Science, Service, Stewardship

2016 5-Year Review: Summary & Evaluation of Middle Columbia River Steelhead

National Marine Fisheries Service
West Coast Region
Portland, OR

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5-Year Review: Middle Columbia River Species

Species Reviewed	Distinct Population Segment
Steelhead (*Oncorhynchus mykiss*)	*Middle Columbia River Steelhead*

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1 · General Information

1.1 Introduction

Many West Coast salmon and steelhead (*Oncorhynchus spp.*) 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. The most recent listing determinations for most salmon and steelhead occurred in 2005 and 2006. This document describes the results of the review of the ESA-listed Middle Columbia River (MCR) steelhead.

1.1.1 Background on salmonid 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.

To identify DPSs of steelhead, we apply the joint U.S. Fish and Wildlife Service-National Marine Fisheries Service DPS policy (61 FR 4722) rather than the ESU policy. Under this policy, a DPS of steelhead must be discrete from other populations, and it must be significant to its taxon.

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 a 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 August 15, 2011, we published our status reviews and listing determinations for 11 ESUs of Pacific salmon and 6 DPSs of steelhead from the Pacific Northwest (76 FR 50448).

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 2010-2011 five-year reviews. 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 centers 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 boundaries. At the end of this process, the science teams prepared reports detailing the results of their analyses (NWFSC 2015).

To further inform the reviews, we also asked our Northwest salmon management biologists familiar with hatchery programs to consider new information available since the previous listing determinations. Among other things, they considered hatchery programs that have ended, new

hatchery programs that have started, 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 our Northwest biologists and other salmon management specialists 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 the MCR steelhead; 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 1999, NMFS listed MCR steelhead under the ESA and classified it as a threatened species (Table 1).

Table 1. Summary of the listing history under the Endangered Species Act for the MCR Steelhead DPS.

Salmonid Species	ESU/DPS Name	Original Listing	Revised Listing(s)
Steelhead (*O. mykiss*)	Middle Columbia River Steelhead	**FR Notice:** 64 FR 14517 **Date:** 3/25/1999 **Classification:** Threatened	**FR Notice:** 71 FR 834 **Date:** 1/5/2006 **Re-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 MCR steelhead in 2005.

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.

Table 2. Summary of rulemaking for 4(d) protective regulations and critical habitat for the MCR Steelhead.

Salmonid Species	ESU/DPS Name	4(d) Protective Regulations	Critical Habitat Designations
Steelhead (*O. mykiss*)	Middle Columbia River Steelhead	**FR notice:** 65 FR 42422 **Date:** 7/10/2000 **Revised:** 6/28/2005 (70 FR 37160)	**FR notice:** 70 FR 52630 **Date:** 9/2/2005

1.3.4 Review History

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

Table 3. Summary of previous scientific assessments for the MCR Steelhead.

Salmonid Species	ESU/DPS Name	Document Citation
Steelhead (*O. mykiss*)	Middle Columbia River Steelhead	NWFSC 2015 Ford et al. 2011 ICTRT and Zabel 2007 ICTRT 2007a ICTRT 2007b McClure et al. 2005 Good et al. 2005 ICTRT 2003 Busby et al. 1996 NMFS 1997 NMFS 1999a NMFS 1999b

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 2009a). 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 MCR Steelhead.

Salmonid Species	ESU/DPS Name	Recovery Priority Number	Recovery Plans/Outline
Steelhead (*O. mykiss*)	Middle Columbia River Steelhead	9	**Title:** Middle Columbia River Steelhead Distinct Population Segment ESA Recovery Plan Available at: http://www.westcoast.fisheries.noaa.gov/protected_species/salmon_steelhead/recovery_planning_and_implementation/middle_columbia/middle_columbia_river_steelhead_recovery_plan.html **Date:** 9/30/2009 **Type:** Final **FR Notice:** 74 FR 50165

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2 · Review Analysis

In this section we review new information to determine whether the MCR steelhead DPS delineation remains appropriate.

2.1 Delineation of species under the Endangered Species Act

Is the species under review a vertebrate?

DPS Name	YES	NO
Middle Columbia River Steelhead	X	

Is the species under review listed as a DPS?

DPS Name	YES	NO
Middle Columbia River Steelhead	X	

Was the DPS listed prior to 1996?

DPS Name	YES	NO	Date Listed if Prior to 1996
Middle Columbia River Steelhead		X	n/a

Prior to this 5-year review, was the 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 "evolutionarily significant unit" (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) Distinct Population Segment (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. Accordingly, in listing the Middle Columbia River steelhead DPS under the DPS policy in 1999, we used the joint DPS policy to delineate the DPS under the ESA.

2.1.1 Summary of relevant new information regarding delineation of the MCR steelhead DPS

DPS Composition

Ford et al. 2011 summarized information potentially justifying reconsideration of the composition of the Lower Columbia River and Middle Columbia River steelhead DPSs. There is

no new information in NWFSC 2015 addressing the uncertainty associated with the Lower Columbia River and MCR steelhead DPS division highlighted in the previous 2011 review:

The division between coastal and interior populations of Chinook salmon, coho salmon, and steelhead coincides with a major biogeographic barrier that lies along the Cascade Crest, and for aquatic species, may have been delineated by Celilo Falls. Life history, genetic, and ecological information indicate that the Big White Salmon and Klickitat River basins form part of a transitional zone between the two regions. At the time of the coastwide status reviews in the mid-1990s, there was considerable disagreement over the placement of populations within this transitional zone. New information, primarily on DNA microsatellite variation, underscores the transitional nature of populations in this area. The extirpation and potential alteration (via hatchery transfers) of some populations further cloud the issue of population assignment.

Within the transition zone it is relatively clear that the Hood River steelhead remain closely associated with Lower Columbia River steelhead populations. Given the relatively close proximity of the mouths of the Hood, Big White Salmon, and Klickitat Rivers, and the lack of definitive genetic information indicating that the populations are discrete, it would be reasonable to assign the Big White Salmon and Klickitat River steelhead populations to either the MCR steelhead DPS or to the Lower Columbia River steelhead DPS. The Fifteenmile Creek population, however, is clearly associated with the Interior Columbia River steelhead lineage. Recent information underscores the transitional nature of the Big White Salmon and Klickitat River populations, and genetic analyses are inconclusive regarding the composition of and best division between the Lower Columbia River and MCR steelhead DPSs (NWFSC 2015).

Membership of Hatchery Programs

In preparing this report, our management biologists reviewed the available information regarding hatchery membership of this DPS (Jones 2015). They considered whether any changes in hatchery programs occurred since the last status review 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 MCR steelhead DPS includes all naturally spawned anadromous *O. mykiss* (steelhead) originating below natural and manmade impassable barriers from the Columbia River and its tributaries upstream of the Wind and Hood Rivers (exclusive) to and including the Yakima River; excludes such fish originating from the Snake River basin. This DPS does include steelhead from seven artificial propagation programs: the Touchet River Endemic Program; Yakima River Kelt Reconditioning Program (in Satus Creek, Toppenish Creek, Naches River, and Upper Yakima River); Umatilla River Program (Oregon Department of Fish and Wildlife (ODFW) Stock #91); and the Deschutes River Program (ODFW Stock #66). This DPS does not include steelhead that are designated as part of an experimental population (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 DPS (71 FR 834; January 5, 2006).

The MCR steelhead hatchery programs have not changed substantially from the previous ESA status review to suggest that their level of divergence relative to the local natural populations has changed (Jones 2015).

2.2 Recovery Criteria

The ESA requires NMFS to develop recovery plans 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?

DPS Name	YES	NO
Middle Columbia River Steelhead	X	

2.2.2 Adequacy of recovery criteria

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

DPS Name	YES	NO
Middle Columbia River Steelhead	X	

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

DPS Name	YES	NO
Middle Columbia River Steelhead	X	

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. The MCR steelhead DPS includes all naturally spawned anadromous *O. mykiss* (steelhead) originating below natural and manmade impassable barriers from the Columbia River and its tributaries upstream of the Wind and Hood Rivers (exclusive) to and including the Yakima River; and excludes such fish originating from the Snake River basin. This DPS does include steelhead from seven artificial propagation programs: the Touchet River Endemic

Program; Yakima River Kelt Reconditioning Program (in Satus Creek, Toppenish Creek, Naches River, and Upper Yakima River); Umatilla River Program (Oregon Department of Fish and Wildlife (ODFW) Stock #91); and the Deschutes River Program (ODFW Stock #66). This DPS does not include steelhead that are designated as part of an experimental population (79 FR 20802; Figure 1). For recovery planning and development of recovery criteria, the Interior Columbia Technical Recovery Team (ICTRT) identified independent populations within the MCR steelhead DPS, and grouped them into genetically similar major population groups (MPGs) (ICTRT 2003). The DPS is composed of four MPGs: Cascades Eastern Slope Tributaries, John Day River, Yakima River, and Walla Walla and Umatilla Rivers.

Recovery strategies outlined in the 2009 Middle Columbia River Steelhead Recovery Plan and its management unit components are targeted on achieving, at a minimum, the ICTRT biological viability criteria for each major population grouping in the DPS "... to have all four major population groups at viable (low risk) status with representation of all the major life history strategies present historically, and with the abundance, productivity spatial structure, and diversity attributes required for long-term persistence." The plan recognizes that, at the major population group level, there may be several specific combinations of populations that could satisfy the ICTRT criteria. Each of the management unit plans identifies particular combinations that are the most likely to result in achieving viable major population group status. The recovery plan recognizes that the management unit plans incorporate a range of objectives that go beyond the minimum biological status required for delisting (NMFS 2009b).

The ICTRT recovery criteria are hierarchical in nature, with ESU/DPS level criteria being based on the status of natural-origin steelhead assessed at the population level. A detailed description of the ICTRT viability criteria and their derivation (ICTRT 2007b) can be found at www.nwfsc.noaa.gov/trt/col/trt_viability.cfm.

Under the ICTRT approach, population level assessments are based on a set of metrics designed to evaluate risk across the four viable salmonid population elements: A/P, spatial structure, and diversity (McElhany et al. 2000). The ICTRT approach calls for comparing estimates of current natural-origin abundance (measured as a 10-year geometric mean of natural-origin spawners) and productivity (estimate of return per spawner at low to moderate parent spawning abundance) against predefined viability curves. In addition, the ICTRT developed a set of specific criteria (metrics and example risk thresholds) for assessing the spatial structure and diversity risks based on current information representing each specific population. The ICTRT viability criteria are generally expressed relative to a particular risk threshold—5 percent risk of extinction over a 100-year period.

The Middle Columbia River Steelhead Recovery Plan identifies a set of most likely scenarios to meet the ICTRT recommendations for low risk populations at the MPG level. In addition, the management unit plans generally call for achieving moderate risk ratings (maintained status) across the remaining extant populations in each MPG (NMFS 2009b). The following describes the combination of population status most likely to achieve viability for each MPG.

