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

December 22, 2022

Dear Recipient:

In accordance with provisions of the National Environmental Policy Act (NEPA), we announce the availability for review of the draft Supplemental Environmental Assessment (SEA) for NOAA's National Marine Fisheries Service's (NMFS) consideration of the Skagit River Steelhead Fishery Resource Management Plan (RMP).

The proposed action is for NMFS to determine whether the Skagit River Steelhead Fishery RMP, submitted by the Sauk-Suiattle Indian Tribe, Swinomish Indian Tribal Community, Upper Skagit Indian Tribe, Skagit River Cooperative, and the Washington Department of Fish and Wildlife , meets Endangered Species Act section 4(d) Limit 6 requirements (*4d-citizens-guide.pdf*)

The SEA document, as well as the 4(d) Proposed Evaluation and Pending Determination document are accessible electronically through the following website: *https://www.fisheries.noaa.gov/action/skagit-river-steelhead-fishery-joint-resource-management-plan*

Comments may be submitted to NMFS via e-mail to the comment coordinator, during the public-comment period. The address for providing e-mail comments is: *salmon.harvest.comments@noaa.gov*. In the subject line of the e-mail, include the following identifier: "Comments on Skagit River Steelhead Fishery RMP."
Comments must be received by January 23, 2023

Comment Coordinator: James Dixon, Fish Biologist
National Marine Fisheries Service, West Coast Region
1009 College St. Southeast, Suite 210
Lacey, WA 98503
Phone: 360-522-3673

Thank you in advance for your input and assistance in finalizing the Environmental Assessment.

Sincerely,

for Scott M. Rumsey, Ph.D.
Acting Regional Administrator

Draft Supplemental Environmental Assessment

Supplemental Environmental Assessment to Analyze Impacts of NOAA's National Marine Fisheries Consideration of the Skagit River Steelhead Fishery Resource Management Plan under Limit 6 of the 4(d) Rule of the Endangered Species Act (ESA)

Prepared by the
National Marine Fisheries Service, West Coast Region

December 2022

Cover Sheet
Draft Supplemental Environmental Assessment

Title of Environmental Review:	Skagit River Steelhead Fishery Resource Management Plan (Skagit River Steelhead RMP)
Distinct Population Segments:	Puget Sound Steelhead DPS
Responsible Agency and Official:	Scott M. Rumsey, Ph.D. Acting Regional Administrator National Marine Fisheries Service West Coast Region 7600 Sand Point Way NE, Building 1 Seattle, Washington 98115
Contact:	James Dixon Sustainable Fisheries Division National Marine Fisheries Service West Coast Region 1009 College St. Southeast, Suite 210 Lacey, Washington 98503
Legal Mandate:	Endangered Species Act of 1973, as amended and implemented – 50 CFR Part 223
Location of Proposed Activities:	Skagit River Basin including Skagit Bay and Mainstem Skagit River in Puget Sound, Washington
Activity Considered:	The proposed resource management plan includes steelhead fisheries and associated activities in the Skagit Basin

This SEA is being prepared using the 2022 Council on Environmental Quality (CEQ) National Environmental Policy Act (NEPA) regulations.

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ABBREVIATIONS AND ACRONYMS

BIA	Bureau of Indian Affairs
BRT	Biological Review Team
CEQ	Council of Environmental Quality
CFR	Code of Federal Regulations
DIP	demographically independent population
DOI	Department of the Interior
DPS	Distinct Population Segment
EA	Environmental Assessment
EFH	Essential Fish Habitat
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FR	Federal Register
LOAF	List of Agreed Fisheries
MPG	Major Population Group
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NWFSC	Northwest Fisheries Science Center
NWIFC	Northwest Indian Fisheries Commission
PFMC	Pacific Fishery Management Council
PSSTRT	Puget Sound Steelhead Technical Review Team
SEA	Supplemental Environmental Assessment
SFD	Sustainable Fisheries Division
SMU	Skagit Management Unit
SRKW	Southern Resident Killer Whale
U.S.	United States
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VSP	viable salmonid population
WDFW	Washington Department of Fish and Wildlife
WDOH	Washington Department of Health

SUMMARY

NOAA's National Marine Fisheries Service (NMFS) is the lead agency for administering the Endangered Species Act (ESA) as it relates to ESA-listed salmon and steelhead. On July 10, 2000, NMFS issued a final rule pursuant to ESA section 4(d) (known as the 4(d) Rule), adopting regulations necessary and advisable to conserve threatened species (50 CFR 223.203). The 4(d) Rule applies the take prohibitions in section 9(a)(1) of the ESA to salmon and steelhead listed as threatened, and sets forth specific circumstances when the take prohibitions would not apply, known as 4(d) limits. Limit 6 applies to Joint Tribal/State resource management plans (RMPs) developed under the *United States* v. *Washington* (*U.S.* v. *Washington* 1979) or *United States* v. *Oregon (U.S.* v. *Oregon* 2009*)* settlement processes. Limit 6 recognizes that salmon fisheries in some areas are co-managed by the Tribes and States according to case law. Various orders of the *United States* v. *Washington* court mandate that many aspects of fishery management, including but not limited to harvest and artificial production actions, be jointly coordinated by the State of Washington and the Western Washington Treaty Tribes (*U.S.* v. *Washington* 1979). Under Limit 6 of the 4(d) Rule, the ESA section 9 take prohibitions do not apply to activities carried out under an RMP developed jointly by the States of Washington, Oregon and/or Idaho and the Tribes within the continuing jurisdiction of *United States* v. *Washington* or *United States* v. *Oregon*, when NMFS determines that the RMP meets the Limit 6 requirements. Additional information about the 4(d) Rule, exemptions, and scientific concepts that NMFS uses to evaluate programs can be found at http://www.westcoast.fisheries.noaa.gov/permits/section_4d.html.

