National Marine Fisheries Service Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion

Consultation to Conduct Scientific Research on Eulachon in the Columbia River

NMFS Consultation Number: WCRO-2020-03011

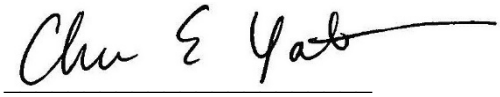
ARN: 151422WCR2020PR00227

Action Agency: National Marine Fisheries Service

Affected Species and Determinations:

ESA-Listed Species	Status	Is Action Likely To Adversely Affect Species?	Is Action Likely To Jeopardize the Species?	Is Action Likely To Adversely Affect Critical Habitat?	Is Action Likely To Destroy or Adversely Modify Critical Habitat?
Lower Columbia River Chinook salmon *(O. tshawytscha)*	Threatened	No	No	No	No
Upper Willamette River Chinook salmon *(O. tshawytscha)*	Threatened	No	No	No	No
Upper Columbia River Spring-Run Chinook salmon *(O. tshawytscha)*	Endangered	No	No	No	No
Snake River Spring/Summer Run Chinook salmon *(O. tshawytscha)*	Threatened	No	No	No	No
Snake River Fall-Run Chinook salmon *(O. tshawytscha)*	Threatened	No	No	No	No
Columbia River Chum salmon (*O. keta*)	Threatened	No	No	No	No
Lower Columbia River coho salmon (*O. kisutch*)	Threatened	No	No	No	No
Snake River Sockeye salmon (*O. nerka*)	Threatened	No	No	No	No
Lower Columbia River steelhead (*O. mykiss*)	Threatened	No	No	No	No
Upper Willamette River steelhead *(O. mykiss)*	Threatened	No	No	No	No
Middle Columbia River steelhead (*O. mykiss*)	Threatened	No	No	No	No
Upper Columbia River steelhead *(O. mykiss)*	Threatened	No	No	No	No
Snake River Basin steelhead (*O. mykiss*)	Threatened	No	No	No	No
Southern DPS of Eulachon (*Thaleichthys pacificus*)	Threatened	Yes	No	Yes	No

Consultation Conducted By: National Marine Fisheries Service, West Coast Region

Issued By: 

FOR Barry A. Thom
Regional Administrator

Date: December 9, 2020

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1. INTRODUCTION

This Introduction section provides information relevant to the other sections of this document and is incorporated by reference into Sections 2 and 3 below.

1.1 Background

The National Marine Fisheries Service (NMFS) prepared this biological opinion (opinion) and incidental take statement portions of this document in accordance with section 7(b) of the ESA of 1973, as amended (16 U.S.C. 1531 et seq.).

The NMFS has not yet promulgated an ESA section 4(d) rule prohibiting take of threatened southern distinct population segment (DPS) of eulachon (hereafter, "eulachon"). However, consultation under section 7(a)(2) of the ESA is still required to evaluate whether or not the Federal action is likely to jeopardize the continued existence of listed species, or result in the destruction or adverse modification of designated critical habitat.

We also reviewed the proposed actions for potential effects on essential fish habitat (EFH) designated under the Magnuson-Stevens Fishery Conservation and Management Act (MSA). This review was pursuant to section 305(b) of the MSA, implementing regulations at 50 CFR 600.920, and agency guidance for use of the ESA consultation process to complete EFH consultation. In this case, we concluded that the proposed actions would not adversely affect EFH. Thus, consultation under the MSA is not required for this action.

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The document will be available within two weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. A complete record of this consultation is on file with the Protected Resources Division in the Portland, Oregon office of NMFS's West Coast Region.

In this opinion, we conclude that the proposed action is not likely to jeopardize the continued existence of the southern distinct population segment (DPS) of eulachon, and is not likely to adversely affect its critical habitat.

We also conclude that the proposed action is not likely to adversely affect the Lower Columbia River (LCR) Chinook salmon Snake River (SR) Fall-run Chinook salmon, SR Spring/Summer-run Chinook salmon, Upper Columbia River (UCR) Spring-run Chinook salmon, Upper Willamette River (UWR) Chinook salmon, LCR steelhead, Middle Columbia River steelhead, Snake River Basin steelhead, UCR steelhead, UWR steelhead, Columbia River (CR) chum salmon, LCR coho salmon, and SR sockeye salmon, or their designated critical habitats.

1.2 Consultation History

NMFS' West Coast Region (WCR) proposes to provide funding through a grant to the Washington Department of Fish and Wildlife (WDFW) to conduct scientific research on eulachon within the Columbia River on the west coast of the U.S.

1.3 Proposed Federal Action

Under the ESA, "action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (50 CFR 402.02). We considered, under the ESA, whether or not the proposed action would cause any other activities and determined that it would cause the following activities: in-water research, i.e., collection of eulachon eggs and larvae using plankton nets towed by research vessels.

The proposed action is to fund scientific research on eulachon in the Columbia River by the WDFW. Details of the research activities are described as follows:

WDFW proposes to conduct scientific research on eulachon in the Columbia River on the West Coast of the U.S. The research activities would take place within the Columbia River near river mile 35. The research goals are to: 1) estimate eulachon abundance in the Columbia River by collecting eulachon eggs and larvae to conduct a spawning stock biomass estimation (SSB) for the Columbia River subpopulation; and 2) collect life history information on the species.

Eulachon SSB Estimation

The WDFW proposes to use plankton nets to capture eulachon eggs and larvae in the Columbia River near river mile 35. Research vessels would tow the nets and a General Oceanic flow meter would mounted on the net frame to determine the volume filtered during each sample run. The transects would consist of six separate one-to-five minute stationary plankton tows made at stations situated along an existing standardized sampling transect. The transect position is perpendicular to the river flow and crosses Clifton Channel from the Oregon shore to Tenasillahe Island, and then crosses the shipping channel to Price Island on the Washington shore. Transects would be sampled from January through May for both the 2020-2021 and 2021-2022 eulachon return years. WDFW would sample weekly until the run begins to peak, likely in February or March. Twice weekly sampling would take place during the peak period of eulachon egg and larvae outflow and, before returning to a weekly schedule through May for approximately 30 sampling days per calendar year.

Eulachon Life History—Eulachon Sex Ratio, Age, Size, and Fecundity Estimations

WDFW proposes to collect 20 adult eulachon (per calendar year) from the eulachon commercial and recreational fisheries in Washington and use them to estimate the sex ratios, average age, and size distribution, and egg counts for the eulachon return to the Columbia River[1]. Those

[1] All adult eulachon used for these activities would be obtained from the eulachon commercial fishery, which is a Washington state action, and an activity not subject to the ESA or its implementing regulations as NMFS has not yet promulgated an ESA section 4(d) rule prohibiting take of threatened eulachon.

counts, in turn, would be used to determine Columbia River eulachon fecundity and help generate SSB estimations.

2. ENDANGERED SPECIES ACT: BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

The ESA establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat upon which they depend. As required by section 7(a)(2) of the ESA, Federal agencies must ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species, or adversely modify or destroy their designated critical habitat. Per the requirements of the ESA, Federal action agencies consult with NMFS and section 7(b)(3) requires that, at the conclusion of consultation, NMFS provides an opinion stating how the agency's actions would affect listed species and their critical habitat. If incidental take is expected, section 7(b)(4) requires NMFS to provide an incidental take statement (ITS) that specifies the impact of any incidental taking and includes non-discretionary reasonable and prudent measures and terms and conditions to minimize such impacts.

We concluded that the proposed action is not likely to adversely affect the following species or their designated critical habitats: Lower Columbia River (LCR) Chinook salmon, Snake River (SR) Fall-run Chinook salmon, SR Spring/Summer-run Chinook salmon, Upper Columbia River (UCR) Spring-run Chinook salmon, Upper Willamette River (UWR) Chinook salmon, LCR steelhead, Middle Columbia River steelhead, Snake River Basin steelhead, UCR steelhead, UWR steelhead, Columbia River (CR) chum salmon, LCR coho salmon, and SR sockeye salmon. Our concurrence is documented in the "Not Likely to Adversely Affect" Determinations section (Section 2.11).

2.1 Analytical Approach

This biological opinion includes both a jeopardy analysis and an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of "to jeopardize the continued existence of a listed species," which is "to engage in an action that would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

This biological opinion relies on the definition of "destruction or adverse modification," which "means a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features" (81 FR 7214). The adverse modification analysis considers the impacts of the Federal action on the conservation value of designated critical habitat.