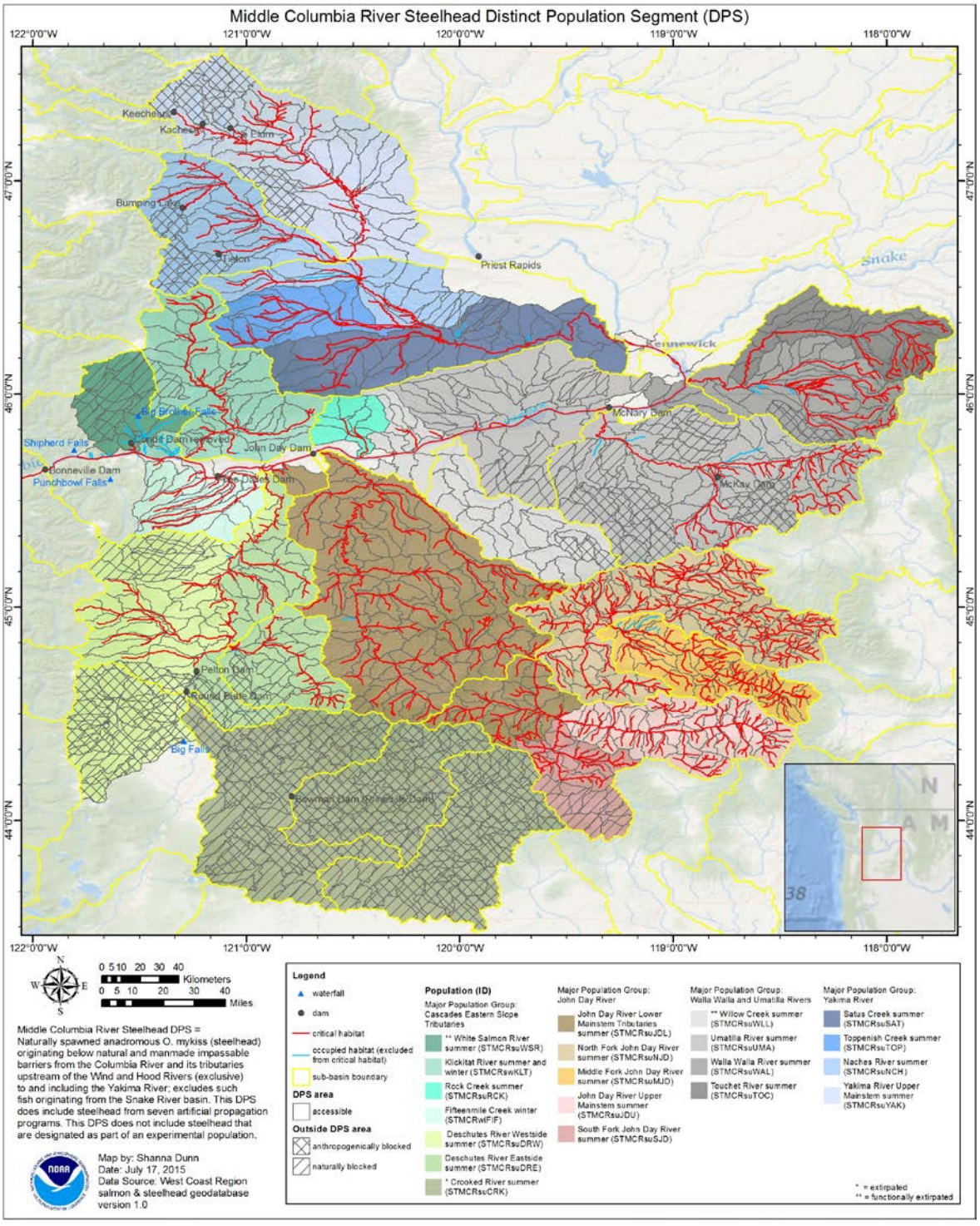

Figure 1. MCR Steelhead population structure[1]

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

Cascades Eastern Slope Tributaries MPG

The Klickitat River, Fifteenmile Creek, and both the Deschutes River Eastside and Deschutes River Westside populations should reach at least viable status. The management unit plans also call for at least one population to be highly viable, consistent with ICTRT recommendations. The Rock Creek population should reach maintained status (25 percent or less risk level). MPG viability could be further bolstered if reintroduction of steelhead into the Crooked River succeeds and if the White Salmon River population successfully recolonizes its historical habitat following the removal of Condit Dam.

John Day River MPG

The John Day River Lower Mainstem Tributaries, North Fork John Day River and either the Middle Fork John Day River or John Day River Upper Mainstem populations should achieve at least viable status. The management unit plan also calls for at least one population to be highly viable, consistent with ICTRT recommendations.

Yakima River MPG

To achieve viable status, two populations should be rated as viable, including at least one of the two classified as large—the Naches River and the Yakima River Upper Mainstem. The remaining two populations should, at a minimum, meet the maintained criteria. The management unit plan also calls for at least one population to be highly viable, consistent with ICTRT recommendations.

Umatilla/Walla Walla Rivers MPG

Two populations should meet viability criteria. The management unit plan also calls for at least one population to be highly viable, consistent with ICTRT recommendations. The Umatilla River is the only large population, and therefore needs to be viable. In addition either the Walla Walla River or Touchet River also needs to be viable.

2.3 Updated Information and Current Species' Status

In addition to recommending recovery criteria, the ICTRT also assessed the current status of each population within the DPS (ICTRT 2007b). Each population was rated against the biological criteria identified in the recovery plan and assigned a current viability rating.

2.3.1 Analysis of VSP Criteria (including discussion of whether the VSP criteria have been met)

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

There have been improvements in the viability ratings for some of the component populations, but the MCR Steelhead DPS is not currently meeting the viability criteria described in the

Middle Columbia River Steelhead Recovery Plan. In addition, several of the factors cited by the 2005 BRT remain as concerns or key uncertainties. Natural origin returns to the majority of populations in two of the four MPGs in this DPS increased modestly relative to the levels reported in the previous five-year review. Abundance estimates for 2 of 3 populations with sufficient data in the remaining two MPGs (Cascades Eastern Slope Tributaries and Walla Walla and Umatilla Rivers) were marginally lower. Natural-origin spawning estimates are highly variable relative to minimum abundance thresholds across the populations in the DPS. Three of the four MPGs in this DPS include at least one population rated at low risk for abundance and productivity. The survival gaps for the remaining populations are generally smaller than those for the other Interior Columbia River Basin listed DPSs. Updated information indicates that stray levels into the John Day River populations have deceased in recent years. Out of basin hatchery stray proportions, although reduced, remain high in spawning reaches within the Deschutes River basin populations. In general, the majority of population level viability ratings remained unchanged from prior reviews for each MPG within the DPS (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

Significant habitat restoration and protection actions at the Federal, state, tribal, and local levels have been implemented to improve the degraded habitat conditions and fish passage issues described in the 2009 Recovery Plan. While these efforts have been substantial and are expected to benefit the survival and productivity of the targeted populations, we do not yet have evidence demonstrating that improvements in habitat conditions have led to improvements in population viability. The effectiveness of habitat restoration actions and progress toward meeting the viability criteria should be/continues to be monitored and evaluated with the aid of newly implemented monitoring and evaluation programs. Generally, it takes one to five decades to demonstrate increases in viability.

Current Status and Trends in Habitat

Below, we summarize information on the **current status and trends in habitat** conditions by MPG since our last 2010-2011 status review. 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; (2) **specific areas** where concerns about this DPS habitat condition remain; (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; (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 addressing priority habitat areas when sequencing restoration actions.

Cascades Eastern Slope Tributaries MPG

1) Key Emergent or Ongoing Habitat Concerns

Passage issues and issues related to water flow remain a habitat concern in some portions of the Cascades Eastern Slope Tributaries MPG. As described below under (3) Key Protective Measures and Major Restoration Actions, considerable effort has been expended in addressing riparian and passage issues in the MPG since adoption of the 2009 Recovery Plan, however, there remains a need to quantitatively review and analyze the miles of riparian treated in key areas vs. the target miles identified in the 2009 Recovery Plan for treatment.

Low stream flows and warm water temperatures continue to be a concern in the Rock Creek basin. Additional studies conducted since the last 5-year status review concluded that stream flows in the Rock Creek watershed are naturally low in summer, water temperatures are naturally high, and summer habitat in the lower portion of the watershed is typically limited to isolated pools of warm water that are not suitable for the rearing of juvenile steelhead (Harvey 2014; Aspect 2013; Aspect 2015; Glass 2009; Conley 2015).

2) Specific Areas of Concern

Specific areas of concern are limited to the ongoing passage issues in the Crooked River and the upper Deschutes River and low flows due to irrigation withdrawals in Fifteenmile Creek and Deschutes River watersheds.

3) Key Protective Measures and Major Restoration Actions

Since adoption of the Recovery Plan in 2009, and the previous 2011 5-year status review, considerable effort has been expended in addressing riparian and passage issues in the Cascades Eastern Slope Tributaries MPG:

- The Pelton-Round Butte Selective Water Withdrawal and Fish Collection Facility has been in operation since 2010 (ODFW 2015a). Efforts to improve flow patterns through the reservoir modify the operating procedures to restore downstream water quality, and reintroduce steelhead smolts and fry above the Project are ongoing (PGE 2015).

- In addition to the improvements to passage at the Pelton-Round Butte hydroelectric system, major protection measures and restoration projects in the Deschutes River Westside watersheds included

acquisition of 450 acres along 2 miles of Whychus Creek, improvement of 6 fish passage barriers which made an additional 31 stream miles accessible and improvement of channel complexity in 4 miles of stream was completed (ODFW 2015b).

- Major restoration actions in the Deschutes River Eastside watersheds included improvement of eight barriers that opened up about 119 miles of additional habitat and development of another 4.5 miles of stream through side channel developments (ODFW 2015c). Additionally, over 4 miles of stream length was improved by adding roughness elements, 85 riparian miles were treated or protected, and 20 irrigation systems were improved for efficiency (ODFW 2015c).

- Within the Klickitat River basin, improvement of passage at Castile Falls and Lyle Falls were identified as needs in the 2009 Middle Columbia River Steelhead Recovery Plan (NMFS 2009b). These projects have been completed. Completion reports for the Lyle Falls and Castile Falls passage projects are not yet finalized.

- The mainstem Klickitat River was disconnected from its floodplain for long reaches due to the presence of HWY 142, Klickitat River Road, and the former railroad embankment. The Haul Road Project restored 29.3 acres of floodplain function and planted 5.15 miles of riparian vegetation within the affected reach (Lindley and Conley 2013 and 2015; Conley and Lindley 2012).

- The Columbia River Land Trust, in cooperation with Washington Department of Natural Resources (DNR), has purchased the development rights for about 9,000 acres of the mainstem Klickitat River, protecting these acres from further development into the future. The project protects 5.2 miles of the mainstem and 24 miles of tributary habitat (http://www.dnr.wa.gov/aboutdnr/managedlands/pages/amp_na_klickitat.aspx; http://www.columbian.com/news/2014/jul/15/forest-project-will-conserve-9000-acres/).

- Within the Fifteenmile Creek watershed, channel complexity was addressed in roughly 2.5 miles of stream, 43 miles of riparian area were planted, nine irrigation systems were improved for efficiency, and 91 percent of the riparian area in the watershed has been protected under the Conservation Reserve Enhancement Program (CREP) (ODFW 2015d, OWEB 2015).

- Also in the Fifteenmile Creek watershed, the Fifteenmile Action to Stabilize Temperatures (FAST) was formally adopted and implemented in 2013 (FAST 2013). The FAST plan, a cooperative agreement among agencies and landowners, is intended to reduce the occurrence of high stream temperature events through planning and appropriate reduction of water use. Components of the plan include preseason irrigation planning in light of forecasted water supply conditions and in-season modification of timing and quantity of water withdrawal intended to reduce the impacts of irrigation on water temperature during peak temperature events. Continued plan implementation and monitoring support is necessary to track implementation effectiveness and validate the predictive model.