On November 18, 2016, NMFS received an RMP for the proposed steelhead *(Oncorhynchus mykiss)* fisheries in the Skagit Terminal Area under Limit 6 of the 4(d) Rule, referred to as the '2016 RMP' in this analysis. The 2016 RMP was submitted by the Sauk-Suiattle Indian Tribe, Swinomish Indian Tribal Community, Upper Skagit Indian Tribe, Skagit River Cooperative, and the Washington Department of Fish and Wildlife (WDFW), referred to as the co-managers. NOAA Fisheries released its Proposed Evaluation and Pending Determination (PEPD) for a 30-day public review and comment period on December 7, 2017 (Federal Register notice (82 FR 57729, December 7, 2017)). A Final Environmental Assessment (EA) with a Finding of No Significant Impact (FONSI) was completed by NMFS in April of 2018, referred to as the '2018 EA' in this analysis. NMFS' determination in the 2018 EA was that harvest actions as described in the 2016 RMP satisfied the ESA Section 4(d) Rule. In the 2018 EA, the Preferred Alternative was Alternative 2, enacting the RMP for a duration of five years.

On December 8, 2021, NMFS received an RMP from the co-managers for the proposed steelhead fisheries in the Skagit Terminal Area under Limit 6 of the 4(d) Rule, referred to as the '2021 RMP'. This supplemental environmental assessment (SEA) is being prepared in response to the request by the co-managers to review the 2021 RMP. The format of the 2021 RMP is similar to the 2016 RMP, but with a 10-year duration, from date of issuance through April of 2032, instead of the former 5-year duration.

The 2018 EA includes a description of the four alternatives analyzed in detail and alternatives considered but not analyzed in detail. In this SEA, only Alternative 5 (Approve 10-year RMP) will be described; please see the 2018 EA for additional information on the other alternatives. The 2018 EA is available on NMFS' website, here: https://www.fisheries.noaa.gov/resource/document/environmental-assessment-analyze-impacts-noaas-national-marine-fisheries. Where methodologies, the affected environment, and environmental consequences under the new 10-year alternative are not the same as those discussed in the 2018 EA, this SEA provides further information and analyses.

1. PURPOSE OF AND NEED FOR THE PROPOSED ACTION

The Proposed Action is for NMFS to make a 4(d) Rule, Limit 6 determination on a 10-year Skagit River steelhead fishery RMP managing and monitoring fisheries in the Skagit freshwater basin and Skagit Bay, collectively the Skagit Terminal Area, which impact steelhead.

The purpose of the Proposed Action is to ensure the sustainability of Puget Sound steelhead by conserving the productivity, abundance, diversity, and spatial structure of the populations within the Puget Sound Steelhead Distinct Population Segment (DPS) and to meet the criteria under Limit 6 of the ESA 4(d) Rule while providing for the harvest of abundant Puget Sound steelhead. The need for the Proposed Action is to provide meaningful exercise of tribal treaty fishing rights and fishing opportunity for citizens of the State of Washington.

The RMP was submitted by the Sauk-Suiattle Indian Tribe, the Swinomish Indian Tribal Community, the Upper Skagit Indian Tribe, and WDFW, referred to collectively as the co-managers. The co-managers' objectives under the RMP are: 1) to acknowledge Skagit-origin steelhead as an independently managed component of the Puget Sound DPS, for harvest purposes; and 2) to conduct Skagit Terminal Area fisheries in a manner pursuant to *U.S.* v. *Washington*, which would not appreciably reduce the likelihood of survival and recovery of ESA-listed Puget Sound steelhead.

2. ALTERNATIVES

The 2018 EA includes a description of the alternatives analyzed in detail and alternatives considered but not analyzed in detail. The alternatives analyzed in the 2018 Skagit Steelhead EA, and included here by reference, were: Alternative 1 (No Action, equivalent to no harvest), Alternative 2 (Abundance-based Five-Year Management), Alternative 3 (Intermediate Fixed Harvest Rate), and Alternative 4 (Escapement-Based Harvest Management). Since the 2018 EA is incorporated into this action, in the following, only the new alternative presented in the 2021 RMP, Alternative 5, Abundance-based Ten-Year Management, will be described.

2.1 Action Area and Analysis Area

The action area in the 2021 RMP remains the same as presented in the 2018 EA, and is incorporated here by reference. In summary, the action area, including where steelhead would be harvested under the Skagit River Steelhead RMP, includes:

Treaty Fisheries:

1. Marine Catch Area 8.1, Skagit Bay
2. Freshwater Areas 78C; 78D-1, 78D-2, 78D-3, 78D-4 to the mouth of the Baker River; 78O Baker River from the Skagit River to Hwy 20 bridge; 78 Sauk River from the Skagit River to the Sauk Prairie Road bridge; 78P Cascade River from the Skagit River to the Rockport/Cascade bridge.

Non-treaty Fisheries:

1. Skagit River mainstem – Dalles Bridge (approximately river mile 54) in Concrete upstream to Gorge Powerhouse (approximately river mile 94.3).
2. Sauk River – mouth (enters Skagit River mainstem at river mile 66) to Sauk Prairie Road Bridge.
3. Suiattle River – mouth (enters Sauk at river mile 13) upstream to Boundary Bridge (intersection of Forest Road 26 and 25, river mile 12) (McClure 2017; Sauk-Suiattle Indian Tribe et al. 2021).

The action area is also referred to by the co-managers as the Skagit Terminal Area. Figure 2-1 shows a map of the action area for proposed treaty and non-treaty fisheries.