The critical habitat designations for the species considered here used the term primary constituent element (PCE) or essential features. The new critical habitat regulations (81 FR 7414) replace this term with physical or biological features (PBFs). The shift in terminology

does not change the approach used in conducting a ‘‘destruction or adverse modification’’ analysis, which is the same regardless of whether the original designation identified PCEs, PBFs, or essential features. In this biological opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

For eulachon, the NMFS has not promulgated protective regulations under section 4(d). Promulgation of section 4(d) take prohibitions for eulachon shall result in a reinitiation of this opinion if the effects of the research program considered in this opinion results in take that is prohibited by the section 4(d) rule.

We use the following approach to determine whether a proposed action is likely to jeopardize listed species or destroy or adversely modify critical habitat:

- Identify the rangewide status of the species and critical habitat likely to be adversely affected by the proposed action.
- Describe the environmental baseline in the action area.
- Analyze the effects of the proposed action on both species and their habitat using an “exposure-response-risk” approach. For research actions, exposure equates to capturing and handling the animals (including tagging, etc.); response is the degree to which they are affected by the actions (e.g., injured or killed); and risk relates to what those responses mean at the individual, population, and species levels.
- Describe any cumulative effects in the action area.
- Integrate and synthesize the above factors to assess the risk that the proposed action poses to species and critical habitat.
- Reach jeopardy and adverse modification conclusions.
- If necessary, define a reasonable and prudent alternative to the proposed action.

2.2 Rangewide Status of the Species and Critical Habitat

This opinion examines the status of eulachon adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species’ likelihood of both survival and recovery. The species status section also helps to inform the description of the species’ current “reproduction, numbers, or distribution” as described in 50 CFR 402.02. The opinion also examines the condition of critical habitat throughout the designated area, evaluates the conservation value of the various watersheds and coastal and marine environments that make up the designated area, and discusses the current function of the essential physical and biological features that help to form that conservation value.

One factor affecting the status of eulachon, and aquatic habitat at large, is climate change. Climate change is likely to play an increasingly important role in determining the abundance and distribution of eulachon, and the conservation value of designated critical habitats, in the Pacific Northwest. These changes will not be spatially homogeneous across the Pacific Northwest. The largest hydrologic responses are expected to occur in basins with significant snow accumulation, where warming decreases snow pack, increases winter flows, and advances the timing of spring

melt (Mote et al. 2014, Mote 2016). Rain-dominated watersheds and those with significant contributions from groundwater may be less sensitive to predicted changes in climate (Tague et al. 2013, Mote et al. 2014).

During the last century, average regional air temperatures in the Pacific Northwest increased by 1-1.4°F as an annual average, and up to 2°F in some seasons (based on average linear increase per decade; Abatzoglou et al. 2014; Kunkel et al. 2013). Warming is likely to continue during the next century as average temperatures are projected to increase another 3 to 10°F, with the largest increases predicted to occur in the summer (Mote et al. 2014). Decreases in summer precipitation of as much as 30% by the end of the century are consistently predicted across climate models (Mote et al. 2014). Precipitation is more likely to occur during October through March, less during summer months, and more winter precipitation will be rain than snow (ISAB 2007; Mote et al. 2013; Mote et al. 2014). Earlier snowmelt will cause lower stream flows in late spring, summer, and fall, and water temperatures will be warmer (ISAB 2007; Mote et al. 2014). Models consistently predict increases in the frequency of severe winter precipitation events (i.e., 20-year and 50-year events), in the western United States (Dominguez et al. 2012). The largest increases in winter flood frequency and magnitude are predicted in mixed rain-snow watersheds (Mote et al. 2014).

Overall, about one-third of the current cold-water habitat in the Pacific Northwest is likely to exceed key water temperature thresholds by the end of this century (Mantua et al. 2009). Higher temperatures will reduce the quality of available habitat for most freshwater life stages (ISAB 2007). Reduced flows will make it more difficult for migrating fish to pass physical and thermal obstructions, limiting their access to available habitat (Mantua et al. 2010; Isaak et al. 2012). Temperature increases shift timing of key life cycle events for eulachon and species forming the base of their aquatic foodwebs (Crozier et al. 2011; Tillmann and Siemann 2011; Winder and Schindler 2004). Higher stream temperatures will also cause decreases in dissolved oxygen and may also cause earlier onset of stratification and reduced mixing between layers in lakes and reservoirs, which can also result in reduced oxygen (Meyer et al. 1999; Winder and Schindler 2004, Raymondi et al. 2013). Higher temperatures are likely to cause several species to become more susceptible to parasites, disease, and higher predation rates (Crozier et al. 2008; Wainwright and Weitkamp 2013; Raymondi et al. 2013).

As more basins become rain-dominated and prone to more severe winter storms, higher winter stream flows may increase the risk that winter or spring floods in sensitive watersheds will damage spawning redds and wash away incubating eggs (Goode et al. 2013). Earlier peak stream flows will also alter migration timing for eggs and larvae, and may flush some eggs and larvae from rivers to estuaries before they are physically mature, increasing stress and reducing survival (McMahon and Hartman 1989; Lawson et al. 2004).

In addition to changes in freshwater conditions, predicted changes for coastal waters in the Pacific Northwest as a result of climate change include increasing surface water temperature, increasing but highly variable acidity, and increasing storm frequency and magnitude (Mote et al. 2014). Elevated ocean temperatures already documented for the Pacific Northwest are highly likely to continue during the next century, with sea surface temperature projected to increase by 1.0-3.7ºC by the end of the century (IPCC 2014). Habitat loss, shifts in species' ranges and

abundances, and altered marine food webs could have substantial consequences to anadromous, coastal, and marine species in the Pacific Northwest (Tillmann and Siemann 2011, Reeder et al. 2013).

Moreover, as atmospheric carbon emissions increase, increasing levels of carbon are absorbed by the oceans, changing the pH of the water. Acidification also affects sensitive estuary habitats, where organic matter and nutrient inputs further reduce pH and produce conditions more corrosive than those in offshore waters (Feely et al. 2012, Sunda and Cai 2012).

Global sea levels are expected to continue rising throughout this century, reaching likely predicted increases of 10-32 inches by 2081-2100 (IPCC 2014). These changes will likely result in increased erosion and more frequent and severe coastal flooding, and shifts in the composition of nearshore habitats (Tillmann and Siemann 2011, Reeder et al. 2013). Estuarine-dependent fish are predicted to be impacted by significant reductions in rearing habitat in some Pacific Northwest coastal areas (Glick et al. 2007). Historically, warm periods in the coastal Pacific Ocean have coincided with relatively low abundances of cold water fish, while cooler ocean periods have coincided with relatively high abundances, and therefore these species are predicted to fare poorly in warming ocean conditions (Scheuerell and Williams 2005; Zabel et al. 2006). This is supported by the recent observation that anomalously warm sea surface temperatures off the coast of Washington from 2013 to 2016 resulted in poor coho and Chinook salmon body condition for juveniles caught in those waters (NWFSC 2015). Changes to estuarine and coastal conditions, as well as the timing of seasonal shifts in these habitats, have the potential to affect a wide range of listed aquatic species (Tillmann and Siemann 2011, Reeder et al. 2013).

The adaptive ability of threatened and endangered species is depressed due to reductions in population size, habitat quantity and diversity, and loss of behavioral and genetic variation. Without these natural sources of resilience, systematic changes in local and regional climatic conditions due to anthropogenic global climate change will likely reduce long-term viability and sustainability of populations in many of these evolutionarily significant units (ESUs) (NWFSC 2015). New stressors generated by climate change, or existing stressors with effects that have been amplified by climate change, may also have synergistic impacts on species and ecosystems (Doney et al. 2012). These conditions will possibly intensify the climate change stressors inhibiting recovery of listed species in the future.

Status of the Species

For Pacific salmon and steelhead—and eulachon—NMFS commonly uses four parameters to assess the viability of the populations that, together, constitute the species: spatial structure, diversity, abundance, and productivity (McElhany et al. 2000). These "viable salmonid population" (VSP) criteria therefore encompass the species' "reproduction, numbers, or distribution" as described in 50 CFR 402.02. When these parameters are collectively at appropriate levels, they maintain a population's capacity to adapt to various environmental conditions and allow it to sustain itself in the natural environment. These attributes are influenced by survival, behavior, and experiences throughout a species' entire life cycle, and these characteristics, in turn, are influenced by habitat and other environmental conditions.