- Two evaluations of canopy closure conducted throughout the Rock Creek watershed (ENVIRON 2013; Harvey 2014) reported that roughly 98 percent of fish bearing streams naturally have trees growing in the riparian area. Roughly 5 miles of riparian area were identified that needed riparian plantings. To date, approximately 90 percent of the identified areas have been planted.

- PacifiCorp completed removal of Condit Dam from the White Salmon River watershed in September 2012 providing access to 16.9 miles of habitat for salmon and steelhead that had been blocked for over 100 years (PacifiCorp 2012a, b).

4) Key Regulatory Mechanisms

The NMFS 2009 Recovery Plan (NMFS 2009b) and the previous 5-year status review did not identify regulatory mechanisms as a priority issue affecting salmon recovery for any of the watersheds within the Cascades Eastern Slope Tributaries MPG. Various federal, state, county and tribal regulatory mechanisms are in place to minimize or avoid habitat degradation caused by human use and development. Many of these mechanisms have been improved and updated in the past 5 years, such as the required updates of the Critical Areas Ordinances and updates of Oregon's instream flow protections. In addition, the Oregon Department of Water Resources implemented the state's Integrated Water Resource Strategy to further restore and protect streamflow for salmonids in 2012. However, 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

- Evaluation of potential for improvement of upstream passage at Opal Springs Dam on the lower Crooked River (RM 8), a tributary to the upper Deschutes River (Upper Deschutes Watershed Council et al., undated). This passage barrier is ranked the second highest priority on Oregon's 2013 Statewide Fish Passage Priority List (http://www.dfw.state.or.us/fish/passage/). This project is in the planning stages.

- Continued support of the U.S. Department of Agriculture's Conservation Reserve Enhancement Program (CREP) agreements that currently protect large portions of the riparian areas in the Cascades Eastern Slope Tributaries MPG.

- Additional efforts to improve stream flow, water temperature, and the quantity of available habitat in areas adversely affected by irrigation diversions in the Fifteenmile Creek and Deschutes River watersheds.

- The Middle Columbia River Steelhead Recovery Plan (NMFS 2009b) indicated that re-establishment of the functionally extirpated White Salmon River steelhead population is not necessary for MPG viability. However, MPG viability would be further bolstered if White Salmon River steelhead naturally re-colonized their historical habitat made available with the 2011-2012 removal of Condit Dam (NMFS 2013). We, therefore, also recommend (1) monitoring population abundance and survival to document the rate of re-colonization of the

watershed by White Salmon River steelhead, and (2) evaluating priority habitat restoration actions in the area formerly occupied by the Condit Dam Reservoir.

- A detailed accounting, compilation, and analysis of the extent of habitat actions with reference to the priority reaches called for in section 10 of the 2009 Oregon Management Unit Plan to track progress against the plan objectives.

John Day River MPG

1) Key Emergent or Ongoing Habitat Concerns

New information available since the last status review did not identify any new key emergent habitat concerns in the John Day River MPG. Although the North Fork John Day River population is rated highly viable (NWFSC 2015), there remain a number of opportunities in the North Fork John Day to increase natural production through additional habitat work, including protection of habitats that support production. The 2009 Recovery Plan identified stream flow as the primary habitat issue of concern in the John Day River watershed along with targeted restoration of stream function (structure and floodplain connectivity) and associated riparian conditions.

2) Specific Areas of Concern

There is no additional information available since the previous status review that identifies specific new habitat areas of concern for steelhead in the John Day River MPG. The primary habitat issues of concern in the John Day River watershed are stream flow (particularly in the lower John Day River), along with targeted restoration of stream function (structure and floodplain connectivity) and associated riparian conditions.

3) Key Protective Measures and Major Restoration Actions

Since adoption of the Recovery Plan in 2009 where the Oregon Management Unit portion of the Recovery Plan identified high priority watershed reaches within each population for key habitat strategies, considerable effort has been expended in addressing habitat issues in the John Day River MPG. Future status assessments would benefit from a systematic review and analysis of the amount of habitat addressed against those high priority watershed reaches specified in the 2009 Recovery Plan.

Within the lower John Day River watershed, 3,829 acres have been acquired to protect habitat, 38 barriers were removed which made an additional 293 stream miles accessible, 40 fish diversions were screened, 44 stream miles were treated to improve habitat complexity, 3,955 acres of riparian habitat were treated or protected, 12 irrigation systems were improved, and 243 water/sediment control structures were installed since the previous NMFS 2011 5-year status review (ODFW 2015e). However, the effectiveness of the irrigation projects in improving stream flow is unknown.

The priority areas for habitat improvement identified in the Recovery Plan (NMFS 2009b) are located upper portion of the lower John Day River. We suspect that additional actions have been implemented in these habitats. However, at this time we do not have information available that

would allow us to identify the key protective measures or major restoration activities for the upper portion of the lower John Day River.

4) Key Regulatory Mechanisms

The NMFS 2009 Recovery Plan (NMFS 2009b) and the previous 5-year status review did not identify regulatory mechanisms as a priority issue affecting salmon recovery for any of the watersheds within the John Day River MPG. Various federal, state, county and tribal regulatory mechanisms are in place to minimize or avoid habitat degradation caused by human use and development. Many of these mechanisms have been improved and updated in the past 5 years, such as Oregon's 2012 Integrated Water Resource Strategy to further restore and protect streamflow throughout the state. See Listing Factor D: Adequacy & Inadequacy of Regulatory Mechanisms and Protective Efforts in this document for details.

5) Recommended Future Actions

The greatest opportunity to advance recovery of MCR steelhead in the John Day River MPG is to:

- Increase flows in the John Day River watershed, along with targeted restoration of stream function (structure and floodplain connectivity) and associated riparian conditions, and
- Systematically analyze the amount of habitat addressed by recovery actions against those watershed reaches identified in the 2009 recovery plan as high priorities.

Yakima River MPG

1) Key Emergent or Ongoing Habitat Concerns.

- The Yakima River Upper Mainstem population does not meet spatial structure criteria identified in the Recovery Plan, due to fish passage barriers in Manastash Creek, the Cle Elum River, and multiple tributaries in the Wilson-Cherry watershed (YBFWRB 2015). Other dams within the basin block potential habitat for fish, reducing abundance even in areas that meet spatial structure criteria.
- Productivity and life history diversity of all four Yakima River populations are negatively affected by the Bureau of Reclamation Yakima Project's infrastructure and operations due to the Project's impacts on mainstem flows regimes, the physical impacts of diversions on juveniles and smolts, and associated changes in predation rates (YBFWRB 2015).
- Habitat conditions and reduced instream flows reduce the productivity of many steelhead-producing tributaries in the Yakima River basin, including Manastash, Cowiche, Ahtanum, Swauk, and Teanaway (YBFWRB 2015).
- Loss and simplification of floodplain habitats in the Yakima River basin have reduced the availability of productive mid and lower elevation rearing habitat for steelhead (YBFWRB 2015).

2) Specific Areas of Concern

- Yakima Project operations primarily impact the mainstem Yakima, Naches, lower Cle Elum, Bumping, and Tieton rivers. Improving survival and productivity of all life stages in these reaches is essential (YBFWRB 2015). Specific issues to address include:
    - High smolt mortalities due to reduced spring flows;
    - Reduced rearing success due to low winter flows below reservoirs;
    - Impacts on rearing juveniles due to altered summer flows.
- Lack of fish passage in Manastash Creek, the Cle Elum River, and multiple tributaries in the Wilson-Cherry watershed prevents the Yakima River Upper Mainstem population from meeting spatial diversity criteria (YBFWRB 2015).
- Floodplain habitat issues are concentrated in mainstem reaches of the Yakima River, including the Kittitas, Gap to Gap and Wapato floodplains, in the Naches River, and in the valley floor reaches of priority tributaries including the Cle Elum River, Taneum Creek, the Teanaway River, Cowiche Creek, the Little Naches River, Ahtanum Creek and others (NMFS 2014b; YBFWRB 2015).

3) Key Protective Measures and Major Restoration Actions.

Since adoption of the Recovery Plan in 2009, and issuance of the 2011 5-year status review, considerable effort has been expended in addressing flow and passage issues in the Yakima River MPG:

- The U.S. Bureau of Reclamation and Washington State Department of Ecology approved the Yakima Basin Integrated Water Resource Management Plan in 2012 (U.S. Bureau of Reclamation and Washington State Department of Ecology 2011, 2012; YBFWRB 2015). The plan is a $4 billion, 30-year effort focused on improving fish habitat while also meeting the water demands of Washington's agricultural industry. The Plan was developed cooperatively between FWS, NMFS, U.S. Bureau of Reclamation (BOR), U.S. Forest Service (USFS), the State of Washington, the Yakama Nation, the Yakima Basin Fish and Wildlife Recovery Board, Benton, Kittitas, and Yakima Counties, the City of Yakima, the Yakima Basin irrigation districts, and environmental interest groups. Funding for the program comes from State and Federal sources (YBFWRB 2015). The fish passage and habitat elements of the plan are directly benefiting steelhead, and the planned improvements in water management infrastructure and operations have the potential to improve instream flow conditions.
- Yakima County continues to lead a large number of partners, including NMFS, in the Gap-to-Gap process in the middle Yakima River and the Naches River to remove or set back levees and open significant areas of floodplain to improve floodplain function, allow more channel migration and creation of off-channel habitat (as well as improving flood protection) (Anchor QEA 2014; NMFS 2014b; YBFWRB 2015).

- In Manashtash Creek, a conceptual watershed restoration plan has been developed collaboratively by the Kittitas County Conservation District, Washington Environmental Council, and the Kittitas County irrigators that will address passage barriers, stranding, and flows affected by existing irrigation projects (Bureau of Reclamation 2013; http://www.kccd.net/manastash.htm). Phase I of the plan includes consolidation and reconstruction of the major water diversions on Manastash Creek to eliminate manmade barriers or impediments to fish passage and all unscreened diversions. Phase 1 is nearing completion. Phase II includes the restoration of natural summer/fall flows in the lower part of Manastash Creek while protecting the 'vested' water rights of the Manastash Creek water users (YBFWRB 2015).

- The Cowiche Creek (tributary to the Naches River) irrigation project was completed in 2014 (http://scc.wa.gov/wp-content/uploads/2014/08/CowicheCreekCRM_FINAL.pdf; http://www.westcoast.fisheries.noaa.gov/publications/recovery_planning/salmon_steelhead/domains/interior_columbia/middle_columbia/mid-c-cowiche.pdf). Under this project, members of Cowiche Creek Water Users Association switched withdrawals from Cowiche Creek and began receiving their irrigation water from the Tieton River through the Yakima-Tieton Irrigation District irrigation system, leaving as much as 8 cfs in Cowiche Creek during the low-flow season. Habitat restoration actions in the subwatershed include removal of four passage barriers (opening 20 miles of habitat), screening of two gravity diversions and 18 pumps (http://scc.wa.gov/wp-content/uploads/2014/08/CowicheCreekCRM_FINAL.pdf; http://www.westcoast.fisheries.noaa.gov/publications/recovery_planning/salmon_steelhead/domains/interior_columbia/middle_columbia/mid-c-cowiche.pdf; YBFWRB 2015).