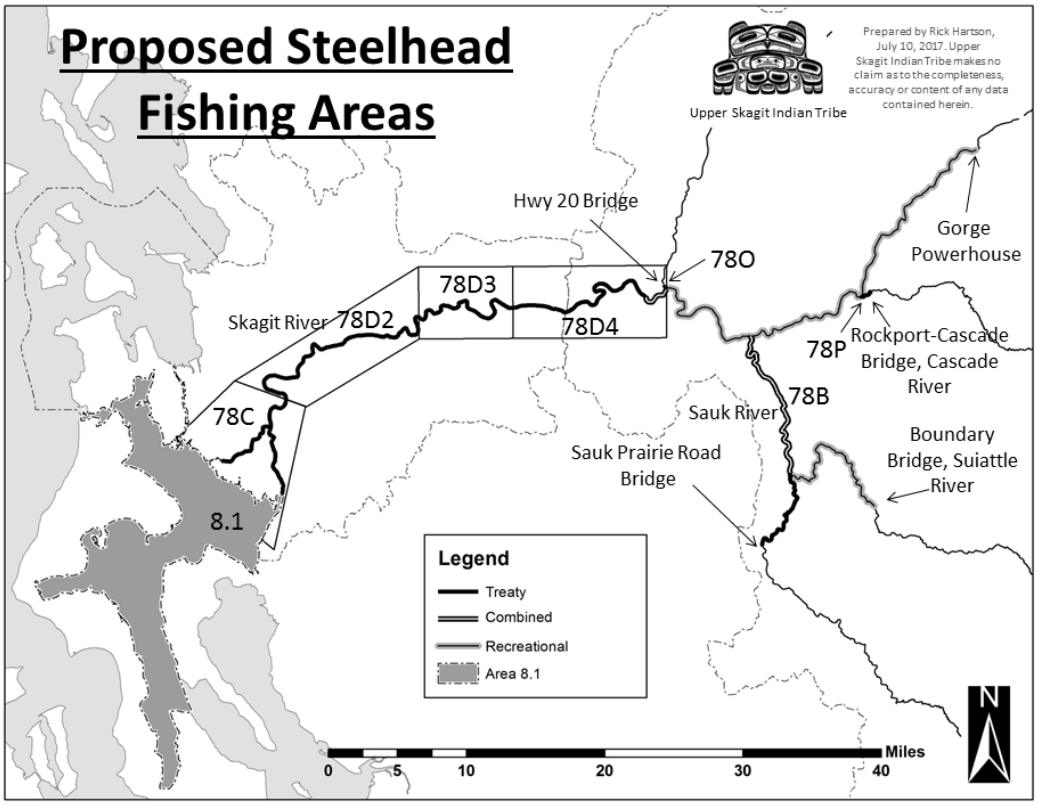

Figure 2-1. Action area for the Skagit River steelhead RMP. The analysis area for each resource is the same as the action area unless noted in Chapter 3 (Hartson 2017 in McClure 2017).

2.2 Alternative 5 (Proposed Action/Preferred Alternative) - Approve the Skagit RMP Under the 4(d) Rule Limit 6 for 10 Years

Under this alternative, NMFS would approve the 2021 RMP for the duration of 10 years under Limit 6 criteria of the 4(d) Rule.

2.2.1 Fisheries Management

Alternative 5 would utilize a Skagit Steelhead Management Unit (SMU), with an annual harvest rate managed independently from the other (non-Skagit) steelhead populations in Puget Sound. The Proposed Action utilizes an abundance-based, stepped harvest rate, which increases at specific abundance levels, as the total Skagit River wild steelhead abundance increases (Table 2-1). The proposed stepped harvest rates would include both direct and incidental harvest of wild steelhead in the action area. The lowest proposed harvest rate of 4 percent would apply to abundances at or below 4,000 adult steelhead (effectively limiting harvest to incidental take for existing fisheries). That rate would increase to 10 percent for abundances between 4,001 and 6,000 steelhead. Between 6,001 and 8,000 steelhead the harvest rate would be 20 percent, and above abundances of 8,001 steelhead, the harvest rate would increase to 25 percent (Table 2-1).

Table 2-1. Stepped fishing regime proposed for managing steelhead fisheries in the Skagit SMU (Sauk-Suiattle Indian Tribe et al. 2021)

Preseason Forecast for Skagit River Steelhead	Allowable Impact Rate
Terminal Run ≤ 4,000	4%
4,001 ≤ Terminal Run < 6,000	10%
6,001 ≤ Terminal Run < 8,000	20%
Terminal Run ≥ 8,001	25%

The co-managers structured the stepped harvest values and impact rates based on critical and viable thresholds (McElhany et al. 2000; NMFS 2019c) to establish conservative fishery harvest implementation and ensure the sustainability of the Skagit SMU.

As in the 2016 RMP, these management strategies would apply to treaty tribal commercial, subsistence, and ceremonial fisheries and non-tribal recreational fisheries directed at the Skagit SMU. In addition to the abundance-based limitations, Skagit SMU fisheries would be restricted seasonally; tribal fisheries would typically operate between December 1 and April 15, and non-tribal recreational fisheries would operate no earlier than February 1 through April 30. For RMP fisheries, seasonal and area regulations would vary depending on the preseason abundance estimates.

Should new information become available that would indicate a deviation from the steelhead fishery management regime described in the 2021 RMP, or should substantial changes come to light, the co-managers would consult with NOAA Fisheries, as described under the 4(d) Rule Limit 6 (NOAA 2003) and determine an appropriate course of action (Sauk-Suiattle Indian Tribe et al. 2021).

2.2.2 Reporting

The co-managers would continue the annual reporting elements of the 2018 RMP for the 10-year duration of the 2021 RMP. The Skagit SMU annual report would provide pre-season management agreements describing fisheries consistent with the 2021 RMP, the observed landed catch and estimated mortality in tribal and recreational fisheries, the estimated number and age composition of natural spawners, terminal harvest rates, any information on illegal harvests, results from any genetic analysis, and other data collected that would be useful in the evaluation of the Skagit RMP (Sauk-Suiattle Indian Tribe et al. 2021).

2.2.3 Enforcement

The WDFW Law Enforcement Program enforces regulations enacted by the Fish and Wildlife

Commission for non-treaty commercial and recreational fishing regulations. These officers assist city, county, other state, and tribal law enforcement agencies, and cooperate with the U.S. Fish and Wildlife Service, NMFS Enforcement branch, and the U.S. Coast Guard in fisheries enforcement (Sauk-Suiattle Indian Tribe et al. 2021).

Certain recreational fisheries may be assigned high priority for enforcement and may be more intensively monitored. Officers are assigned to work during open fishing days and restricted periods and conduct additional checks during closed periods. Officers carry out bank and boat patrols to check and assist anglers. Covert surveillance may also be conducted where reports of violations have been received.

Individual tribal governments monitor and enforce their own commercial, subsistence, and ceremonial regulations for fisheries conducted on and off reservation (Sauk-Suiattle Indian Tribe et al. 2021). Tribal enforcement officers can be cross-deputized and may cooperate with other tribal, state, and federal fisheries enforcement agencies. Violations of tribal regulations may involve fines or prosecution by tribal justice agencies. Officers are assigned to monitor tribal usual and accustomed fishing areas; fisheries compliance for gear, area, and retention specifics; and other tribally imposed regulations and requirements (Sauk-Suiattle Indian Tribe et al. 2021). Officers patrol these fisheries from shore and boat, where they can also assist tribal fishers. Officers also patrol closed water for fishing out of season or in closed waters.