"Spatial structure" refers both to the spatial distributions of individuals in the population and the processes that generate that distribution. A population's spatial structure depends fundamentally on habitat quality and spatial configuration and the dynamics and dispersal characteristics of individuals in the population.

"Diversity" refers to the distribution of traits within and among populations. These range in scale from DNA sequence variation at single genes to complex life history traits (McElhany et al. 2000).

"Abundance" generally refers to the number of naturally-produced adults (i.e., the progeny of naturally-spawning parents) in the natural environment (e.g., on spawning grounds).

"Productivity," as applied to viability factors, refers to the entire life cycle; i.e., the number of naturally-spawning adults produced per parent. When progeny replace or exceed the number of parents, a population is stable or increasing. When progeny fail to replace the number of parents, the population is declining. McElhany et al. (2000) use the terms "population growth rate" and "productivity" interchangeably when referring to production over the entire life cycle. They also refer to "trend in abundance," which is the manifestation of long-term population growth rate.

For species with multiple populations, once the biological status of a species' populations has been determined, NMFS assesses the status of the entire species using criteria for groups of populations, as described in recovery plans and guidance documents from technical recovery teams. Considerations for species viability include having multiple populations that are viable, ensuring that populations with unique life histories and phenotypes are viable, and that some viable populations are both widespread to avoid concurrent extinctions from mass catastrophes and spatially close to allow functioning as metapopulations (McElhany et al. 2000).

A species' status thus is a function of how well its biological requirements are being met: the greater the degree to which the requirements are fulfilled, the better the species' status. For the purposes of our later analysis, all the species considered here require functioning habitat and adequate spatial structure, abundance, productivity, and diversity to ensure their survival and recovery in the wild.

Table 1, below provides a summary of listing and recovery plan information, status summaries and limiting factors for the eulachon.

Table 1. Listing classification and date, recovery plan reference, most recent status review, status summary, and limiting factors for eulachon.

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Threats
Southern DPS of eulachon	Threatened 3/18/10	NMFS 2016	Gustafson et al. 2016	The Southern DPS of eulachon includes all naturally-spawned populations that occur in rivers south of the Nass River in British Columbia to the Mad River in California. Sub populations for this species include the Fraser River, Columbia River, British Columbia and the Klamath River. In the early 1990s, there was an abrupt decline in the abundance of eulachon returning to the Columbia River. Despite a brief period of improved returns in 2001-2003, the returns and associated commercial landings eventually declined to the low levels observed in the mid-1990s. Although eulachon abundance in monitored rivers has generally improved, especially in the 2013-2015 return years, recent poor ocean conditions and the likelihood that these conditions will persist into the near future suggest that population declines may be widespread in the upcoming return years	• Changes in ocean conditions due to climate change, particularly in the southern portion of the species' range where ocean warming trends may be the most pronounced and may alter prey, spawning, and rearing success. • Climate-induced change to freshwater habitats • Bycatch of eulachon in commercial fisheries • Adverse effects related to dams and water diversions • Water quality, • Shoreline construction • Over harvest • Predation

The DPS is composed of four subpopulations: the Klamath, Columbia, Fraser, and British Columbia. All eulachon in Puget Sound Rivers are considered part of the Columbia River subpopulation. Figures 1 and 2 (below) display annual eulachon run size estimates (spawning stock biomass estimations) are provided for the years 2000 through 2019 for the Columbia River and the Fraser River subpopulations. No run size estimates are not available for the Klamath subpopulation and the British Columbia subpopulation.

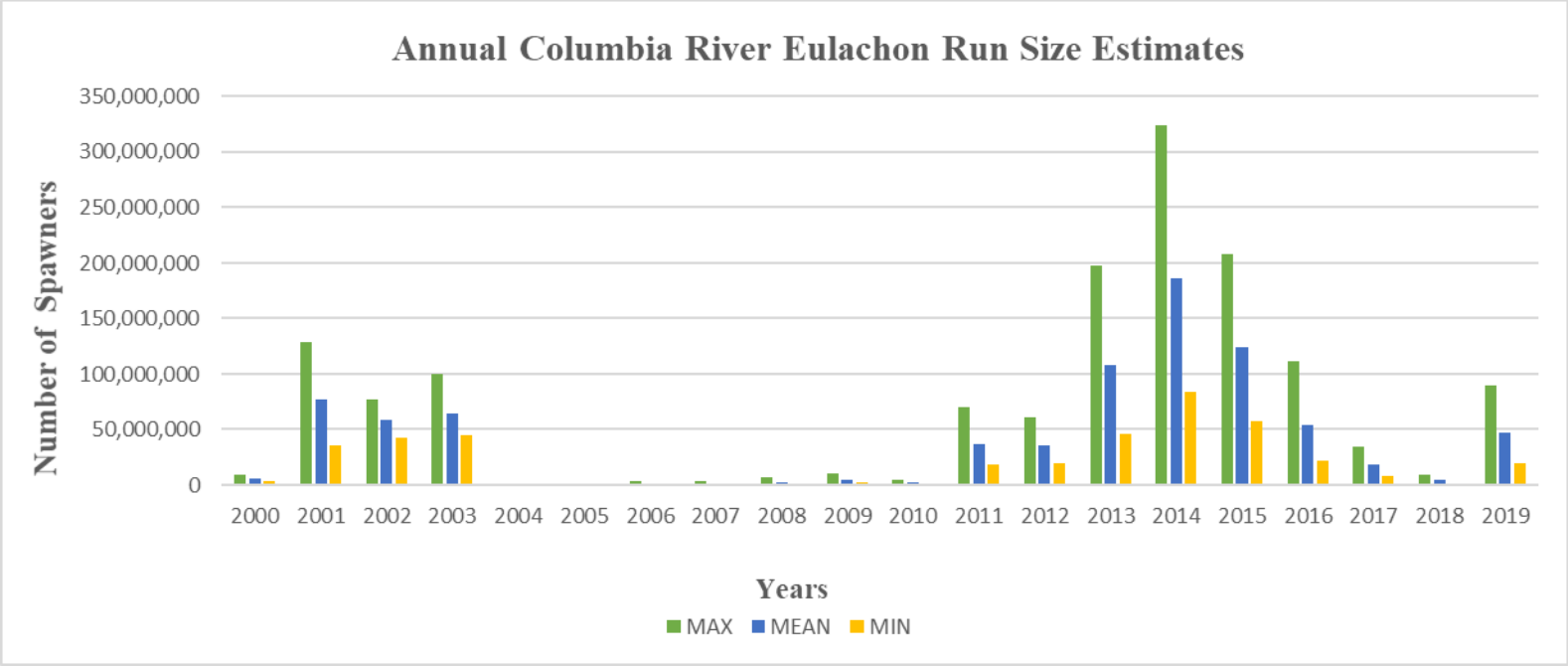

Figure 1. Columbia River subpopulation run size estimations for the years 2000 through 2019.