- Recent studies indicate that reservoir management and diversion practices by the BOR at Roza Dam (Yakima River) cause a significant drop in flows below Roza Dam just at the time that juveniles are trying to migrate downstream and out of the basin significantly increasing smolt mortality (Courter et al. 2015). As a result, the BOR has informally agreed to reduce the spring freshet impacts by reducing hydro production at the Roza Dam (Upper Yakima Basin) facility in April and May (YBFWRB 2015).

4) Key Regulatory Mechanisms

Various federal, state, county and tribal regulatory mechanisms are in place to minimize or avoid habitat degradation caused by human use and development. Many of these mechanisms have been improved and updated in the past five years. However, 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

- Additional fish passage barriers should be fixed to allow the Yakima River Upper Mainstem population to meet its spatial structure goals (YBFWRB 2015). This will require:
    - Restoration of full passage in Manastash Creek (work due to be completed in 2016)

  - Restoration of access to the Upper Cle Elum (in design phase) and or Wilson/Naneum watershed
  - Maintenance of access in currently accessible areas. Recent data highlights the need to monitor, evaluate and improve passage facilities at Easton and Nelson Dams.

- Survival of outmigrating juveniles and smolts through the mainstem Yakima and lower Naches Rivers needs to be improved to increase the productivity of all four Yakima River steelhead populations (YBFWRB 2015). The two primary strategies for doing so are to:
  - Manage flows and infrastructure at the Bureau of Reclamation's Yakima Project diversions and other diversions in a manner that supports high survival rates for steelhead juveniles and smolts; and,
  - Restore complex floodplain habitats in mainstem reaches (Wapato, Gap to Gap, Lower Naches, Kittitas, and Cle Elum reaches as focal areas);
- Continued work is needed to protect and enhance instream flows throughout the basin. Focal areas should include the Teanaway watershed, Manastash Creek, Ahtanum Creek, and Toppenish Creek (YBFWRB 2015).
- Ongoing tributary habitat restoration and protection should be sustained to ensure that ample and productive spawning and juvenile rearing habitat is available for steelhead (YBFWRB 2015).
- Local, state and federal governments and stakeholders should to continue to work together to ensure that existing voluntary and regulatory programs are adequately protecting habitat for MCR Steelhead (YBFWRB 2015).

Walla Walla and Umatilla Rivers MPG

1) Key Emergent of Ongoing Habitat Concerns

The last 5-year review concluded that the greatest opportunity to advance recovery in the Walla Walla and Umatilla Rivers MPG would be to increase flows and identified reducing water temperatures and removal/improvement of passage barriers as priority actions. Stream flow and water temperature continue to be a concern as do passage barriers that could be improved to provide access to upstream habitats.

2) Specific Areas of Concern

Many issues related to the assessment of population abundance, distribution and survival remain unchanged since the last review. The success of implemented projects has not been assessed. The factors limiting fish production and the priority restoration areas are described in the 2011 Recovery Plan (SRSRB 2011). The highest priorities remain to be passage at major barriers (Bennington Dam, Mill Creek flood control channel, and Nursery Bridge), low flow and water temperature.

3) Key Protective Measures and Major Restoration Actions

Since adoption of the Recovery Plan in 2009, and the previous 2011 5-year status review, considerable effort has been expended in addressing habitat issues in the Walla Walla and Umatilla Rivers MPG:

Within the Umatilla River watershed, 5.60 average cfs (cubic feet per second) of streamflow was protected instream and 11 irrigation systems improved for irrigation efficiency; 12 barriers were improved for fish passage making 61.73 stream miles of habitat accessible to anadromous fish; 6 fish screens were installed on diversions (ODFW 2015f).

Within the Walla Walla River watershed, 3 barriers improved for fish passage providing access to 73 stream miles, 1 riparian acre along 20 stream miles were treated or protected, 7 average cfs of streamflow were protected instream, and 86 irrigation systems were improved for irrigation efficiency (ODFW 2015g). ODFW completed an inventory of fish passage barriers in the Birch Creek watershed. The Umatilla Agricultural Water Quality Management Area Plan was revised in 2015 (Umatilla Land Advisory Committee and Oregon Department of Agriculture 2015).

Within the Washington portion of the Walla Walla River watershed, passage improvements were made at 10 discrete sites within Mill Creek as well as in Titus and Yellowhawk Creeks. More than 10 fish screens were installed and roughly 20 cubic feet of water was leased to remain instream (http://hws.ekosystem.us/).

Within the Touchet River watershed, fish passage improvements were made at Ireland Gulch, Jim Creek, and at three sites in the north Touchet River making 10 stream miles of habitat accessible to anadromous fish. Fish screens were installed at multiple diversions and three irrigation systems improved for irrigation efficiency http://hws.ekosystem.us/.

4) Key Regulatory Mechanisms

The NMFS 2009 Recovery Plan (NMFS 2009b) and the previous 5-year status review did not identify regulatory mechanisms as a priority issue affecting salmon recovery for any of the watersheds within the Walla Walla and Umatilla Rivers MPG. Various federal, state, county and tribal regulatory mechanisms are in place to minimize or avoid habitat degradation caused by human use and development. Many of these mechanisms have been improved and updated in the past 5 years, including Oregon's new 2012 Integrated Water Resource Strategy to further restore and protect streamflow throughout the state and updated shoreline master plans and critical areas ordinances plans in Washington. See Listing Factor D: Adequacy & Inadequacy of Regulatory Mechanisms and Protective Efforts in this document for details.

5) Recommended Future Actions

- Continue U.S. Army Corps of Engineers' (Corps) and fisheries co-managers' implementation of flow and passage improvements in the Umatilla, Walla Walla and Touchet Rivers -- specifically Bennington Dam, Mill Creek channel, and Nursery Bridge.

- Provide passage (1) over McKay Dam, a high priority passage action identified by the State of Oregon (Oregon's 2013 Statewide Fish Passage Priority List)

(http://www.dfw.state.or.us/fish/passage/), and (2) up Mill Creek, a tributary to the Walla Walla River to achieve spatial structure goal for summer-run steelhead (SRSRB 2011).

- Support development and implementation of a long-term study and design for passage and adequate flood risk reduction in the Nursery Bridge – Milton-Freewater OR levee system.
- Implement priority actions identified in the recovery plan (NMFS 2009b) that will reduce water temperature in the MPG.
- Implement key habitat status/trends and habitat restoration effectiveness monitoring to address key habitat status and trends and habitat restoration effectiveness.
- Assess impacts of Boyd Hydroelectric Project on migration, spawning, and habitat use and evaluate the potential to decommission the dam.
- Implement a comprehensive research and monitoring program to address population abundance and survival, success of implemented recovery actions, and basic understandings of the factors limiting fish production in the MPG.

DPS Summary

The risk to the species' persistence because of habitat destruction or modification has improved since the last status review. However, major habitat concerns remain in this DPS particularly with regard to (1) passage barriers, particularly at dams, in the Deschutes River, Walla Walla and Umatilla Rivers MPG, and Yakima River MPG, (2) stream flow in the John Day River MPG and Yakima River MPG, and (3) water temperature in the Walla Walla and Umatilla Rivers MPG.

Listing Factor A Conclusion

New information available since the last status review indicates there is improvement in freshwater and estuary habitat conditions because of restoration, habitat protection, and additional habitat made available by removal of Condit Dam in October 2011-2012. In particular, changes to hydropower operations have increased juvenile survival rates through the mainstem Columbia River corridor. Improvements to fish passage and numerous tributary habitat restoration projects should result in improved survival for this DPS. We therefore conclude that the risk to the species' persistence because of habitat destruction or modification has improved slightly since the last 2011 status review. However, future 5-year assessments would benefit from a systematic review and quantitative analysis of the amount of habitat addressed versus the priority watershed reaches targeted for protection and restoration activities in the 2009 recovery plan in order to track progress against plan objectives. Habitat concerns remain in several subbasins of this DPS, particularly with regard to passage barriers, stream flow, and water temperature in areas that exceed water quality standards due to anthropogenic causes. There remain numerous opportunities for habitat restoration or protection throughout the range of this DPS. Additional habitat protection or restoration actions are necessary to bring this DPS to viable status.

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

Harvest

Over the past five years, harvest rates of MCR steelhead have remained relatively stable. The overall exploitation rate remained less than 10 percent for all fisheries combined, although higher rates of harvest are reported for some populations (TAC 2011-14). The May 2008 *U.S. v. Oregon* Management Agreement (2008-2017) has, on average, maintained reduced harvest impacts to this DPS (TAC 2011-14).

Research and Monitoring

Much of the scientific research and monitoring being conducted for MCR steelhead 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% of any PNW ESA-listed salmonid ESU/DPS. In 2014, researchers were approved to take up to 149,220 naturally produced juvenile MCR steelhead with a 2.43 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% of requested take and 11.07% of requested mortalities were used in PNW Section 10a1A permits from 2008 to 2014). The majority of the requested nonlethal take of juvenile steelhead has been and is expected to continue to be captured with screw traps, electrofishing units, beach seines, fyke nets, and hook and line (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 and steelhead 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 DPS, the potential mortality levels are typically low. These effects would be spread out over various channels and tributaries of the middle Columbia River basin. 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.

The quantity of permits issued over the past five years has been mostly consistent with the prior five years; however, the overall effect on listed populations has not changed substantially.

Therefore, we conclude that the risk to the species' persistence because of utilization related to scientific studies remains essentially unchanged since the Ford et al. 2011 status review.

Listing Factor B Conclusion

New information available since the last status review indicates that the current *U.S. v. Oregon* Management Agreement (2008-2017) has, on average, maintained reduced harvest impacts for MCR steelhead fisheries (TAC 2011-14). However, research impacts have increased slightly (NMFS APPS database; https://apps.nmfs.noaa.gov/). The risk to the species' persistence because of overutilization remains essentially unchanged since the 2011 five-year status review with harvest and research/monitoring sources of mortality continuing to impede the rate of recovery for the MCR Steelhead DPS.

Listing Factor C: Disease and Predation

Predation

A Columbia River Basin-wide assessment of avian predation on juvenile salmonids indicates that the most significant impacts to smolt survival occur in the Columbia River estuary (Collis et al. 2009). Although actions to reduce avian predation in the Columbia River Basin have been ongoing with implementation of the Federal Columbia River Power System (FCRPS) Biological Opinion (Opinion), high levels of avian predation by Caspian terns and double-crested cormorants continue to affect the MCR steelhead DPS. Further, predation remains a concern because of a general increase in pinniped populations along the West Coast. Non-indigenous fish affect salmon and their ecosystems through many mechanisms.

Caspian Terns

The NMFS' 2008 FCRPS Opinion recommended that the Action Agencies implement the Caspian Tern Management Plan (Reasonable and Prudent Alternative (RPA) Action 45) to substantially reduce this species' nesting habitat and salmonid predation rates in the Columbia River estuary by 2018. The plan calls for reductions in nesting habitat for Caspian terns at East Sand Island in the lower estuary, concurrent with the development of alternative nesting habitat elsewhere in the interior Northwest and along California coast (i.e., outside the Columbia River basin) (NMFS 2014a). To date, nine alternative nesting habitat islands totaling 8.3 acres have been constructed at interior locations, but no coastal sites have been developed. Tern nesting habitat on East Sand Island has been reduced from 6 acres down to a current 1.58 acres, which has reduced the colony from a pre-management level of about 9,000 pairs to 6,000 to 6,500 pairs. However, this is short of the reduction to 3,500 to 4,000 pairs that was anticipated by the management plan and assessed in the 2008 Opinion's analysis (NMFS 2014a).