See Section 10.0 of the 2021 RMP for more information regarding enforcement (Sauk-Suiattle Indian Tribe et al. 2021).

2.2.4 Management of Adults on the Spawning Grounds

To ensure that enough Skagit steelhead escape to the spawning grounds, the co-managers would develop an annual plan based on the forecast of the returning run. The proposed harvest plan, based on a stepped returning adult abundance of wild steelhead, would limit the total allowable harvest rate on the overall run at varying levels of abundance (see Table 2-1) (Sauk-Suiattle Indian Tribe et al. 2021). Therefore, depending on the forecasted run size, the total proportion of the run that would "escape" the fisheries would vary annually – higher abundance runs would result in a lower proportion (relative) of the total run reaching the spawning grounds, while lower abundance runs would result in a higher proportion (relative) of the total run reaching the spawning grounds. More information on the development of the Skagit RMP and management of adults on the spawning grounds is further described in Section 3.2.1.2, Skagit River Steelhead.

The 4(d) Rule criterion (4(i)(A)) for salmon and steelhead resource management plans for harvest programs allows populations, in this case, steelhead demographically independent populations (DIPs) within the Skagit River, to be aggregated for management purposes when dictated by information scarcity, if consistent with the survival and recovery of the listed DPS (NOAA 2003). The co-managers describe the reasons for using the Skagit River steelhead management unit (SMU) in lieu of

population-level units based on lack of available data for each of the four identified steelhead DIPs (Sauk-Suiattle Indian Tribe et al. 2021). Then the co-managers apply Ricker and Beverton-Holt spawner-recruit population models, to the aggregate management unit, to determine how many steelhead adults would be required to reach the spawning grounds so that the proposed fisheries do not appreciably affect the viable salmonid population (VSP) parameters of the ESA-listed Skagit River natural origin steelhead populations within the Skagit SMU. An allowable harvest rate of 4 percent has been proposed for run sizes of 4,000 steelhead or less. This means that a minimum of 96 percent of the forecasted run would escape to spawn during lower abundance run sizes (i.e., < 4,000 steelhead). The highest allowable harvest rate of 25 percent has been proposed for run-sizes of 8,001 steelhead or greater. This means that a minimum of 75 percent of the forecasted steelhead run would escape to spawn during higher steelhead abundance run sizes (i.e., > 8,001 steelhead) (see Table 2-1).

The co-managers would actively monitor both the actual escapement (Skagit Basin steelhead abundance) and the fisheries harvest within the action area to ensure that the proposed harvest rates are not exceeded (Sauk-Suiattle Indian Tribe et al. 2021). They would use the results to adaptively manage the fishery in-season, annually, and over the 10-year duration of the 2021 RMP.

2.2.5 Consideration of Viable Salmonid Population Parameters

NMFS's Puget Sound Steelhead Technical Review Team (PSSTRT) considered the viability of Puget Sound steelhead under the four VSP parameters: abundance, productivity, spatial structure, and diversity (McElhany et al. 2000). In addition to the abundance-based stepped steelhead harvest management regimes that take into consideration impacts to abundance and productivity, the co-managers propose to implement additional fishery management strategies to conserve spatial structure and diversity components for the Skagit SMU, in lieu of information on the individual Skagit steelhead DIPs (Sauk-Suiattle Indian Tribe et al. 2021) to address concerns outlined in NMFS' PSSTRT population delineation and viability documents (Hard et al. 2015; Myers et al. 2015). The co-managers include the following fishery management strategies in the 2021 RMP:

1. <u>Protection of Kelts (Repeat Spawners)</u>

   Alternative 5 (Proposed Action/Preferred Alternative) would provide protection of kelts by:

   a. Opening recreational fisheries for adult steelhead well upstream of the relatively small Nookachamps Creek population,

   b. Closing recreational fisheries directed at adult steelhead no later than April 30 to limit kelt mortality,

   c. Tribal fisheries directed at Skagit steelhead focus on the timeframe from January through April, a time when kelts are not abundant. This is confirmed by the Skagit steelhead test fishery results, and,

   d. Other tribal net fisheries encounter steelhead, both prespawn and kelt, incidental to target species; however, steelhead are not targeted in these fisheries and some of these fisheries

may be conducted as steelhead non-retention (steelhead must be released), as a conservation measure. In this case, a steelhead mortality rate of 18.5% is applied to all released steelhead.

2. Protection of Summer-Timed Steelhead

Alternative 5 (Proposed Action/Preferred Alternative) would provide protection for the summer-timed component of the Skagit steelhead populations by:

a. opening recreational fisheries directed at adult steelhead no earlier than February 1 and closing no later than April 30, and,

b. not opening any tribal fisheries directed at the harvest of summer-timed steelhead.

3. Protection of Early-Timed Winter Steelhead

Alternative 5 (Proposed Action/Preferred Alternative) would provide protection of early run winter steelhead by:

a. opening recreational fisheries directed at adult steelhead no earlier than February 1, and,

b. ensuring treaty fisheries apply most efforts between February and early April and to monitor the fishery in real-time and manage to ensure harvest limits are observed.

4. Protection of Nookachamps Creek Steelhead Population

Alternative 5 (Proposed Action/Preferred Alternative) would provide protection of the Nookachamps Creek population, by:

a. Opening recreational fisheries for adult steelhead well upstream of the relatively small Nookachamps Creek population, and,

b. ensuring treaty fisheries will not concentrate on early returns, but rather be designed to access steelhead across the entire return period.

2.2.6 Research, Monitoring and Evaluation

Also included in the 2021 RMP are procedures for research, monitoring, and evaluation. For the duration of the 2021 RMP, the co-managers would record annual accounting of recreational encounters, all landed catch, estimates of non-landed mortalities, and estimation of spawning escapement. These records would provide the basic information needed to monitor population abundance trends and assess management performance against the harvest objectives (harvest rate ceilings and abundance thresholds). The 2021 RMP establishes the following performance indicators for re-evaluation:

- Is the preseason forecast accurately predicting the abundance of returning adults?
- The accuracy and precision of the forecast method will be evaluated each year and the error of

the preseason forecast evaluated.

- Are the fisheries managed consistent with the allowable impact rates? Postseason estimates of impact rates will be compared with the allowable rates for treaty and nontreaty fisheries identified during the preseason planning process.