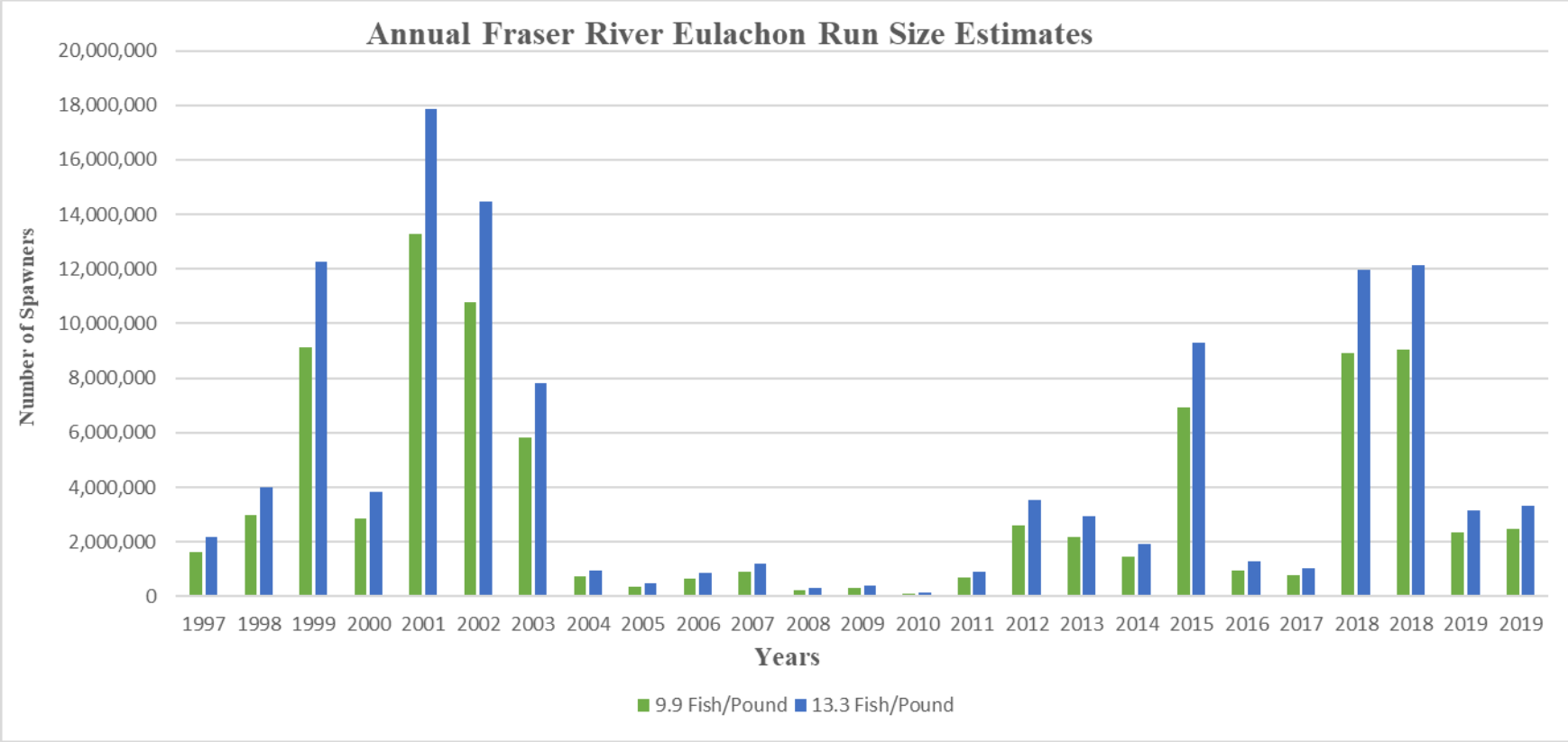

Figure 2. Fraser River subpopulation run size estimations for the years 1995 through 2019[2].

[2] For the sampling years 2018 and 2019, two different sampling periods, a 7-week and a 10-week, were conducted in the Fraser River to produce run size estimates.

Status of Critical Habitat

This section describes the status of designated critical habitat affected by the proposed actions by examining the condition and trends of the essential physical and biological features of that habitat throughout the designated areas. These features are essential to the conservation of eulachon because they support one or more of the species' life stages (*e.g.*, sites with conditions that support spawning, rearing, migration and foraging).

For eulachon, critical habitat includes portions of 16 rivers and streams in California, Oregon, and Washington (76 FR 65324). We designated all of these areas as migration and spawning habitat for this species.

Table 2 provides a summary of the status of critical habitats for species considered in this opinion.

Table 2. Critical habitat, designation date, federal register citation, and status summary for critical habitat considered in this opinion.

Species	Designation Date and Federal Register Citation	Critical Habitat Status Summary
Southern DPS of eulachon	10/20/11 76 FR 65324	Critical habitat for eulachon includes portions of 16 rivers and streams in California, Oregon, and Washington. All of these areas are designated as migration and spawning habitat for this species. In Oregon, we designated 24.2 miles of the lower Umpqua River, 12.4 miles of the lower Sandy River, and 0.2 miles of Tenmile Creek. We also designated the mainstem Columbia River from the mouth to the base of Bonneville Dam, a distance of 143.2 miles. Dams and water diversions are moderate threats to eulachon in the Columbia and Klamath rivers where hydropower generation and flood control are major activities. Degraded water quality is common in some areas occupied by southern DPS eulachon. In the Columbia and Klamath river basins, large-scale impoundment of water has increased winter water temperatures, potentially altering the water temperature during eulachon spawning periods. Numerous chemical contaminants are also present in spawning rivers, but the exact effect these compounds have on spawning and egg development is unknown. Dredging is a low to moderate threat to eulachon in the Columbia River. Dredging during eulachon spawning would be particularly detrimental.

2.3 Action Area

"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02).

The action area is restricted to the Columbia River from river mile 32 to river mile 39.

2.4 Environmental Baseline

The "environmental baseline" includes the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR 402.02).

Eulachon face a number of habitat-related threats. Climate-related impacts on ocean habitat are the most serious threat to eulachon persistence (Gustafson et al. 2010). Other threats to the species include climate-related impacts on freshwater habitat and habitat alteration and degradation from various activities. Additionally, hydroelectric dams block access to historical eulachon spawning grounds and affect spawning substrate quality through flow management, altered coarse sediment delivery, and siltation. During the eulachon spawning run, dredging and harvest activities may entrain and kill fish or otherwise decrease spawning success. These factors (and others) have negatively affected the DPS's habitat to the extent that it was necessary to list them under the ESA.

The best scientific information presently available demonstrates that a multitude of factors, past and present, have contributed to the decline of eulachon. Thus, as a general matter, eulachon have at least some biological requirements that are not being met in the action area. Eulachon are still experiencing the impact of a variety of past and ongoing Federal, state, and private activities in the action area and that impact is expressed in the threats described above and in the species status section—all of which, in combination, are currently keeping the species from recovering and actively preventing them from having all their biological requirement met in the action area.

2.5 Effects of the Action

Under the ESA, "effects of the action" are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (see 50 CFR 402.17). In our analysis, which describes the effects of the proposed action, we considered 50 CFR 402.17(a) and (b).

Effects on Species

As eulachon in the Columbia River are part of the Columbia River subpopulation, our analysis aggregates the effects at the subpopulation scale and then looks at them in the context of the species scale.

2.5.1 Eulachon

Plankton Net Tows—Spawning Stock Biomass Estimations

Based on information provided by WDFW[3], we expect the maximum number of eggs and larvae to be captured by plankton net tows to be 500,000 (250,000 in 2021 and 250,000 in 2022) in the Columbia River. All captured eulachon eggs and larvae are expected to die.

Plankton Net Surveys

NMFS does not expect adult eulachon to be captured in the plankton nets. We base this expectation on the fact that during the past eight years that WDFW has been conducting plankton net surveys for eulachon in the Columbia River, they have never caught any adult eulachon in the plankton nets. Therefore the likelihood of adult eulachon getting captured in the plankton nets is extremely small.

The egg and larvae production estimates for the 2014-2019 sample-years for the Columbia River Basin subpopulation are summarized in Table 3.

Table 3. Estimated Columbia River subpopulation eulachon egg and larvae production, and spawning stock biomass estimations for the 2014-2019 sample-years (Langness et al. 2020).

Sample Year	Eggs/Larvae Minimum	Eggs/Larvae Mean	Eggs/Larvae Maximum	Spawning Stock Biomass Range (MIN – MAX)
2014/2015	937,000,000,000	2,014,000,000,000	3,382,000,000,000	57,525,700/207,570,500
2015/2016	353,000,000,000	899,000,000,000	1,825,000,000,000	21,654,800/111,991,000
2016/2017	132,800,000,000	298,300,000,000	555,100,000,000	8,148,600/34,071,100
2017/2018	22,000,000,000	67,000,000,000	150,000,000,000	1,300,000/9,200,000
2018/2019	314,211,000,000	760,634,000,000	1,452,313,000,000	19,285,000/89,137,000

Using the average of the minimum egg/larvae estimates (351,802,200,000) for 2014-2019, the ecological consequences of removing up to 250,000 eggs/larvae per year from the total production of the Columbia River subpopulation will be a minimal effect on eulachon productivity. Using the average of the minimum egg/larvae estimates for 2014-2019, we calculated that this level of effect represents a reduction of 0.00000071% of the estimated annual

[3] Emil from Laura Heironimus, WDFW, to Robert Anderson, NMFS, October 26, 2020.

egg/larvae production for the Columbia River subpopulation, which would indicate that the effect would be even smaller at the and at the species scale.

There is little fisheries-independent data available for eulachon that provide an adequate estimate of abundance and trends. Historical abundance estimates of eulachon were based on commercial landing statistics. The research on eulachon being carried out by WDFW has and would continue to improve our understanding of trends in abundance for the species (project goal), which is providing critical data that is beneficial to the management and conservation of the species.