Double-crested Cormorants

The number of double-crested cormorants nesting in the Columbia River estuary has increased from about 150 pairs in the early 1980s to 11,000 to 13,500 pairs, with most of the increase occurring over the past 10 years (Appendix E in NMFS 2014a). Consumption rates of juvenile salmon and steelhead also increased during this period; in 2006, double-crested cormorants probably consumed more than 4 percent of the juvenile yearling Chinook salmon and about 13

percent of the juvenile steelhead in the lower Columbia River. In the 2014 FCRPS Supplemental Opinion, NMFS therefore recommended that the Action Agencies develop a cormorant management plan and implement actions to reduce cormorant numbers to no more than 5,380 to 5,939 nesting pairs on East Sand Island (RPA Action 46). The Corps completed a Cormorant Management Environmental Impact Statement and Management Plan in early 2015 and began implementation on East Sand Island in late May by culling adults and oiling eggs.

Pinnipeds

Status of Pinnipeds Populations in Oregon and Washington

Pinniped predation continues to remain a concern for listed species in Oregon and Washington due to a general increase in pinniped populations along the West Coast. For example, California sea lions have increased at a rate of 5.4 percent per year between 1975 and 2011 (NMFS 2015b), Steller sea lions have increased at a rate of 4.18 percent per year between 1979 and 2010 (Allen and Angliss 2014), and harbor seals likely remain at or near carrying capacity in Washington and Oregon (Jefferies et al. 2003, Brown et al. 2005, respectively, as cited in NMFS 2014c).[2]

Columbia River Basin

In the Columbia River Basin, there has been a steady influx of pinnipeds (Figure 2), especially California sea lions, over the past 5 years with sharp increases in California sea lion presence in 2013 of 750 animals, 1,420 animals in 2014,[3] and 2,340 animals in 2015.[3]

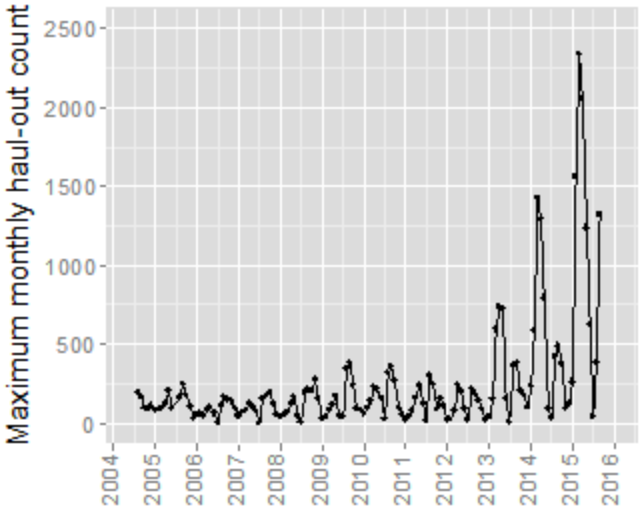

Figure 2. Estimated peak counts (spring and fall) of California sea lions in the East Mooring Basin in Astoria, Oregon, 2004 through 2015.[3]

[2] The last population estimates of harbor seals in Washington (coastal population) and Oregon was in 2003 and 2005 (Jefferies et al. 2003, Brown et al. 2005, respectively, as cited in NMFS 2014c), when the population growth rate was estimated at 7 percent (NMFS 2014c).

[3] E-mail to Robert Anderson, NMFS, from Bryan Wright, ODFW, October 28, 2015.

As pinniped numbers have increased in the Columbia River Basin over the past 13 years (2002 through 2014), more than 40,000 fish from listed and non-listed salmon and steelhead stocks (listed stocks: Upper Columbia River spring-run Chinook salmon, Snake River spring/summer-run Chinook salmon, Upper Columbia River steelhead, Snake River Basin steelhead, Middle Columbia River steelhead; non-listed stocks: Middle Columbia River spring-run Chinook salmon, Upper Columbia River summer-run Chinook salmon, Deschutes River summer-run Chinook salmon) have been consumed by California sea lions in the vicinity of Bonneville Dam (Stansell et al. 2014). Most, but not all, California sea lions leave Bonneville Dam by the end of May, and there have been a handful that have taken residence in the area between Bonneville Dam forebay and The Dalles Dam. All up-river stocks are subject to pinniped predation in the vicinity of Bonneville Dam, although it is the spring-run stocks that are at greatest risk.

The states of Oregon, Washington and Idaho are operating under a Marine Mammal Protection Act Section 120 authorization, that allows for the lethal removal of CA sea lions that are individually identifiable and observed to be having a significant negative impact on ESA-listed salmonids at Bonneville Dam, to address the threat of predation by California sea lions in the vicinity of Bonneville Dam. Between 2008 and 2014 this program has prevented the loss of between 7,000 and 24,000 salmonids at Bonneville Dam (Wright et al. 2015).

Ongoing research in the Columbia River (Wargo Rub et al. 2014)[4] suggests that 10 to 45 percent of the returning adult salmon are unaccounted for during the 146 mile migration between the Columbia River estuary and the Bonneville Dam, at the time when the California sea lions are present in the Columbia River in large numbers. If California sea lions are in fact responsible for a substantial fraction of this estimated loss, then this additional source of pinniped predation (in addition to documented predation at Bonneville Dam) may represent a significant shift in the severity of pinniped predation to the recovery of listed Columbia River Basin salmon and steelhead stocks, in addition to anthropogenic threats (e.g., impacts from habitat loss, dams, etc.).

Additionally, California sea lions numbers over the past five years at Willamette Falls, 28 miles south of the confluence of the Willamette and Columbia Rivers at Portland, Oregon, have been steadily increasing and their predation on listed salmonid stocks has reached significant levels (Brown et al. 2015). In the late winter and spring months of 2014 and 2015, some 25-50 California sea lions consumed between 8-14 percent of the listed spring-run Chinook salmon and winter-run steelhead, respectively, attempting to pass the falls to upriver spawning areas (Wright et al. 2015).

The effect of marine mammal predation on the productivity and abundance of Columbia River Basin salmon and steelhead stocks has not been quantitatively assessed at this time. The absolute number of animals preying upon salmon and steelhead throughout the lower Columbia River and Willamette River is not known. In addition to pinniped predation on salmonids, this steady influx

[4] Wargo Rub, A.M. October 2014. Preliminary report on survival and run timing of adult spring/summer Chinook salmon through the lower Columbia River to Bonneville Dam. PowerPoint presentation to Northwest Power and Conservation Council (October 27, 2014).

of pinnipeds into the Columbia River may also represent a threat to other species, such as eulachon. For example, in 2015 Washington Department of Fish and Wildlife (WDFW)[5] estimated, based on biomass reconstruction for eulachon consumption, that harbor seals were consuming an estimated 2,700,000 eulachon per day in the Columbia River estuary.

The information available since the last status review clearly indicates that predation by pinnipeds on listed stocks of Columbia River Basin salmon and steelhead, as well as eulachon, has increased at an unprecedented rate. So while there are management efforts to reduce pinniped predation in the vicinity of Bonneville Dam, this management effort is insufficient to reduce the severity of the threat, especially pinniped predation in the Columbia River estuary (river miles 1 to 145), and at Willamette Falls.

Recommendations

- Expand monitoring efforts in the Columbia River and Willamette River to assess predator-prey interactions between pinnipeds and listed species.
- Maintain predatory pinniped management actions at Bonneville Dam to reduce the loss of up-river listed salmon and steelhead stocks.
- Complete life-cycle/extinction risk modeling to quantify predation rates by predatory pinnipeds on listed salmon and steelhead stocks in the Columbia River and Willamette River.

Indigenous and Non-indigenous Fish

A sport fishing reward program was implemented in 1990 to reduce the numbers of the indigenous Northern pikeminnow in the Columbia River Basin (NMFS 2010). The program continues to meet expected targets, which may reduce predation on smolts in the mainstem Columbia River.

A number of studies conclude that many established non-indigenous species (including to smallmouth bass, channel catfish, and American shad) pose a threat to the recovery of ESA-listed Pacific salmon. Threats are not restricted to direct predation; non-indigenous species compete directly and indirectly for resources, significantly altering food webs and trophic structure, and potentially altering evolutionary trajectories (Sanderson et al. 2009; NMFS 2010). WDFW has lifted limits on bass and catfish in the Columbia River in an effort to reduce predator populations. See http://wdfw.wa.gov/fishing/regulations/ that list the lack of a catch limit on these species.

Disease

Disease rates over the past five years are believed to be consistent with the previous review period. A strain of infectious haematopoietic necrosis virus (IHNV) was detected on the Pacific Coast, which originated in the Columbia River, and was reported in the last status review but has not be detected on the Pacific Coast since 2011. There was concern that this strain of IHNV

[5] E-mail (forwarded) to Robert Anderson, NMFS, from Brent Norberg, NMFS, on February 19, 2015, from Steven Jefferies, WDFW, regarding sea lion counts in Astoria, Oregon.

would be more virulent and increase the spread of the infection, but these concerns have not been borne out as IHNV reports in the basin have declined in the past few years. These fluctuations in the in disease rates are considered normal but current high water temperatures and low water flows, associated with climate change effects, could exacerbate conditions that can lead to increase disease rates, affecting MCR steelhead.

Listing Factor C Conclusion

New information available since the last status review indicates there is an increase in the level of avian and pinniped predation on MCR steelhead. At this time we do not have information available that would allow us to quantify the change in extinction risk due to predation. We therefore conclude that the risk to the species' persistence because of predation has increased by an unquantified amount since the last status review. The disease rates have continued to fluctuate within the range observed in past review periods and are not expected to affect the extinction risk of the DPS.

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. 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

Mainstem Hydrosystem Improvements (including Middle-Columbia River Public Utility Districts)

Implementation of the FCRPS Opinion (NMFS 2008a; NMFS 2010) provided a number of actions aimed at survival improvements, including reduced duration of outmigration to the estuary, improvements in juvenile survival and condition, and increased access to habitats. We subsequently developed a 2014 Supplemental FCRPS Opinion to address a 2011 Court Remand Order requiring us to re-examine the 2008 and 2010 biological opinions and more specifically identify habitat actions planned for the 2014-2018 period of the opinion. We adopted the 2014 Supplemental FCRPS Opinion on January 17, 2014 (NMFS 2014a).

The Middle Columbia River Steelhead Recovery Plan (NMFS 2009b) identified the existence and operation of dams in the spawning tributaries and the mainstem Columbia River migration corridor as threats to the survival and recovery of the DPS. The most significant changes in conditions at tributary projects have taken place at Portland General Electric's Pelton Round Butte Project on the Deschutes River and PacifiCorp's Condit Dam on the White Salmon River (PacifiCorps 2012a, b). In the mainstem Columbia River, the four run-of-the-river projects that are part of the FCRPS reduce the survival of juvenile and adult salmonids compared to a free-flowing reach. In each case, the operations, and to some extent the configuration at these dams are adjusted to protect listed steelhead through consultation with the operators (the Federal

Energy Regulatory Commission in the case of the privately owned dams and the Corps, Bonneville Power Administration, and the U.S. Bureau of Reclamation in the case of the FCRPS) as described in NMFS' biological opinions. The recent changes at these dams that are likely to have affected the status of the MCR species are described in the following sections.