- Are the number of spawners consistent with expectations? The estimated number of spawners will be compared with the range as predicted in the risk assessment simulations and forecasts.

- Is the range of spawn-timing maintained or increased? Spawn-timing information will be collected to assess long-term changes.

The Skagit terminal area co-managers have methods in place to monitor fisheries and observe spawning timing and frequency so to assess natural escapement of steelhead. These methods will be periodically reviewed, evaluated, and where necessary modified, to enhance resulting data quantity and quality.

The co-managers would continue the annual reporting elements of the 2016 RMP for the 10-year duration of the 2021 RMP. The Skagit SMU annual report would provide pre-season management agreements describing fisheries consistent with the 2021 RMP, the observed landed catch and estimated mortality in tribal and recreational fisheries, the estimated number and age composition of spawners, terminal harvest rates, information on illegal harvests, results from genetic analyses, and other data collected that would be useful in the evaluation of the Skagit RMP (Sauk-Suiattle Indian Tribe et al. 2021).

See Section 9.0 of the 2021 RMP for more information regarding research, monitoring, and evaluation (Sauk-Suiattle Indian Tribe et al. 2021).

3. AFFECTED ENVIRONMENT

3.1 Introduction

Chapter 3, Affected Environment, describes the existing conditions of resources within the analysis area that have the potential to be impacted by implementation of the Proposed Action. This SEA only includes updated information on resources where new information is available since the 2018 EA. Please consult Section 3, *Affected Environment* of the 2018 EA for a more complete discussion of the affected environment, incorporated here by reference.

3.1.1 Scoping

Through internal scoping, each resource area was reviewed to determine if it had the potential to be

impacted by the Proposed Action. If there is no impact, or if the impact is considered negligible, the resource will not be considered for further analysis in this SEA. Only resources impacted by the Proposed Action are described in Chapter 3, Affected Environment, and analyzed in Chapter 4, Environmental Consequences of this SEA. Below is a list of the results of scoping for this SEA.

As a result of the scoping above, the resource areas evaluated in this SEA include:

- Fish: ESA-listed Steelhead, other Puget Sound/Strait of Georgia Salmon Species, and Bull Trout
- Wildlife: Southern Resident Killer Whales
- Habitat: Essential Fish Habitat and Critical Habitat
- Cultural Resources
- Socioeconomics

Chapter 3, Affected Environment, of the 2018 EA included a description of existing conditions and the analysis areas for these resources, which is incorporated by reference. Chapter 3, Affected Environment, of this SEA includes updated information to impacted resources where new information is available since the 2018 EA was produced. In addition, Chapter 3 considers adverse and disproportional impacts related to these resources in Section 3.8, Environmental Justice. Consult the 2018 EA for a more complete discussion of the Affected Environment and its components.

3.2 Fish

For the purposes of this SEA, certain fish species would be impacted by the implementation of Alternative 5, Proposed Action/Preferred Alternative. Sections 3.2.1 through 3.2.3 will describe any changes in fish resource areas since the 2018 EA was completed, and Sections 4.2.1 through 4.2.3 will analyze impacts.

The descriptions of fish species below include new information but are not limited to this purpose. Refer to the 2018 EA for more information.

3.2.1 ESA-Listed Steelhead

The only ESA-listed salmon or steelhead species that would be substantially affected by the proposed action is the Puget Sound steelhead DPS. New information about the current status of Puget Sound steelhead, primarily the Skagit SMU, which would be harvested under implementation of the 2021 RMP, is described below.

3.2.1.1 *Puget Sound Steelhead*

To define the status of the Puget Sound steelhead DPS, this section describes VSP population characteristics (abundance, productivity, diversity, and spatial structure (McElhany et al. 2000)), harvest, and hatchery production, where new information is available since the 2018 EA was prepared. This section describes the Puget Sound steelhead DPS as a whole; for more specific

information about the status of the Skagit SMU component of the DPS, see Section 3.2.1.2, *Skagit River Steelhead*.

The Puget Sound Steelhead DPS remains ESA-listed as threatened (originally listed on May 11, 2007 (72 FR 26722)). Figure 3-1 shows a map of the range for the entire Puget Sound Steelhead DPS. NMFS' most recent five-year status review for Pacific salmon and steelhead, (issued on May 26, 2016 (81 FR 33469)), concluded that the biological risks faced by the Puget Sound Steelhead DPS have not substantially changed since the 2011 status review (NWFSC 2015). NMFS is currently preparing a new five-year status review for the Puget Sound Steelhead DPS. In the meantime, the NWFSC released a biological viability assessment update (Ford 2022) that contains updated information that will be incorporated into the next five-year status review and is referenced in this SEA. Although the status of Puget Sound steelhead remains similar to the status described in the 2018 EA, some additional annual abundance information is available, and a recovery plan for Puget Sound steelhead was completed in 2019 (NMFS 2019c).