Eulachon Life History—Eulachon Sex Ratio, Age, Size, and Fecundity Estimations

The WDFW proposes to obtain adult eulachon to estimate the sex ratio and age and size distribution of the 2020-2021 and 2021-2022 eulachon returns to the Columbia River for fecundity estimations for use in generating an SSB estimation. All adult eulachon used for these activities would be obtained from the eulachon commercial fishery, which is a Washington state action, and an activity not subject to the ESA or its implementing regulations as NMFS has not yet promulgated an ESA section 4(d) rule prohibiting take of threatened eulachon. Since WDFW is not proposing to directly capture any adult eulachon, but obtain fish from the commercial fishery, there is no impact on the Columbia River subpopulation or the species to evaluate in this opinion.

Boat Traffic

While there will be a minor increase in boat traffic associated with the plankton net surveys and correspondingly minor increases in sound levels (decibel – dB), these activities will be intermittent and of short duration and frequency. Given that dozens to hundreds of boats can be found in the action area on any given day—and all eulachon (adults) would be moving rapidly through the action area in any case—the increase in boat traffic and associated sound levels is unlikely to be detectable above background. Therefore, it is unlikely that the minor increase in boat traffic would cause any changes in foraging or migration behavior, among eulachon (adults) in the action area, and as a result, plankton net surveys would likely have no adverse physiological, behavioral, or reproductive effects on eulachon.

2.5.2 Effects on Critical Habitat

The proposed research activities do not involve any kind of habitat impacts other than intermittent increase in sound levels (dB). As previously described, these intermittent sound levels will to be too small and short in duration to be detectable above background levels to affect the conservation value of the PBFs in the action area. Therefore, we expect the likelihood of effects on critical habitat PBFs for the species considered in this opinion would be too small to meaningfully measure, detect or evaluate, and therefore are likely to be inconsequential.

2.6 Cumulative Effects

"Cumulative effects" are those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject

to consultation (50 CFR 402.02). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Some continuing non-Federal activities are reasonably certain to contribute to climate effects within the action area. However, it is difficult if not impossible to distinguish between the action area's future environmental conditions caused by global climate change that are properly part of the environmental baseline vs. cumulative effects. Therefore, all relevant future climate-related environmental conditions in the action area are described in the environmental baseline (Section 2.4).

Within the action area, non-Federal actions are likely to include human population growth, water withdrawals (i.e., those pursuant to senior state water rights) and land use practices. In the action area, state, tribal, and local government actions are likely to be in the form of legislation, administrative rules, or policy initiatives, shoreline growth management and resource permitting. For example, currently, all commercial and recreational eulachon fisheries are extremely limited in the states of Washington and Oregon. Therefore, effects of harvest on eulachon productivity and abundance is minimal (a low-level tribal subsistence fishery still occurs on the Cowlitz River).

As these cities border riverine systems, diffuse and extensive growth will increase overall volume of contaminant loading from wastewater treatment plants and sediments from sprawling urban and suburban development into riverine, estuarine, and marine habitats. Impacts from heightened agricultural production will likely result in two negative impacts on eulachon. The first impact is the greater use and application of pesticide, fertilizers, and herbicides and their increased concentrations and entry into freshwater systems. Second, increased output and water diversions for agriculture may also place greater demands upon limited water resources. Water diversions will reduce flow rates and alter habitat throughout freshwater systems. As water is drawn off, contaminants will become more concentrated in these systems, exacerbating contamination issues in habitats for eulachon.

Although these factors are ongoing to some extent and likely to continue in the future, past occurrence is not a guarantee of a continuing level of activity. That will depend on whether there are economic, administrative, and legal impediments or safeguards in place. Therefore, although NMFS finds it likely that the cumulative effects of these activities will have adverse effects commensurate with or greater than those of similar past activities; it is not possible to quantify these effects.

2.7 Integration and Synthesis

The Integration and Synthesis section is the final step in our assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the effects of the action (Section 2.5) to the environmental baseline (Section 2.4) and the cumulative effects (Section 2.6), taking into account the status of the species and critical habitat (Section 2.2), to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) Reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) appreciably

diminish the value of designated or proposed critical habitat as a whole for the conservation of the species.
As described in the effects section, we expect the maximum numbers of eggs and larvae that may be captured by plankton net tows to equal 250,000 per year. The ecological consequences of removing up to 250,000 eggs/larvae per year from the total production of the Columbia River subpopulation will have minimal effects on eulachon productivity. Using the average of the minimum egg/larvae estimates for 2014-2019, we calculated that this level of effect represents a reduction of 0.00000071% of the estimated annual egg/larvae production for the Columbia River subpopulation, and at the species scales.

There is little fisheries-independent data available for eulachon that provide an adequate estimate of abundance and trends. Historical abundance estimates of eulachon were based on commercial landing statistics. The research on eulachon being carried out by WDFW and would continue to improve our understanding of trends in abundance for the species (project goal), which is providing critical data that is beneficial to the management and conservation of the species.
The environmental baseline within the action area includes extensive development for residential, commercial and recreational use, rivers with highly regulated streamflow, simplified channel habitats, and rivers that are disconnected from their floodplains. We estimate that these habitat-related effects are likely to continue affecting eulachon, but we cannot quantify the degree to which short and long-term habitat-related effects are likely to impact the species' structure, diversity, productivity, or abundance because the precise distribution and abundance of eulachon within the action area are not a simple function of the quantity, quality, or availability of predictable habitat resources within the action area. Nonetheless, we do not expect the effects of this action to adversely affect these habitat features in the action area or further degrade the environmental baseline.

Non-Federal actions are likely to continue affecting eulachon, salmon and steelhead. The cumulative effects in the action area are difficult to analyze because of the uncertainties associated with government and private actions, and the changing economies of the region. Whether these effects will increase or decrease is a matter of speculation; however, given the trends in the region, the adverse cumulative effects are likely to increase. Although Federal, state, tribal, and local governments have developed recovery plans and initiatives to benefit listed species, they must be applied and sustained in a comprehensive way before NMFS can consider them in its analysis of cumulative effects.

The effects of climate change are also likely to continue to be negative. However, given the proposed actions' short time frames and limited areas, those negative effects, while somewhat unpredictable, are too small to be effectively gauged as an additional increment of harm over the time span considered in this analysis. Moreover, the actions would in no way contribute to climate change (even locally), and in any case the proposed actions would actually help monitor the effects of climate change by noting stream temperatures, flows, the status of riverine up- and down-welling areas, etc. So while we can expect both cumulative effects and climate change to continue their negative trends, it is unlikely that the proposed actions would have any additive impact to the pathways by which those effects are realized (e.g., a slight reduction in eulachon abundance would have no effect on increasing stream temperatures or continuing land development).

Therefore, the effects of the proposed action, when added to the environmental baseline, and cumulative effects, will not reduce appreciably the likelihood of both the survival and recovery of the species considered in this opinion.

As previously discussed, we do not expect the proposed action to have any appreciable effect the species' critical habitat, as the actions' short duration, minimal intrusion, and overall lack of measureable effects signify that even when taken together they would have no discernible impact on critical habitat.

The detrimental effect of the research activities contemplated in this opinion—even when they are added to the effects already contemplated in the region—are expected to be minimal. Because these effects are so small, the actions would have only a slight negative effect on the species' abundance and productivity. And because that slight impact is in most cases distributed throughout the subpopulation, it would be so attenuated as to have no appreciable effect on spatial structure or diversity. The abundance and productivity reductions are so small as to have no more than a negligible effect on the species' survival and recovery, and the research is designed to benefit the species' survival in the long term.

Therefore, we expect the detrimental effects on the species to be minimal and be limited to slight reductions in abundance and productivity. Because these reductions to the individual species are so slight, the proposed action would have no appreciable effect on the species' diversity or distribution. Moreover, the actions are expected to provide lasting benefits for the species, and all habitat effects would be inconsequential.

2.8 Conclusion

After reviewing the current status of the listed species, the environmental baseline within the action area, the effects of the proposed action, any effects of interrelated and interdependent actions, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of eulachon or destroy or adversely modfy its critical habitat.

2.9 Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harass" is further defined by interim guidance as any act which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering. "Harm" is further defined by regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102). "Incidental take" is defined by regulation as takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency (50 CFR 402.02). Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an

otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this incidental take statement.