Improvements in Operations and Fish Passage at Federal Energy Regulatory Commission-licensed Hydropower Facilities and Dams

The implementation of the RPAs in the 2008 FCRPS Opinion (NMFS 2008a), as amended in 2010 (NMFS 2010) and supplemented in 2014 (NMFS 2014a), has provided a number of actions that are improving the survival and condition of salmon and steelhead migrants through the mainstem Columbia River:

- Flow management from storage reservoirs
- Increased spill levels at McNary and John Day dams
- Operations and maintenance activities to maintain biological performance
- Piscivorous fish, avian, and pinniped predation control measures

Changes in the life-cycle productivity of MCR steelhead, as updated in this status review, were affected by alterations to the FCRPS since about 2005. Studies show that the direct survival of juvenile steelhead outmigrating from mid-Columbia River populations has increased because of the installation or improvement of juvenile passage structures: surface passage routes and spillway weirs at McNary Dam in 2007, two surface passage weirs at John Day Dam in 2008, spillway wall at The Dalles Dam in 2010, and a new outfall for the Juvenile Bypass System at McNary Dam in 2012. Juvenile and adult passage facilities at mainstem dams are the subject of ongoing testing for passage survival and behavioral responses with the results informing further changes to facility design and project operations under the principle of adaptive management.

The 2008 FCRPS Opinion also set up an offsite mitigation program that includes habitat restoration below Bonneville Dam. These projects are designed to reconnect portions of the historical floodplain that have been isolated behind dikes and levees for many years. Middle Columbia River steelhead are expected to benefit from increased flux of insect prey from the river margins to the mainstem migration corridor (Diefenderfer et al. 2013).

Deschutes Basin Passage Improvements:

- Pelton Round Butte, Selective Water Withdrawal Facility: In the first year of operations, 2010, the facility and operations adjusted the management of water flow and temperature to better resemble historical conditions, as required by the new Federal Energy Regulatory Commission license, state 401 water quality certification, and the Warm Springs Tribes' water quality certification. These adjustments in flow and temperature management are primarily targeted to benefit Chinook salmon populations, but to date, specific benefits to Deschutes River steelhead production are unknown. Habitat and passage improvements in Trout Creek, also part of the Pelton Round Butte re-licensing agreement, are expected to benefit the Deschutes River Eastside steelhead population.

- Fish Reintroduction: Outplants in Wychus Creek, Crooked River and the Deschutes River of fry from the Round Butte hatchery stock above Pelton Round Butte are intended to re-establish populations to a large portion of their historic habitat. The number of juvenile migrants collected at the selective water withdrawal facility has declined since starting operations in 2010 and the licensees are analyzing possible issues and solutions. Nevertheless, adult steelhead from the reintroduction program are returning with 32 adults recorded during the 2011-2012 return season (first season of adult returns from the reintroduction above Pelton Round Butte), 133 adults for the 2012-2013 adult return season, and 96 adults for the 2014-2015 adult return season (Hill et al. 2014; PGE and CTWSRO 2012 and 2014).

Condit Dam Removal:

Condit Dam, a 125-foot high concrete gravity structure, was completed in 1913 on the White Salmon River (river mile 3.3) near White Salmon, Washington. The dam was initially built to supply power to the Crown Willamette Paper Company in Camas, Washington and could generate up to about 14 megawatts of electricity. The original construction included a wooden fish ladder that was damaged by floods in 1914 and again in 1918. The ladder was not restored after the 1918 event. An experimental fish elevator was constructed in 1925 but it failed and that effort was abandoned. Thus, fish had not passed the project since 1918 and nearly 33 miles of historic steelhead habitat was cut off (PacifiCorp 2011).

In 1999, PacifiCorp, Federal and state agencies, Tribes, and non-governmental organizations reached an agreement to remove the dam and appurtenant facilities. Beginning in September 2011, PacifiCorp excavated a large tunnel through the base of the dam. On October 26, 2011, PacifiCorp breached the last 10 feet of concrete at the upstream end of the tunnel with explosives and drained the reservoir. The original cofferdam used during construction was left on the riverbed and subsequently encased in reservoir sediments. Even though fish could migrate through the new tunnel in the dam, the cofferdam prevented migration beyond the project site. PacifiCorp removed the cofferdam on April 24, 2012, restoring full passage to historic habitat on the mainstem White Salmon River (PacifiCorp 2012a, b). In mid-July, 2012, Yakama Nation staff observed adult steelhead jumping at Husum Falls and BZ Falls well upstream of Condit Dam (pers. comm., Jeanette Burkhardt, Biologist, Yakama Nation, July 18, 2012).

As Condit Dam and associated facilities were being razed, PacifiCorp and its contractors restored much of the new bank line in the old reservoir reach to its original contours and conducted extensive planting with native grasses, shrubs and trees. Engineered log jams were installed at various locations to reduce erosion. Demolition of the dam continued until September 14, 2012, when all in-water work was completed and the dam was fully removed (PacifiCorp 2012a, b).

FCRPS Biological Opinion Tributary Habitat Restoration Program

The RPAs in the 2008 FCRPS Opinion (NMFS 2008a) incorporate a process by which the Action Agencies are to identify and implement tributary habitat improvement actions sufficient to meet specific habitat quality—and associated survival—improvements for 56 populations of salmon and steelhead in the Interior Columbia River Basin. The technical foundation of the program is a method for estimating the changes in habitat function that are reasonably certain to

result from implementation of habitat improvement actions and the corresponding changes in fish survival that are reasonably certain to occur as the productive capacity of habitat changes.

The Action Agencies have evaluated survival benefits expected for each population from actions implemented under the FCRPS Opinion RPA through 2011, as well as the total benefits projected from past actions and those planned for implementation through 2018. NMFS has determined that it is reasonably certain that benefits for all 56 populations will meet or exceed Opinion's requirements (NMFS 2014a). For Middle Columbia River steelhead populations, tributary habitat performance standards in the 2008 FCRPS Opinion RPA were relatively low (NMFS 2008a). Survival benefits projected from implementation of actions under the FCRPS tributary habitat program for populations in this DPS are 4 percent for populations in the Yakima River and Walla Walla and Umatilla Rivers MPGs, and 1 percent for all populations in the John Day River and Cascades Eastern Slope Tributaries MPGs, with the exception of the Klickitat River population, for which a 4 percent survival improvement is projected.

While in some cases these projected survival improvements are significant and will no doubt contribute to long-term recovery of the four MPGs in the MCR Steelhead DPS, it is important to note that the survival improvements generally are well below the survival improvements needed to achieve the basic biological criteria for MPG and DPS viability (Subsection 2.2.3 of this document: List the Recovery Criteria as They Appear in the Recovery Plan).

FCRPS Biological Opinion Research, Monitoring and Evaluation

The FCRPS Action Agencies are implementing a comprehensive fish population and habitat research, monitoring, and evaluation (RME) program under the 2008 FCRPS Opinion and its 2010 Supplement (NMFS 2008a; NMFS 2010). Major program components include:

- Monitoring to evaluate fish response to the aggregate effects of multiple habitat actions at the watershed or population scale through the use of intensively monitored watersheds (IMWs). Under the Opinion, IMWs are underway in the Entiat, Methow, John Day, and Lemhi Rivers. In addition, IMWs funded by NMFS are underway in Asotin Creek, the upper Middle Fork John Day River, and the Potlatch River. IMWs have robust experimental design, including data of sufficient quantity, duration, spatial scale, and resolution, to detect change despite environmental variation.

- Habitat status and trends monitoring (under the Columbia Habitat Monitoring Program, or CHaMP) strategically paired with adult and juvenile fish status and trends monitoring.[6] This monitoring will provide data to calibrate mathematical models simulating the overall effects of habitat improvements on changes in habitat condition and, in turn, the effects of these changes on fish abundance and productivity within each MPG and each ESU or DPS within the interior Columbia River basin. This information will also help detect trends in habitat condition over broader geographic scales, including effects of climate change.

[6] CHaMP monitoring is underway under the FCRPS Opinion (NMFS 2008a; NMFS 2010) in the Asotin, Entiat, John Day, Lemhi, Methow, Minam, South Fork Salmon, Tucannon, Umatilla, Upper Grande Ronde, Wenatchee, and Yankee Fork watersheds.

- Development of tributary habitat models that take advantage of advancements in habitat monitoring and fish/habitat relationships to link, both empirically and mechanistically, measures of habitat quality with fish survival. This will allow for improved estimates of the effect of changes in habitat quantity and quality on fish population trajectories as well as improved targeting of habitat restoration efforts.
- Action effectiveness monitoring to determine if actions are meeting their biological objectives and to help identify actions that most effectively address specific limiting factors.
- Implementation and compliance monitoring to verify that habitat improvement actions are completed as planned and are functioning as intended.
- This multifaceted RME approach will inform conclusions regarding habitat status and trends, fish population status and trends, fish-habitat relationships (i.e., how changes in habitat affect fish survival), fish response to various treatment types, and the effectiveness of various types of actions in addressing specific limiting factors.
- Data, analysis, and understanding regarding one population, location, or type of action can be applied appropriately to other populations and locations.
- Data from the 2008 Opinion RME program (NMFS 2014a; BPA and USBR 2013) are preliminary but appear to be supporting the working hypothesis that implementation of tributary habitat improvement actions under the RPA is contributing to improvements in fish population abundance and productivity. Results are showing the types of changes in habitat that we would expect to see, along with increased fish densities in areas treated with improvement actions (e.g., Entiat River IMW, Methow River IMW, upper Middle Fork John Day River). Results in Bridge Creek and the Lemhi River also show improved fish survival.
- Research is also establishing relationships between habitat quality and fish survival and is identifying the factors that most influence juvenile salmon and steelhead productivity. An understanding of those relationships, combined with detailed watershed and population assessments, is helping biologists and managers target the most critical habitat issues and more accurately estimate the benefits for fish. It is crucial to continue this monitoring, to expand it strategically, and to ensure that mangers use the results in planning and implementing actions.

Below are specific examples of the FCRPS Opinion's Research, Monitoring and Evaluation for Middle Columbia River steelhead:

- Habitat in the Bridge Creek watershed in the John Day River watershed has been degraded by erosion, channel incision, development, and other factors, resulting in higher water temperatures and loss of spawning and rearing habitat. Studies have shown that stabilizing a large proportion of beaver dams in the watershed has led to positive results for habitat and for fish. Relatively rapid changes in the stream channel and riparian vegetation considered favorable for fish have been documented since the dams were stabilized. Fish populations also showed changes, with steelhead abundance in the treated reaches steadily rising above that in the control reaches in the years

following the treatment. Fish survival also improved: steelhead survival had been higher in the control area preceding the treatment, but after treatment, survival in the treated reaches was higher than in the control area. The area and timing of the fish response suggests that the improvements in survival and abundance were the result of habitat improvements (NMFS 2014a).