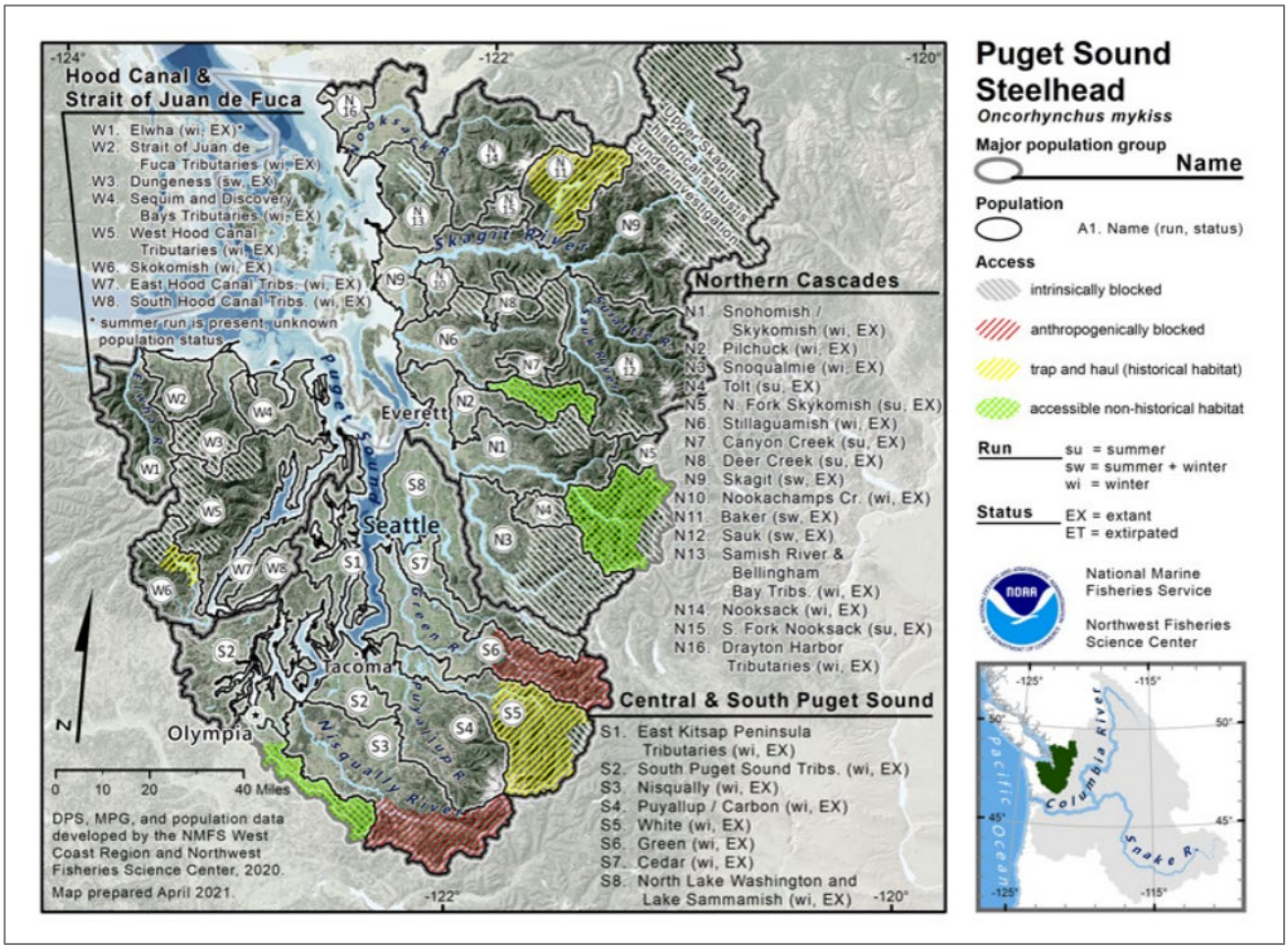

Figure 3-1. Map of the Puget Sound Steelhead DPS's spawning and rearing areas, identifying 32 demographically independent populations (DIPs) within 3 major population groups (MPGs). The 3 steelhead MPGs are Northern Cascades, Central & South Puget Sound, and Hood Canal & Strait of Juan de Fuca. Areas

where dams block anadromous access to historical habitat is marked in red cross-hatching; and areas where historical habitat is accessible via trap and haul programs is marked in yellow cross-hatching. Areas where the laddering of falls has provided access to non-historical habitat is marked in green cross-hatching. Finally, historically inaccessible portions of watersheds are marked in grey and white cross-hatching.

Abundance and Productivity

As discussed in the 2018 EA (NMFS 2018b), the 2019 recovery plan (NMFS 2019c), and the 2022 viability assessment (Ford 2022), the abundance of the Puget Sound Steelhead DPS went through a period of substantial decline (Busby et al. 1996; Hard et al. 2007; Sauk-Suiattle Indian Tribe et al. 2016; Sauk-Suiattle Indian Tribe et al. 2021). Since estimates began for many populations in the late 1970s and early 1980s, the long-term abundance of adult steelhead returning to many Puget Sound rivers fell substantially; however, in the nearer term, there has been a relative improvement in abundance and productivity (Ford 2022).

Total abundance of steelhead in populations for which data are available has shown a generally declining trend over the full period of the abundance data available for each DIP, although 15 of the 32 DIPs show increases in the most recent 5-year geometric mean (Figure 3-2)(Table 3-1). From 2015 to 2019, nine steelhead DIPs had fewer than 250 natural spawners annually, and 12 steelhead DIPs had 500 or fewer natural spawners (Table 3-1).