As noted previously, we have not yet promulgated an ESA section 4(d) rule prohibiting take of threatened eulachon. Nonetheless, the amount of incidental take must be considered due to the fact that it could affect the species' viability.

In this instance, and for the actions considered in this opinion, there is no incidental take at all. The reason for this is that all the take contemplated in this document is intentional take that would be carried out as a consequence of the funding (proposed action). The actions are considered to be direct take rather than incidental take because its actual purpose is to take the animals while carrying out a lawful activity. Thus, the take cannot be considered "incidental" under the definition given above. Nonetheless, one of the purposes of an incidental take statement is to lay out the amount or extent of take beyond which individuals carrying out an action cannot go without being in possible violation of section 9 of the ESA. That purpose is fulfilled here by the amounts of direct take laid out in the effects section above (2.5). Those amounts—displayed in the effects analyses—constitute hard limits on both the amount and extent of take that would be allowed in a given year. This concept is also reflected in the reinitiation clause just below.

2.10 Reinitiation of Consultation

This concludes formal consultation for the proposal to Conduct Scientific Research on Eulachon in the Columbia River. As 50 CFR 402.16 states, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and if: (1) The amount or extent of incidental taking specified is exceeded, (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion, (3) the agency action is subsequently modified in a manner that causes an effect on the listed species or critical habitat that was not considered in this opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action.

In the context of this opinion, there is no incidental take anticipated and the reinitiation trigger set out in (1) is not applicable. If any of the direct take amounts specified in this opinion's effects analysis section (2.5) are exceeded, reinitiation of formal consultation will be required because the regulatory reinitiation triggers set out in (2) and/or (3) will have been met.

2.11 "Not Likely to Adversely Affect" Determinations

The proposed action is not likely to adversely affect LCR Chinook salmon SR Fall-run Chinook salmon, SR Spring/Summer-run Chinook salmon, UCR Spring-run Chinook salmon, UWR Chinook salmon, LCR steelhead, Middle Columbia River steelhead, Snake River Basin steelhead, UCR steelhead, UWR steelhead, CR chum salmon, LCR coho salmon, SR sockeye salmon, or their designated critical habitats. Table 4 provides information on listing classification and date, recovery plan reference, most recent status review, status summary, and limiting factors, and Table 5 provides information on the critical habitat, designation date, federal register citation, and status summaries for critical habitat for salmon and steelhead.

Table 4. Listing classification and date, recovery plan reference, most recent status review, status summary, and limiting factors for each species considered herein.

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Lower Columbia River Chinook salmon	Threatened 6/28/05	NMFS 2013	NWFSC 2015	This ESU comprises 32 independent populations. Twenty-seven populations are at very high risk, 2 populations are at high risk, one population is at moderate risk, and 2 populations are at very low risk Overall, there was little change since the last status review in the biological status of this ESU, although there are some positive trends. Increases in abundance were noted in about 70% of the fall-run populations and decreases in hatchery contribution were noted for several populations. Relative to baseline VSP levels identified in the recovery plan, there has been an overall improvement in the status of a number of fall-run populations, although most are still far from the recovery plan goals.	• Reduced access to spawning and rearing habitat • Hatchery-related effects • Harvest-related effects on fall Chinook salmon • An altered flow regime and Columbia River plume • Reduced access to off-channel rearing habitat • Reduced productivity resulting from sediment and nutrient-related changes in the estuary • Contaminant
Upper Columbia River spring-run Chinook salmon	Endangered 6/28/05	Upper Columbia Salmon Recovery Board 2007	NWFSC 2015	This ESU comprises four independent populations. Three are at high risk and one is functionally extirpated. Current estimates of natural origin spawner abundance increased relative to the levels observed in the prior review for all three extant populations, and productivities were higher for the Wenatchee and Entiat populations and unchanged for the Methow population. However, abundance and productivity remained well below the viable thresholds called for in the Upper Columbia Recovery Plan for all three populations.	• Effects related to hydropower system in the mainstem Columbia River • Degraded freshwater habitat • Degraded estuarine and nearshore marine habitat • Hatchery-related effects • Persistence of non-native (exotic) fish species • Harvest in Columbia River fisheries
Snake River spring/summer-run Chinook salmon	Threatened 6/28/05	NMFS 2017a	NWFSC 2015	This ESU comprises 28 extant and four extirpated populations. All expect one extant population (Chamberlin Creek) are at high risk. Natural origin abundance has increased over the levels reported in the prior review for most populations in this ESU, although the increases were not substantial enough to change viability ratings. Relatively high ocean survivals in recent years were a major factor in recent abundance	• Degraded freshwater habitat • Effects related to the hydropower system in the mainstem Columbia River, • Altered flows and degraded water quality • Harvest-related effects • Predation

				patterns. While there have been improvements in abundance and productivity in several populations relative to prior reviews, those changes have not been sufficient to warrant a change in ESU status.	
Upper Willamette River Chinook salmon	Threatened 6/28/05	ODFW & NMFS 2011	NWFSC 2015	This ESU comprises seven populations. Five populations are at very high risk, one population is at moderate risk (Clackamas River) and one population is at low risk (McKenzie River). Consideration of data collected since the last status review in 2010 indicates the fraction of hatchery origin fish in all populations remains high (even in Clackamas and McKenzie populations). The proportion of natural origin spawners improved in the North and South Santiam basins, but is still well below identified recovery goals. Abundance levels for five of the seven populations remain well below their recovery goals. Of these, the Calapooia River may be functionally extinct and the Molalla River remains critically low. Abundances in the North and South Santiam rivers have risen since the 2010 review, but still range only in the high hundreds of fish. The Clackamas and McKenzie populations have previously been viewed as natural population strongholds, but have both experienced declines in abundance despite having access to much of their historical spawning habitat. Overall, populations appear to be at either moderate or high risk, there has been likely little net change in the VSP score for the ESU since the last review, so the ESU remains at moderate risk.	• Degraded freshwater habitat • Degraded water quality • Increased disease incidence • Altered stream flows • Reduced access to spawning and rearing habitats • Altered food web due to reduced inputs of microdetritus • Predation by native and non-native species, including hatchery fish • Competition related to introduced salmon and steelhead • Altered population traits due to fisheries and bycatch
Snake River fall-run Chinook salmon	Threatened 6/28/05	NMFS 2017b	NWFSC 2015	This ESU has one extant population. Historically, large populations of fall Chinook salmon spawned in the Snake River upstream of the Hells Canyon Dam complex. The extant population is at moderate risk for both diversity and spatial structure and abundance and productivity. The overall viability rating for this population is 'viable.' Overall, the status of Snake River fall Chinook salmon has clearly improved compared to the time of listing and compared to prior status reviews. The single extant population in the ESU is currently	• Degraded floodplain connectivity and function • Harvest-related effects • Loss of access to historical habitat above Hells Canyon and other Snake River dams • Impacts from mainstem Columbia River and Snake River hydropower systems • Hatchery-related effects • Degraded estuarine and nearshore habitat.

				meeting the criteria for a rating of 'viable' developed by the ICTRT, but the ESU as a whole is not meeting the recovery goals described in the recovery plan for the species, which require the single population to be "highly viable with high certainty" and/or will require reintroduction of a viable population above the Hells Canyon Dam complex.	
Columbia River chum salmon	Threatened 6/28/05	NMFS 2013	NWFSC 2015	Overall, the status of most chum salmon populations is unchanged from the baseline VSP scores estimated in the recovery plan. A total of 3 of 17 populations are at or near their recovery viability goals, although under the recovery plan scenario these populations have very low recovery goals of 0. The remaining populations generally require a higher level of viability and most require substantial improvements to reach their viability goals. Even with the improvements observed during the last five years, the majority of populations in this ESU remain at a high or very high risk category and considerable progress remains to be made to achieve the recovery goals.	• Degraded estuarine and nearshore marine habitat • Degraded freshwater habitat • Degraded stream flow as a result of hydropower and water supply operations • Reduced water quality • Current or potential predation • An altered flow regime and Columbia River plume • Reduced access to off-channel rearing habitat in the lower Columbia River • Reduced productivity resulting from sediment and nutrient-related changes in the estuary • Juvenile fish wake strandings • Contaminants
Lower Columbia River coho salmon	Threatened 6/28/05	NMFS 2013	NWFSC 2015	Of the 24 populations that make up this ESU, 21 populations are at very high risk, 1 population is at high risk, and 2 populations are at moderate risk. Recent recovery efforts may have contributed to the observed natural production, but in the absence of longer term data sets it is not possible to parse out these effects. Populations with longer term data sets exhibit stable or slightly positive abundance trends. Some trap and haul programs appear to be operating at or near replacement, although other programs still are far from that threshold and require supplementation with additional hatchery-origin spawners .Initiation of or improvement in the downstream juvenile facilities at Cowlitz Falls, Merwin, and North Fork Dam are likely to further improve the status of the associated upstream populations. While these and other recovery efforts have likely improved the status of a number of coho salmon	• Degraded estuarine and near-shore marine habitat • Fish passage barriers • Degraded freshwater habitat: Hatchery-related effects • Harvest-related effects • An altered flow regime and Columbia River plume • Reduced access to off-channel rearing habitat in the lower Columbia River • Reduced productivity resulting from sediment and nutrient-related changes in the estuary • Juvenile fish wake strandings • Contaminants