- Yakama Nation biologists have conducted habitat surveys in the Klickitat River watershed using a new rapid aquatic-habitat survey methodology to provide information on status and trends in habitat conditions and to monitor the effectiveness of habitat projects. Habitat surveys in the upper Klickitat River focused on reaches with planned habitat improvements; pre-project surveys were completed in two reaches, and post-project surveys were also completed in one of those two reaches. In the reach with both pre- and post-project data, habitat complexity increased, pool frequency more than tripled, residual pool depths increased slightly, density of large wood not in log-jams remained similar, and large-wood jams more than doubled from pre-to post-project (NMFS 2014a).

Federal Land Management

A majority of the Middle Columbia River steelhead DPS is in private ownership (64 percent), with the remaining area under Federal (23 percent), tribal (10 percent) and state (3 percent) ownership. Most of the landscape consists of rangeland and timberland, with significant concentrations of dryland agriculture in the lower portions of major river drainages and irrigated agriculture and urban development generally concentrated in valley bottoms (NMFS 2009b).

There are four primary Federal agencies responsible for land and water management in the MCR steelhead DPS: the USFS, the Bureau of Land Management (BLM), the BOR with a major responsibility for water use in the Yakima and Umatilla subbasins, and the Corps with a significant role in flood protection.

In the MCR steelhead DPS most of the federally owned lands are high quality headwater habitats vital to the conservation of this DPS, therefore, habitat on Federally-owned and federally managed land is a major recovery priority in several MPGs. Although federally-owned lands (primarily USFS and BLM) make up only 23 percent of the range of MCR steelhead, much of that range is heavily influenced by the BOR operation and management of flows primarily for irrigation in the Yakima and Umatilla subbasins. The BOR water management protocols have resulted in non-normative flow regimes that do not benefit MCR steelhead, but rather adversely affect normal steelhead migration, spawning and rearing behavior. There is uncertainty over the future conservation of MCR steelhead on federally managed river systems and to a lesser extent federally owned land. The level of habitat protection afforded to this DPS and its habitat will be determined by the USFS and BLM land management plans currently under development and by the BOR and Corps management actions.

Extensive wildfires in Oregon and Washington (http://gacc.nifc.gov/nwcc/information/firemap.aspx) likely have affected habitat quality in burned areas. Wildfires are naturally occurring, but the frequency and intensity of fires has increased as a result of fire suppression which causes development of unnatural tree species

mixes and an unnaturally high density of trees which then results in higher than normal mortality of trees due to insect infestations and disease (Agee 1993). Management of forests to restore natural species and tree density can reduce the intensity and frequency of wildfires and subsequently reduce impacts of fire on fish habitat.

Significant opportunities exist for conservation on Federally managed rivers and federally owned lands as part of the ESA section 7(a)(1) responsibilities. NMFS will continue to work with (1) the USFS, BLM, BOR, and Corps to identify opportunities for restoration actions in the Yakima, Umatilla and Walla Walla subbasins, (2) the BOR on their operations, and (3) the Corps on its flood risk reduction practices. We will also work with these agencies to provide technical assistance for projects that benefit the MCR steelhead DPS. Initiation and completion of BOR, Corps, USFS, and BLM ESA section 7 consultations on all actions where such consultation is required is also a conservation priority.

Non-Federal Tributary Land Management

Oregon's 2010 Integrated Report and 303(d) list

In May 2011, Oregon's Department of Environmental Quality (DEQ) submitted an Integrated Report that met the requirements of the federal Clean Water Act for Sections 305(b) and 303(d) to the U.S. Environmental Protection Agency (EPA). The Integrated Report was approved and finalized in December 2012 (http://www.deq.state.or.us/wq/assessment/assessment.htm).

Washington State Use-based (e.g., aquatic life use) Surface Water Quality Standards, Washington Administrative Code (WAC) 173-201A

The 2003 standards were amended in 2006 to provide additional spawning and incubation temperature criteria of salmon, trout, and char. The standards include an Anti-degradation Policy, which was approved by the EPA in May 2007. The EPA approved the Washington State's 2008 Water Quality Assessment 305(b) report and 303(d) list in January 2009. The EPA approved Washington State's 2010 updated Water Quality Assessment 305(b) report and 303(d) list in 2012 (http://www.ecy.wa.gov/programs/Wq/303d/index.html).

Washington Shoreline Management Act (SMA), Ch. 90.58 RCW

In 1971, the Washington State Legislature passed the Washington Shoreline Management Act (SMA), adopted by public referendum in 1972. The purpose of the Act is to prevent the inherent harm in an uncoordinated and piecemeal development of the state's shorelines by requiring every county and many cities to develop a Shoreline Master Plan (SMP) to govern development in shoreline areas, including all wetlands, river deltas, and riparian areas associated with rivers, streams and lakes. The Washington State Department of Ecology promulgated more protective shoreline requirements in 2003. All counties in Washington State, and the cities within those counties, are subject to these requirements and are updating their shoreline master programs pursuant to the update schedule specified in RCW 90.58.080.

Washington Growth Management Act (GMA), Revised Code of Washington Ch. 36.70A and Critical Areas Ordinance (CAO)

As with the SMA, GMA also has an update process for city and county critical areas ordinances. Most critical areas ordinances were originally adopted following GMA's enactment in 1990/1991. The CAO are typically amended more often than shoreline master programs. Required updates continue to be implemented as required by the ordinance.

Hydraulic Code Rules, Washington Administrative Code (WAC) 220-660

The WDFW protects fish life by using its authority to provide approvals for construction or other work that might affect the flow or bed of waters of the state. The 1994 rules for this authority were amended in 2014 to substantially improve fish protection. The amended rules incorporate new science in the design and construction standards for hydraulic projects such as stream bank protection, culverts and bridges, shoreline armoring, docks and other overwater structures. These standards include using the least impacting technical feasible alternative for bank protection and shoreline armoring, designing water crossings to avoid measurably impacting expected channel functions and processes, and designing and locating overwater structures to protect fish habitats of special concerns. These habitats include spawning, feeding and rearing (refugia) areas and migration corridors.

In 2013, WDFW began monitoring new and replacement culverts on fish-bearing streams in western Washington and new and replacement marine shoreline armoring in Puget Sound. This monitoring is resulting in on-going changes to the rules, policies and procedures to improve both implementation of the current hydraulic code rules and the effectiveness of those rules to protect fish habitats.

Fish Passage Barrier Removal Board (Revised Code of Washington (RCW) 77.95.160)

In 2015, the Washington state legislature created the Fish Passage Barrier Removal Board to establish a new statewide strategy for fish barrier removal and administering grant funding available for that purpose. The legislation established several key objectives for the new strategy including:

- Coordination with all relevant state agencies and local governments to maximize state investments in removing fish barriers.
- Realizing economies of scale by bundling projects whenever possible.
- Streamlining the permitting process whenever possible without compromising public safety and accountability.

Chaired by WDFW, the board includes representatives of the Washington State Department of Transportation, DNR, Tribes, city and county governments, and the Governor's Salmon Recovery Office. In developing the statewide strategy, the board has been working closely with salmon recovery organizations to approve statewide guidelines. Highlights of the Boards work include:

- Approving two project pathways:
    - Watershed Pathway - Remove multiple barriers within a stream system.
    - Coordinated Project Pathway - Remove additional barriers upstream or downstream of a planned and funded project.
- Approving the initial focus areas for Watershed Pathway.
- Analyzing barriers submitted for Coordinated Project Pathway.

Instream Flows

- Oregon's Integrated Water Resource Strategy, a new statewide program to further restore and protect streamflow throughout the state, was initiated in August 2012 (OWRD 2012).
- The Deschutes Groundwater Mitigation Program was developed to provide for new ground water uses while maintaining scenic waterway and instream water right flows in the Deschutes Basin. The goals of the Program are to:
    - Maintain flows for Scenic Waterways and senior water rights, including instream water rights that protect water for fish habitat;
    - Facilitate restoration of flows in the middle reach of the Deschutes River and related tributaries; and
    - Sustain existing water uses and accommodate growth through new ground water development.

    Every five years the Water Resources Commission (WRC) is to evaluate the effectiveness of the Deschutes Groundwater Mitigation Program. The purpose of this evaluation is to ensure that scenic waterway and instream water right flows continue to be met on at least an equivalent or more frequent basis compared to flows within a representative base period. The second 5-year review was completed in 2014 (OWRD 2014). The report concluded that the mitigation program continues to improve summer streamflow in critical reaches and overall instream flow target continue to be met.

Harvest

Pacific Fisheries Management Council Harvest Management

Salmon fisheries in the exclusive economic zone (three to 200 miles offshore) of Washington, Oregon, and California have been managed under salmon Fishery Management Plans (FMPs) of the Pacific Fishery Management Council (PFMC) since 1977. While all species of salmon fall under the jurisdiction of the current plan (PFMC 2014), the FMP currently contains fishery management objectives only for Chinook salmon, coho, pink (odd-numbered years only), and any salmon species listed under the ESA measurably impacted by PFMC fisheries. The PFMC does have an FMP for steelhead. Incidental catches of steelhead in harvests targeting other

species are inconsequential (low hundreds of fish each year) to very rare (PFMC 2014). In the event this situation should change, management objectives for steelhead could be developed and incorporated by plan amendment.

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). Even though the current FMP does not manage for steelhead, because they are so rarely caught in ocean fisheries and retention of steelhead in non-treaty fisheries is currently prohibited, based on currently available information, NMFS has concluded that ocean fishery management actions beyond those already in place that seek to shape fisheries to minimize impacts to steelhead are not necessary (Stelle 2015).

Columbia River Harvest Management: *U.S. v. Oregon*

Harvest impacts on MCR steelhead in mainstem Columbia River fisheries and in mainstem commercial, mainstem recreational, and mainstem treaty fisheries continue to be managed under the 2008-2017 *U.S. v. Oregon* Management Agreement (NMFS 2008b). The parties to the agreement are the United States, the states of Oregon, Washington, and Idaho, and four Columbia River Treaty Tribes: Warm Springs, Yakama, Nez Perce, and Umatilla. The agreement sets harvest rate limits on fisheries impacting MCR steelhead and these harvest limits continue to be annually managed by the fisheries co-managers (TAC 2011-14). Treaty tribes, states, and federal fisheries managers have begun discussions on the development of a new *U.S. v. Oregon* Management Agreement to replace the current agreement prior to 2019. The current *U.S. v. Oregon* Management Agreement (2008-2017) has, on average, maintained reduced impacts of fisheries on the MCR steelhead DPS (TAC 2011-14), and we expect that to continue with the abundance based framework incorporated into the current regulatory regime.

Listing Factor D Conclusion

Based on the improvements noted above, we conclude that the risk to the species' persistence because of the adequacy of existing regulatory mechanisms has decreased slightly. However, despite improvement in the adequacy of regulatory mechanisms within the DPS, there remain a number of concerns regarding existing regulatory mechanisms, including:

- Lack of documentation or analysis of the effectiveness of land-use regulatory mechanisms and land-use management plans.
- Contradictory policies and/or implementation of regulations by Federal agencies. For example, one agency may take actions to improve riparian vegetation and instream habitat in one area while a short distance away, another Federal authority requires removal of vegetation and instream structures.

- Lack of reporting and enforcement for some regulatory programs.

