

Rykaczewski, R.R., J.P. Dunne, W.J. Sydeman, M. Garcia-Reyes, B.A. Black, and S.J. Bograd. 2015. Poleward displacement of coastal upwelling-favorable winds in the ocean's eastern boundary currents through the 21st century. Geophysical Research Letters. 42:6424-6431.

Salathe, E.P., A.F. Hamlet, C.F. Mass, S.Y. Lee, M. Stumbaugh, and R. Steed. 2014. Estimates of Twenty-First-Century Flood Risk in the Pacific Northwest Based on Regional Climate Model Simulations. Journal of Hydrometeorology. 15:1881-1899.

Sawaske, S.R. and D.L. Freyberg. 2014. An analysis of trends in baseflow recession and low-flows in rain-dominated coastal streams of the pacific coast. Journal of Hydrology. 519:599-610.

Schtickzelle, N. and T.P. Quinn. 2007. A Metapopulation Perspective for Salmon and Other Anadromous Fish. Fish and Fisheries. 8:297-314.

Stelle, W.W. 2015. Letter from NMFS West Coast Regional Administrator to Dorothy Lowman, Chair of the Pacific Fisheries Management Council, regarding ESA consultation standards and guidance on the effects of the 2015 fishing season on ESA listed species. March 3, 2015. Available online at: http://www.pcouncil.org/wp-content/uploads/2015/03/F3c_Sup_NMFS_Rpt_GuidanceLtr_MAR2015BB.pdf

Stout, H. A., P.W. Lawson, D.L. Bottom, T. Cooney, M.J. Ford, C.E. Jordan, R.G. Kope, L.M. Kruzic, G.R. Pess, G.H. Reeves, M.D. Scheuerell, T.C. Wainwright, R.S. Waples, E. Ward, L.A. Weitkamp, J.G. Williams, and T.H. Williams. 2012. Scientific conclusions of the status review for Oregon coast coho salmon (*Oncorhynchus kisutch*). U.S. Dept. of Commerce, NOAA Tech. Memo., NMFS-NWFSC-118

USDA (U.S. Department of Agriculture) and USDI (U.S. Department of the Interior). 1994. Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl: Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl. USDA Forest Service and USDI Bureau of Land Management, Washington, DC.

Wade, A.A., T.J. Beechie, E. Fleishman, N.J. Mantua, H.Wu, J.S. Kimball, D.M. Stoms, and J.A. Stanford. 2013. Steelhead vulnerability to climate change in the Pacific Northwest. Journal of Applied Ecology. 50:1093-1104.

Wainwright, T.C., M.W. Chilcote, P.W. Lawson, T.E. Nickelson, C.W. Huntington, J.S. Mills, K.M. Moores, G.H. Reeves, H.A. Stout, and L. A. Weitkamp. 2008. Biological recovery criteria for the Oregon Coast coho salmon evolutionarily significant unit. U.S. Dept. of Commerce, NOAA Tech. Memo., NMFS-NWFSC-91, 199 p.

Wainwright, T.C. and L.A. Weitkamp. 2013. Effects of Climate Change on Oregon Coast Coho Salmon: Habitat and Life-Cycle Interactions. Northwest Science. 87:219-242.

Waters, T.F. 1995. Sediment in streams: sources, biological effects, and control. American Fisheries Society Monograph 7, Bethesda, Maryland.

Weitkamp, L.A., T.C. Wainwright, G.J. Bryant, G.B. Milner, D.J. Teel, R.G. Kope, and R.S. Waples. 1995. Status review of coho salmon from Washington, Oregon, and California. U.S. Dept. of Commerce, NOAA Tech. Memo., NMFS-NWFSC-24, 258 p.

National Marine Fisheries Service
5-Year Review

Oregon Coast Coho Salmon

Conclusion:

Based on the information identified above, we conclude:

- The Oregon Coast Coho Salmon ESU should remain listed as threatened.

REGIONAL OFFICE APPROVAL

Approve: _____ Date: 26 May 2016

Kim Kratz, Ph.D.
Assistant Regional Administrator
Oregon/Washington Coastal Office
West Coast Region
NOAA Fisheries