				populations, abundances are still at low levels and the majority of the populations remain at moderate or high risk. For the Lower Columbia River region land development and increasing human population pressures will likely continue to degrade habitat, especially in lowland areas. Although populations in this ESU have generally improved, especially in the 2013/14 and 2014/15 return years, recent poor ocean conditions suggest that population declines might occur in the upcoming return years	
Snake River sockeye salmon	Endangered 6/28/05	NMFS 2015	NWFSC 2015	This single population ESU is at very high risk dues to small population size. There is high risk across all four basic risk measures. Although the captive brood program has been successful in providing substantial numbers of hatchery produced fish for use in supplementation efforts, substantial increases in survival rates across all life history stages must occur to re-establish sustainable natural production In terms of natural production, the Snake River Sockeye ESU remains at extremely high risk although there has been substantial progress on the first phase of the proposed recovery approach – developing a hatchery based program to amplify and conserve the stock to facilitate reintroductions.	• Effects related to the hydropower system in the mainstem Columbia River • Reduced water quality and elevated temperatures in the Salmon River • Water quantity • Predation
Upper Columbia River steelhead	Threatened 1/5/06	Upper Columbia Salmon Recovery Board 2007	NWFSC 2015	This DPS comprises four independent populations. Three populations are at high risk of extinction while 1 population is at moderate risk. Upper Columbia River steelhead populations have increased relative to the low levels observed in the 1990s, but natural origin abundance and productivity remain well below viability thresholds for three out of the four populations. The status of the Wenatchee River steelhead population continued to improve based on the additional year's information available for the most recent review. The abundance and productivity viability rating for the Wenatchee River exceeds the minimum threshold for 5% extinction risk. However, the overall DPS status remains unchanged from the prior review, remaining at high risk driven by low abundance and productivity relative to viability objectives and diversity concerns.	• Adverse effects related to the mainstem Columbia River hydropower system • Impaired tributary fish passage • Degraded floodplain connectivity and function, channel structure and complexity, riparian areas, large woody debris recruitment, stream flow, and water quality • Hatchery-related effects • Predation and competition • Harvest-related effects

Lower Columbia River steelhead	Threatened 1/5/06	NMFS 2013	NWFSC 2015	This DPS comprises 23 historical populations, 17 winter-run populations and six summer-run populations. Nine populations are at very high risk, 7 populations are at high risk, 6 populations are at moderate risk, and 1 population is at low risk. The majority of winter-run steelhead populations in this DPS continue to persist at low abundances. Hatchery interactions remain a concern in select basins, but the overall situation is somewhat improved compared to prior reviews. Summer-run steelhead populations were similarly stable, but at low abundance levels. The decline in the Wind River summer-run population is a source of concern, given that this population has been considered one of the healthiest of the summer-runs; however, the most recent abundance estimates suggest that the decline was a single year aberration. Passage programs in the Cowlitz and Lewis basins have the potential to provide considerable improvements in abundance and spatial structure, but have not produced self-sustaining populations to date. Even with modest improvements in the status of several winter-run DIPs, none of the populations appear to be at fully viable status, and similarly none of the MPGs meet the criteria for viability.	• Degraded estuarine and nearshore marine habitat • Degraded freshwater habitat • Reduced access to spawning and rearing habitat • Avian and marine mammal predation • Hatchery-related effects • An altered flow regime and Columbia River plume • Reduced access to off-channel rearing habitat in the lower Columbia River • Reduced productivity resulting from sediment and nutrient-related changes in the estuary • Juvenile fish wake strandings • Contaminants
Upper Willamette River steelhead	Threatened 1/5/06	ODFW & NMFS 2011	NWFSC 2015	This DPS has four demographically independent populations. Three populations are at low risk and one population is at moderate risk. Declines in abundance noted in the last status review continued through the period from 2010-2015. While rates of decline appear moderate, the DPS continues to demonstrate the overall low abundance pattern that was of concern during the last status review. The causes of these declines are not well understood, although much accessible habitat is degraded and under continued development pressure. The elimination of winter-run hatchery release in the basin reduces hatchery threats, but non-native summer steelhead hatchery releases are still a concern for species diversity and a source of competition for the DPS. While the collective risk to the persistence of the DPS has not changed	• Degraded freshwater habitat • Degraded water quality • Increased disease incidence • Altered stream flows • Reduced access to spawning and rearing habitats due to impaired passage at dams • Altered food web due to changes in inputs of microdetritus • Predation by native and non-native species, including hatchery fish and pinnipeds • Competition related to introduced salmon and steelhead • Altered population traits due to interbreeding with hatchery origin fish

				significantly in recent years, continued declines and potential negative impacts from climate change may cause increased risk in the near future.	
Middle Columbia River steelhead	Threatened 1/5/06	NMFS 2009	NWFSC 2015	This DPS comprises 17 extant populations. The DPS does not currently include steelhead that are designated as part of an experimental population above the Pelton Round Butte Hydroelectric Project. Returns to the Yakima River basin and to the Umatilla and Walla Walla Rivers have been higher over the most recent brood cycle, while natural origin returns to the John Day River have decreased. There have been improvements in the viability ratings for some of the component populations, but the DPS is not currently meeting the viability criteria in the MCR steelhead recovery plan. In general, the majority of population level viability ratings remained unchanged from prior reviews for each major population group within the DPS.	• Degraded freshwater habitat • Mainstem Columbia River hydropower-related impacts • Degraded estuarine and nearshore marine habitat • Hatchery-related effects • Harvest-related effects • Effects of predation, competition, and disease
Snake River basin steelhead	Threatened 1/5/06	NMFS 2017a	NWFSC 2015	This DPS comprises 24 populations. Two populations are at high risk, 15 populations are rated as maintained, 3 populations are rated between high risk and maintained, 2 populations are at moderate risk, 1 population is viable, and 1 population is highly viable. Four out of the five MPGs are not meeting the specific objectives in the draft recovery plan based on the updated status information available for this review, and the status of many individual populations remains uncertain A great deal of uncertainty still remains regarding the relative proportion of hatchery fish in natural spawning areas near major hatchery release sites within individual populations.	• Adverse effects related to the mainstem Columbia River hydropower system • Impaired tributary fish passage • Degraded freshwater habitat • Increased water temperature • Harvest-related effects, particularly for B-run steelhead • Predation • Genetic diversity effects from out-of-population hatchery releases

Status of Critical Habitat

This section describes the status of designated critical habitat affected by the proposed action by examining the condition and trends of the essential physical and biological features of that habitat throughout the designated areas. These features are essential to the conservation of the ESA-listed species because they support one or more of the species' life stages (*e.g.*, sites with conditions that support spawning, rearing, migration and foraging).

For most salmon and steelhead, NMFS's critical habitat analytical review teams (CHARTs) ranked watersheds within designated critical habitat at the scale of the fifth-field hydrologic unit code (HUC5) in terms of the conservation value they provide to each ESA-listed species that they support (NMFS 2005). The conservation rankings were high, medium, or low. To determine the conservation value of each watershed to species viability, the CHARTs evaluated the quantity and quality of habitat features, the relationship of the area compared to other areas within the species' range, and the significance to the species of the population occupying that area. Even if a location had poor habitat quality, it could be ranked with a high conservation value if it were essential due to factors such as limited availability, a unique contribution of the population it served, or is serving another important role.

Table 5 provides a summary of the status of critical habitats for species considered in this opinion.

Table 5. Critical habitat, designation date, federal register citation, and status summary for critical habitat considered herein.