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 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, pink, coho, sockeye 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) have 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

El Niño-Southern Oscillation (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 Impacts

Hatchery programs can provide short-term demographic benefits, such as increases in abundance, during periods of low natural abundance. They also can help preserve genetic resources until limiting factors can be addressed. However, the long-term use of artificial propagation may pose risks to natural productivity and diversity. The magnitude and type of the risk depends on the status of affected populations and on specific practices in the hatchery program.

Within the MCR steelhead DPS, hatchery programs have not changed substantially since the previous ESA status review. Those programs that were considered to be part of the DPS continue to incorporate natural-origin adults into the broodstock and are operated to conserve genetic resources. Two non-endemic hatchery programs in the Walla Walla and Touchet Rivers were evaluated under the ESA and found to not jeopardize the continued existence or recovery of the DPS. The two programs that release Skamania stock summer- and winter-run steelhead into the White Salmon River discontinued releases in 2010. Additional information is needed to assess the potential impact of hatchery-origin fish on natural production in the Klickitat Basin and the effects of hatchery strays on natural production in the Deschutes River and John Day River systems.

The Yakima Basin wild steelhead kelt program continues with up to 800 steelhead adults per year captured at the Prosser Diversion Dam. About 36 percent of the kelts reconditioned survive to spawn a second time.

Recent genetic sampling documented Rock Creek's steelhead population to be highly introgressed with the Snake River DPS – 85 percent of adult PIT-tag detections with known juvenile origin were of Snake River origin. The YNFP/USGS PIT-tagging effort is ongoing, and steelhead adults tagged as juveniles within Rock Creek began returning in 2014. With a few more years of data, it should become apparent if steelhead in Rock Creek are a viable naturalized

Snake River DPS subpopulation or are sustained by an annual influx of stray steelhead originating from the Snake River (Harvey 2011; Conley 2015).

Listing Factor E Conclusion

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

Hatchery programs continue to release hatchery steelhead and salmon within the DPS, and impacts on the natural-origin populations have not changed since the last review. Hatchery programs considered to be part of the DPS continue to incorporate natural-origin adults into the

broodstock, reducing the potential for divergence between the hatchery population and the associated natural-origin population.

Other Recommendations

Research, Monitoring and Evaluation

- Assess the impacts of the Boyd Hydroelectric Project in the Umatilla Basin on migration, spawning, and habitat use and evaluate the potential to decommission the dam.
- Continue to monitor Rock Creek population to determine if the steelhead population in Rock Creek is a viable naturalized Snake River DPS subpopulation or sustained by an annual influx of stray steelhead originating from the Snake River (Conley 2015).
- Implement a comprehensive research and monitoring program to address population abundance and survival, success of implemented recovery actions, and basic understandings of the factors limiting fish production.
- Evaluate the potential for improvement of upstream passage at Opal Springs Dam on the lower Crooked River (RM 8), a tributary to the upper Deschutes River (Upper Deschutes Watershed Council et al, undated). This passage barrier is ranked the second highest priority on Oregon's 2013 Statewide Fish Passage Priority List (http://www.dfw.state.or.us/fish/passage/).
- Continue/improve monitoring of abundance and productivity.
- Implementation of key habitat status/trends and habitat restoration effectiveness monitoring to address key habitat status and trends and habitat restoration effectiveness.
- Complete evaluation of impacts of hatchery releases in the Klickitat River on natural run steelhead.

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 the final listing determinations for salmon (70 FR 37160) and steelhead (71 FR 834), we noted that while many of the ongoing protective efforts are likely to promote the conservation of listed salmonids, most efforts are relatively recent, have yet to demonstrate their effectiveness, and for the most part do not address conservation needs at scales sufficient to conserve entire ESUs or DPSs. Therefore, we concluded that existing protective efforts did not preclude listing several ESUs of salmon and several DPSs of steelhead.

In our above five-factor analysis, we note the many habitat, hydropower, hatchery, and harvest improvements that 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's 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, as 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.

Although there have been improvements in the viability ratings for some of the component populations of the MCR Steelhead DPS, the DPS is not currently meeting the viability criteria recommended by the ICTRT and adopted in the Middle Columbia River Steelhead Recovery Plan (NWFSC 2015). Natural origin returns to the majority of populations in three of the four MPGs in this DPS increased relative to the levels reported in the previous five-year review. However, natural-origin spawning estimates are highly variable relative to minimum abundance thresholds across the populations in the DPS. Three of the four MPGs in this DPS include at least one population rated at low risk for abundance and productivity. The survival gaps for the remaining populations are generally smaller than those for the other Interior Columbia River Basin listed DPSs (NWFSC 2015). Updated information indicates that stray levels into the John Day River populations have deceased in recent years. Out of basin hatchery stray proportions, although reduced, remain high in spawning reaches within the Deschutes River basin populations. In general, the majority of population level viability ratings remained unchanged from prior reviews for each MPG within the DPS.

Our analysis of the ESA section 4(a)(1) factors indicates that the collective risk to the MCR steelhead's persistence has not changed significantly since our final listing determination in 2006 and the last 5-year review in 2011. Improvements have been made to the operation of the FCRPS and numerous habitat restoration projects have been completed in many Middle Columbia River tributaries. Harvest rates remain relatively low and stable. The protection afforded by some

regulatory mechanisms, such as updates in state and county level regulations, has improved. However, habitat problems continue to exist in much of this DPS with effects of irrigation diversions on water flow and passage barriers being of particular concern. In addition, predation from an increase in pinniped populations and significant avian impacts remain a concern, as do the impacts that climate change poses to long-term recovery.

After considering the biological viability of the MCR steelhead DPS and the current status of its ESA section 4(a)(1) factors, we conclude that the status of the MCR steelhead DPS has improved slightly since last reviewed in 2010-2011; however, further implementation of sound management actions in hydropower, habitat, hatcheries, and harvest are essential to the recovery of the MCR steelhead DPS 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 to result in measurable improvements to population viability. By continuing to implement actions that address the factors limiting population survival and monitoring the effects of the action over time, we will ensure that restoration efforts meet the biological needs of each population and, in turn, contribute to the recovery of this DPS. The MCR Steelhead Recovery Plan is the primary guide for identifying future actions to target and address MCR steelhead's limiting factors and threats. Over the next five years, it will be important continue to implement these actions and monitor our progress.

2.4.1 DPS Delineation and Hatchery Membership

- Recent genetic analyses are inconclusive regarding the composition of and best division between the Lower Columbia River and MCR steelhead DPSs (NWFSC 2015).
- The MCR steelhead hatchery programs have not changed substantially from the previous ESA status review to suggest that their level of divergence relative to the local natural populations has changed (Jones 2015).

2.4.2 DPS Viability and Statutory Listing Factors

- The Northwest Fisheries Science Center's review of updated information (NWFSC 2015) does not indicate a change in the biological risk category of MCR steelhead since the time of the last status review (NWFSC 2015).
- Our analysis of ESA section 4(a)(1) factors indicates that the collective risk to the MCR steelhead's persistence has not changed significantly since our listing determination in 2006. The overall level of concern remains the same.

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3 · Results

3.1 Classification

Listing Status:

Based on the information identified above, we recommend that the MCR steelhead DPS remain classified as a threatened species.

DPS Delineation:

Available genetic and biogeographic information show that the Klickitat and White Salmon River subbasins fall in a transition zone between the Interior Columbia and Coastal/Lower Columbia River Eco-regions. Given the lack of new definitive information to support adjusting the composition of these DPSs (NWFSC 2015), we conclude that these populations should remain in the MCR steelhead DPS.

Hatchery Membership:

The MCR steelhead hatchery programs have not changed substantially from the previous ESA status review to suggest that their level of divergence relative to the local natural populations has changed (Jones 2015). Therefore, we conclude that no changes in hatchery membership for the MCR steelhead DPS are needed.

3.2 New Recovery Priority Number

Since the previous five-year status review (Ford et al. 2011), NMFS revised the MCR Steelhead DPS recovery priority number from one (NMFS 2009a) to a new recovery priority number of nine (NMFS 2015a) as listed in Table 4 of this document.

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4 · Recommendations for Future Actions

In our review of the listing factors, we identified several actions critical to improving the status of the MCR steelhead DPS. The most important actions to be taken over the next 5 years include implementation of the high-priority strategies and actions for the MPGs (Sections 7.2 and 7.3 of the recovery plan, NMFS 2009b), the 2008 Harvest Biological Opinion, NMFS 2010 and 2014 FCRPS Opinions, evaluation of the MCR steelhead overshoot phenomenon, and the completion of ESA consultations on the hatchery programs in the MCR steelhead DPS. We are currently in the process of identifying actions that address the factors contributing to the existing moderate or high risk rating for each population, since such actions have the greatest potential to improve VSP parameters at both the MPG and DPS levels.

We are directing our efforts at populations that need viability improvement according to DPS-, MPG-, and population-level recovery criteria, the best available scientific information concerning DPS status, the role of the independent populations in meeting DPS and MPG viability, limiting factors and threats, and the likelihood of action effectiveness to guide our recommendations for future actions. NMFS is coordinating with the Federal, state, tribal, and local implementing entities to ensure that risk factors and actions identified in the recovery plan, and the actions identified in the Harvest Biological Opinion, the FCRPS Opinion, and the ESA consultations on hatchery programs are addressed.

The greatest opportunity to advance recovery is to increase flows in the Yakima, Umatilla, Walla Walla, and John Day basins. Additional recommended actions include:

- Systematically reviewing and quantitatively analyzing the amount of habitat addressed versus the priority watershed reaches targeted for protection and restoration activities in the 2009 recovery plan in order to track progress against plan objectives.
- Providing or improving passage over the Cle Elum, Rimrock, Opal Springs, and McKay Dams; and evaluate the impacts of the abandoned Boyd Hydroelectric Project and decommission if significant impacts are found.
- Improving flows for fish in the Yakima basin through better management of Reclamation's Yakima Project.
- Continuing to implement projects/programs aimed at upgrading irrigation intakes and conserving water to increase flows for fish, particularly in Fifteenmile Creek, the Deschutes River Eastside and Westside, the Yakima basin, John Day basin, and the Umatilla/Walla Walla basin.
- Continuing to implement the Gap-to-Gap program in the Yakima basin.
- Continuing to work with the Corps and fisheries co-managers in the implementation of flow and passage improvements in the Umatilla, Walla Walla and Touchet Rivers.

- Continuing to seek avenues to reduce pinniped and avian predation in the mainstem Columbia River.
- Encouraging management of forests to restore natural species and tree density toward reducing the intensity and frequency of wildfires and subsequent impacts of fire on fish habitat.
- Encouraging state and tribal fisheries co-managers evaluate MCR overshoot phenomenon and develop management actions to address the issue.

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.

March 25, 1999 (64 FR 14517). Final Rule: Endangered and Threatened Species: Threatened Status for Two ESUs of Steelhead in Washington and Oregon.

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.

September 2, 2005 (70 FR 52630). Final Rule: Endangered and Threatened Species; Designation of Critical Habitat for 12 Evolutionarily Significant Units of West Coast Salmon and Steelhead in Washington, Oregon, and Idaho.

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

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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.

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National Marine Fisheries Service
5-Year Review

Middle Columbia River Steelhead

Conclusion:

Based on the information identified above, we conclude:

- The Middle Columbia River Steelhead DPS should remain listed as threatened.

REGIONAL OFFICE APPROVAL

Approve: _____ Date: 05/27/2016

Michael Tehan
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