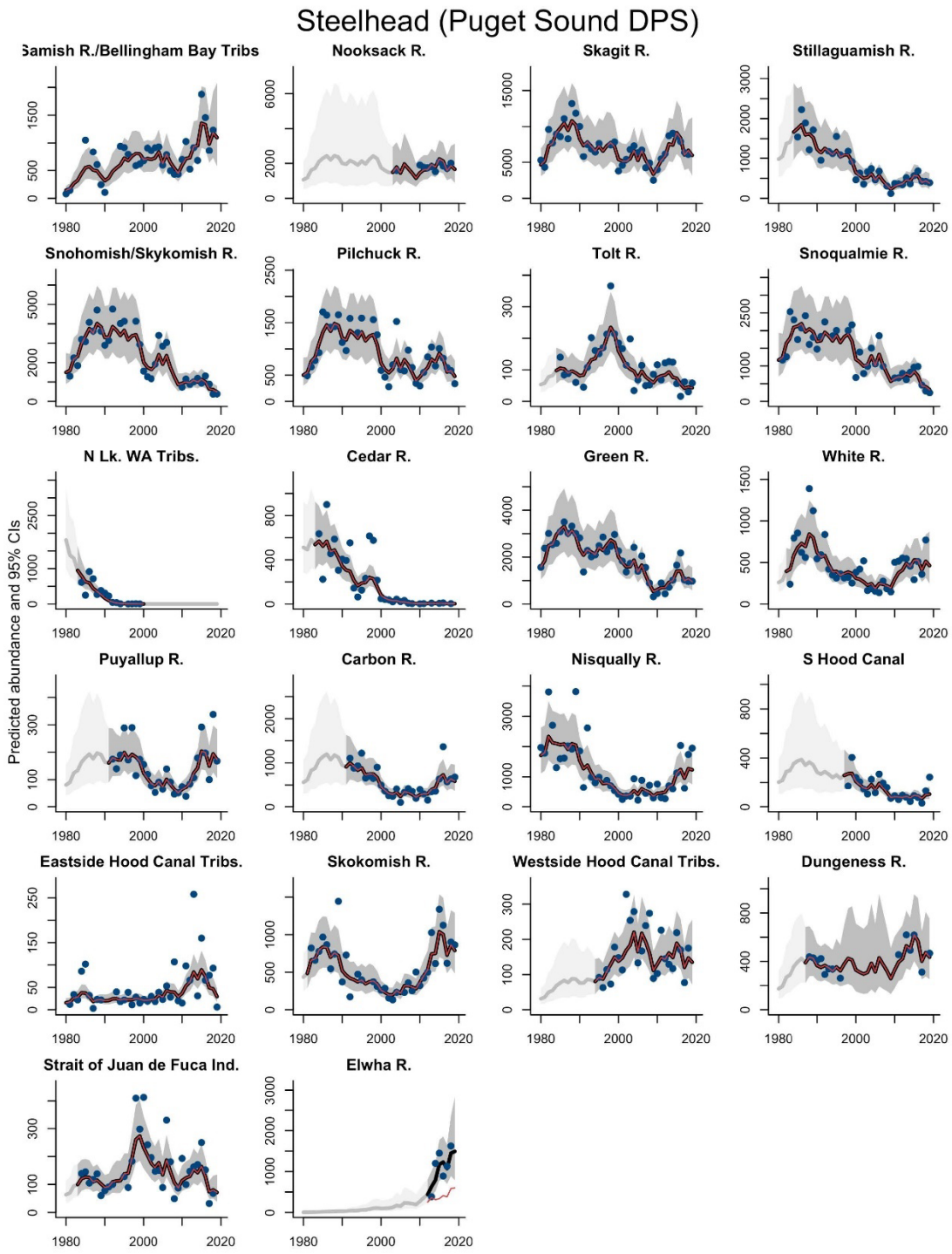

Figure 3-2. Smoothed trends in estimated total (thick black line, with 95% confidence interval in gray) and natural (thin red line) population spawning abundances through 2020. In portions of a time series where a population has no annual estimates but smoothed estimate is shown in light gray. Points show the annual raw spawning abundance estimates. For some trends, the smoothed estimate may be influenced by earlier data points not included in the plot. Note: For this DPS, all abundance data are for natural-origin spawners. No information on hatchery fraction is available (Ford 2022).

Table 3-1. Five-year geometric mean of raw natural spawner counts for Puget Sound steelhead. Percent change between the most recent two 5-year periods is shown on the far right. W, winter-run; S, summer run (Ford 2022).

Population	1990-1994	1995-1999	2000-2004	2005-2009	2010-2014	2015-2019	% Change from 2010-2014 to 2015-2019
Samish R./Bellingham Bay Tribs. (W)	316	717	852	535	748	1,305	74
Nooksack R. (W)	-	-	-	-	1,745	1,906	9
Skagit R. S and (W)	7,202	7,656	5,419	4,677	6,391	7,181	12
Stillaguamish R. (W)	1,078	1,166	550	327	386	487	26
Snohomish/Skykomish R.	3,629	3,687	1,718	2,942	975	690	-29
Pilchuck R. (W)	1,225	1,465	604	597	626	638	2
Snoqualmie R. (W)	1,831	2,056	1,020	1250	706	500	-29
Tolt R. (S)	112	212	119	70	108	40	-63
N. Lake WA Tribs. (W)	60	4	-	-	-	-	-
Cedar R. (W)	241	295	37	12	4	6	50
Green R. (W)	2,062	2,585	1,885	1,045	662	1,282	94
White R. (W)	169	183	147	57	79	182	130
Puyallup R. (W)	199	196	93	72	85	201	136
Nisqually R. (W)	1,200	754	409	446	477	1,368	187
S. Hood Canal (W)	97	148	176	145	69	91	32
Eastside Hood Canal Tribs. (W)	27	21	25	37	60	93	55
Skokomish R. (W)	385	359	205	320	533	958	80
Westside Hood Canal Tribs (W)		97	208	167	138	150	9
Dungeness R. (S and W)	356				517	408	-21
Strait of Juan de Fuca Independents (W)	89	191	212	118	151	95	-37
Elwha R. (W)	-	-	-	-	680	1,241	82

Productivity, defined as the total number of adult recruits produced per total number of spawners, has remained variable across the DPS. Productivity has fluctuated near replacement levels for Puget Sound for some steelhead DIPs, and some have shown signs of productivity above replacement, although several of the populations have been below replacement in the most recent years for which data are available (see Figure 3-3)(NMFS 2022). For the Hood Canal & Strait of Juan de Fuca MPG, both long term and recent productivity are strongly positive (Figure 3-3). For the Northern Cascades MPG, productivity was mostly negative except for the Samish River/Bellingham Bay Tributaries DIP and perhaps the Nooksack and Skagit Rivers. For those populations, this contrasts with the five-year abundance trends, suggesting a downward abundance trend in the near future (Figure 3-3)(Ford 2022). For the Central and South Puget Sound MPG, recent productivity has been predominately positive (Figure 3-3)(Cram et al. 2018; Ford 2022; NMFS 2022).