Species	Designation Date and Federal Register Citation	Critical Habitat Status Summary
Lower Columbia River Chinook salmon	9/02/05 70 FR 52630	Critical habitat encompasses 10 subbasins in Oregon and Washington containing 47 occupied watersheds, as well as the lower Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some, or high potential for improvement. We rated conservation value of HUC5 watersheds as high for 30 watersheds, medium for 13 watersheds, and low for four watersheds.
Upper Columbia River spring-run Chinook salmon	9/02/05 70 FR 52630	Critical habitat encompasses four subbasins in Washington containing 15 occupied watersheds, as well as the Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition. However, most of these watersheds have some, or high, potential for improvement. We rated conservation value of HUC5 watersheds as high for 10 watersheds, and medium for five watersheds. Migratory habitat quality in this area has been severely affected by the development and operation of the dams and reservoirs of the Federal Columbia River Power System.
Snake River spring/summer-run Chinook salmon	10/25/99 64 FR 57399	Critical habitat consists of river reaches of the Columbia, Snake, and Salmon rivers, and all tributaries of the Snake and Salmon rivers (except the Clearwater River) presently or historically accessible to this ESU (except reaches above impassable natural falls and Hells Canyon Dam). Habitat quality in tributary streams varies from excellent in wilderness and roadless areas, to poor in areas subject to heavy agricultural and urban development (Wissmar et al. 1994). Reduced summer stream flows, impaired water quality, and reduced habitat complexity are common problems. Migratory habitat quality in this area has been severely affected by the development and operation of the dams and reservoirs of the Federal Columbia River Power System.
Upper Willamette River Chinook salmon	9/02/05 70 FR 52630	Critical habitat encompasses 10 subbasins in Oregon containing 56 occupied watersheds, as well as the lower Willamette/Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition. However, most of these watersheds have some, or high, potential for improvement. Watersheds are in good to excellent condition with no potential for improvement only in the upper McKenzie River and its tributaries (NMFS 2005). We rated conservation value of HUC5 watersheds as high for 22 watersheds, medium for 16 watersheds, and low for 18 watersheds.
Snake River fall-run Chinook salmon	10/25/99 64 FR 57399	Critical habitat consists of river reaches of the Columbia, Snake, and Salmon rivers, and all tributaries of the Snake and Salmon rivers presently or historically accessible to this ESU (except reaches above impassable natural falls, and Dworshak and Hells Canyon dams). Habitat quality in tributary streams varies from excellent in wilderness and roadless areas, to poor in areas subject to heavy agricultural and urban development (Wissmar et al. 1994). Reduced summer stream flows, impaired water quality, and reduced habitat complexity are common problems. Migratory habitat quality in this area has been severely affected by the development and operation of the dams and reservoirs of the Federal Columbia River Power System.
Columbia River chum salmon	9/02/05 70 FR 52630	Critical habitat encompasses six subbasins in Oregon and Washington containing 19 occupied watersheds, as well as the lower Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. We rated conservation value of HUC5 watersheds as high for 16 watersheds, and medium for three watersheds.
Lower Columbia River coho salmon	2/24/16 81 FR 9252	Critical habitat encompasses 10 subbasins in Oregon and Washington containing 55 occupied watersheds, as well as the lower Columbia River and estuary rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-

Species	Designation Date and Federal Register Citation	Critical Habitat Status Summary
		to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. We rated conservation value of HUC5 watersheds as high for 34 watersheds, medium for 18 watersheds, and low for three watersheds.
Snake River sockeye salmon	10/25/99 64 FR 57399	Critical habitat consists of river reaches of the Columbia, Snake, and Salmon rivers; Alturas Lake Creek; Valley Creek; and Stanley, Redfish, Yellow Belly, Pettit and Alturas lakes (including their inlet and outlet creeks). Water quality in all five lakes generally is adequate for juvenile sockeye salmon, although zooplankton numbers vary considerably. Some reaches of the Salmon River and tributaries exhibit temporary elevated water temperatures and sediment loads that could restrict sockeye salmon production and survival (NMFS 2015a). Migratory habitat quality in this area has been severely affected by the development and operation of the dams and reservoirs of the Federal Columbia River Power System.
Upper Columbia River steelhead	9/02/05 70 FR 52630	Critical habitat encompasses 10 subbasins in Washington containing 31 occupied watersheds, as well as the Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. We rated conservation value of HUC5 watersheds as high for 20 watersheds, medium for eight watersheds, and low for three watersheds.
Lower Columbia River steelhead	9/02/05 70 FR 52630	Critical habitat encompasses nine subbasins in Oregon and Washington containing 41 occupied watersheds, as well as the lower Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. We rated conservation value of HUC5 watersheds as high for 28 watersheds, medium for 11 watersheds, and low for two watersheds.
Upper Willamette River steelhead	9/02/05 70 FR 52630	Critical habitat encompasses seven subbasins in Oregon containing 34 occupied watersheds, as well as the lower Willamette/Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. Watersheds are in good to excellent condition with no potential for improvement only in the upper McKenzie River and its tributaries (NMFS 2005). We rated conservation value of HUC5 watersheds as high for 25 watersheds, medium for 6 watersheds, and low for 3 watersheds.
Middle Columbia River steelhead	9/02/05 70 FR 52630	Critical habitat encompasses 15 subbasins in Oregon and Washington containing 111 occupied watersheds, as well as the Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. We rated conservation value of occupied HUC5 watersheds as high for 80 watersheds, medium for 24 watersheds, and low for 9 watersheds.
Snake River basin steelhead	9/02/05 70 FR 52630	Critical habitat encompasses 25 subbasins in Oregon, Washington, and Idaho. Habitat quality in tributary streams varies from excellent in wilderness and roadless areas, to poor in areas subject to heavy agricultural and urban development (Wissmar et al. 1994). Reduced summer stream flows, impaired water quality, and reduced habitat complexity are common problems. Migratory habitat quality in this area has been severely affected by the development and operation of the dams and reservoirs of the Federal Columbia River Power System.

Effects of the Action

Plankton Net Surveys

NMFS does not expect juvenile or adult salmon and steelhead to be captured in the plankton nets. We base this expectation on the fact that during the past eight years that WDFW has been conducting plankton net surveys for eulachon in the Columbia River, they have never caught any juvenile or adult salmon or steelhead in the plankton nets. Therefore the likelihood of juvenile or adult salmon and steelhead getting captured in the plankton nets is extremely small.

Effects of Boat Traffic on Salmon and Steelhead

While there will be a minor increase in boat traffic associated with the plankton net surveys and correspondingly minor increases in sound levels (decibel – dB), these activities will be intermittent and of short duration and frequency. Given that dozens to hundreds of boats can be found in the action area on any given day—and all salmon and steelhead would be moving rapidly through the action area in any case—the increase in boat traffic and associated sound levels is unlikely to be detectable above background. Therefore, any boat-traffic-induced effects (e.g., changes in salmonid foraging or migration behavior) in the action area will have no appreciable adverse physiological, behavioral, or reproductive effects on the species considered herein. That is, all such effects would be too small and transitory to meaningfully measure, detect or evaluate, and would therefore be insignificant.

Salmon and Steelhead Critical Habitat

As the proposed research activities do not involve any kind of habitat impacts other than intermittent increase in sound levels, we do not expect the proposed action to have adverse effects on designated critical habitat PBFs as these intermittent sound levels will to be too low and short in duration to affect the conservation value of the PBFs in the action area. Therefore, we expect the effects on salmonid critical habitat PBFs considered herein would be too small to meaningfully measure, detect or evaluate, and would therefore be insignificant.

Conclusion

Based on this analysis, NMFS has determined that the proposed action is not likely to adversely affect the subject species or their designated critical habitats.

3. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

The Data Quality Act (DQA) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the opinion addresses these DQA components, documents compliance with the DQA, and certifies that this opinion has undergone pre-dissemination review.

3.1 Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended user of this opinion is WDFW. Individual copies of this opinion were provided to WDFW. The format and naming adheres to conventional standards for style.

3.2 Integrity

This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, 'Security of Automated Information Resources,' Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

3.3 Objectivity

Information Product Category: Natural Resource Plan

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the NMFS ESA Consultation Handbook, and ESA regulations, 50 CFR 402.01 et seq.

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the References section. The analyses in this opinion contain more background on information sources and quality.

Referencing: All supporting materials, information, data and analyses are properly referenced, consistent with standard scientific referencing style.

Review Process: This consultation was drafted by NMFS staff with training in ESA, and reviewed in accordance with West Coast Region ESA quality control and assurance processes.

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