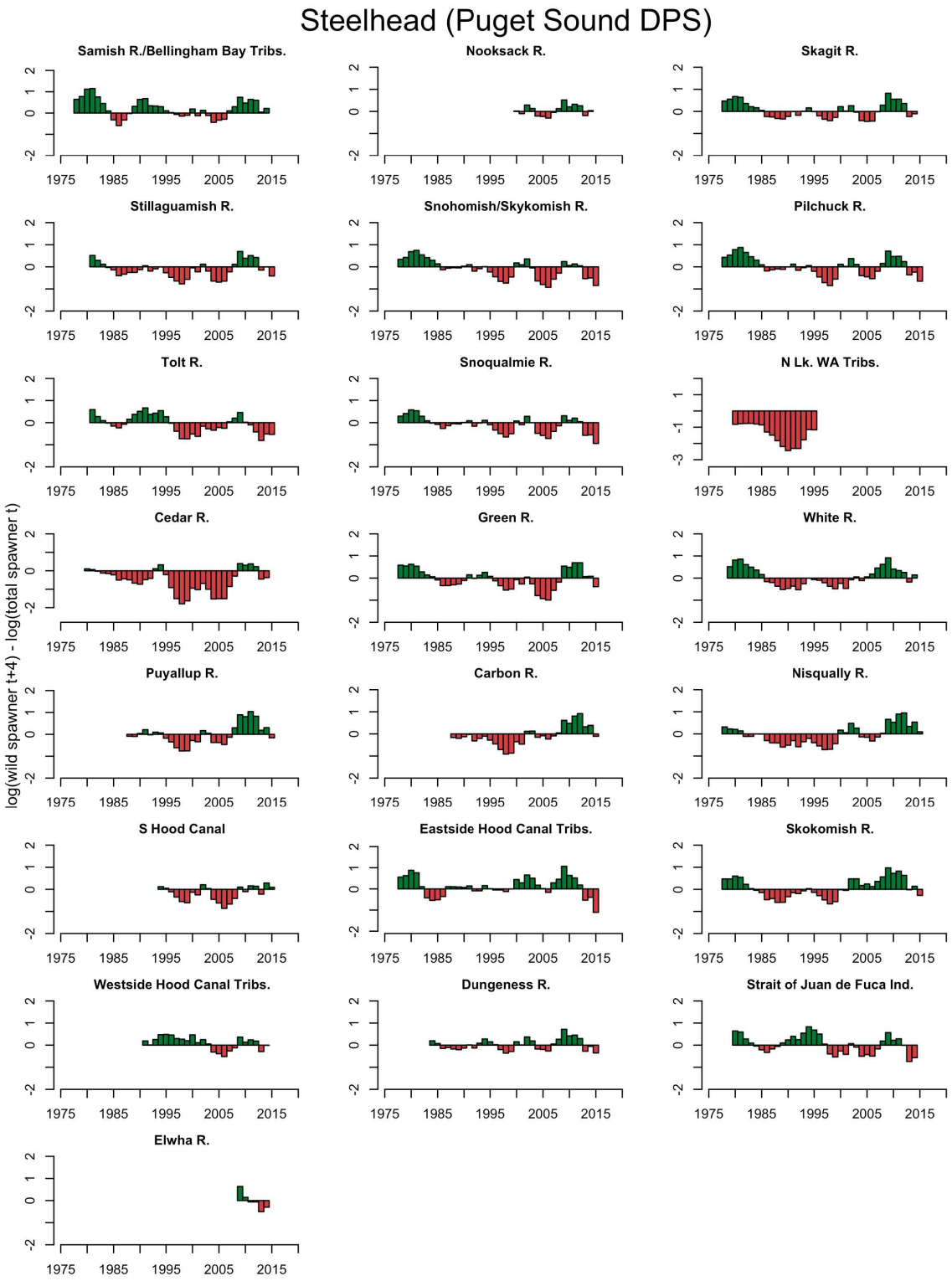

Figure 3-3. Trends in population productivity of Puget Sound steelhead, estimated as the log of the smoothed natural spawning abundance in year *t* minus the smoothed natural spawning abundance in year (*t* - 4).

Spatial Structure and Diversity

Spatial structure and diversity buffer a population against short-term environmental fluctuations and long-term climatic change. The PSSTRT completed its evaluation of factors that influence spatial structure and diversity for the Puget Sound Steelhead DPS in 2015 (Hard et al. 2015), Cram et al. (2018) discussed spatial structure in their Steelhead at Risk Report, and the NWFSC provided an updated report in the 2022 biological viability assessment (Ford 2022). The 2019 Recovery Plan recommends protecting high quality habitats, improving core juvenile rearing habitats, and increasing capacity by restoring access to high quality habitats to increase Puget Sound steelhead abundance, diversity and spatial structure (Hard et al. 2015; NWIFC 2016; NMFS 2019c).

Indicators of spatial structure for the Puget Sound steelhead DPS generally include the fraction of intrinsic potential available rearing and spawning habitat that is occupied compared to what is needed[1], and for diversity, indicators generally include hatchery fish production (see following section, *Hatchery Production*), contribution of resident fish to anadromous fish production, and run timing of adult steelhead. The major risk factors associated with spatial structure and diversity continue to be habitat loss, low abundance of several summer-run populations, diminishing abundance of some winter-run populations, and continued releases of hatchery steelhead from Skamania-derived summer-run and Chambers Creek-derived winter-run stocks (although 2022 biological viability assessment notes that discontinuation the release of Skamania hatchery-origin summer-run steelhead is planned in the near future (Hard et al. 2007; Hard et al. 2015; Ford 2022; NMFS 2022).

Quantitative information on spatial structure and connectivity was not available for most Puget Sound steelhead populations, so the PSSTTRT used a Bayesian Network framework to assess the influence of these factors on steelhead viability at the population, MPG, and DPS scales (Hard et al. 2015). The Puget Sound Steelhead Technical Recovery Team concluded that populations throughout the DPS showed evidence of diminished spatial structure and diversity. Specifically, spatial structure and diversity were determined to be higher in the Northern Cascades MPG and lower in the Central and South Puget Sound MPG. Most Puget Sound steelhead populations were given intermediate scores for spatial structure and low scores for diversity because of extensive hatchery influence, low breeding population sizes, and freshwater habitat fragmentation or loss (NWFSC 2015; Ford 2022; NMFS 2022).

The Steelhead at Risk Report (Cram et al. 2018) reported that in the Puget Sound DPS, six of the 32 populations (19 percent) had lost greater than approximately five percent of their original habitat to large dams and barriers; however, since the 2018 EA was prepared, a number of events occurred in the Puget Sound that affected steelhead habitat. The 2014 Elwha and Glines Canyon Dam removals continue to be evaluated, but it is evident that steelhead are accessing much of this newly available habitat (Fraik et al. 2021; Pess et al. In review). Passage operations have also begun on the North Fork

[1] Intrinsic potential is the area of habitat suitable for steelhead rearing and spawning, at least under historical conditions (Hard et al. 2015)

Skokomish River. Improvements in adult fish collection at Mud Mountain Dam are near completion, with the expectation that improvements in adult survival will facilitate better utilization of habitat above the dam. In addition, the 2020 removal of the diversion dam on the Middle Fork Nooksack Dam and of the Pilchuck River Diversion Dam will provide access to important headwater spawning and rearing habitats. The proposed modification of the Howard Hanson Dam in the longer term will also allow steelhead to return to historical habitat in the Green River (NMFS 2019b). Four of the top six steelhead populations identified by Cram et al. (2018) as having habitat blocked by major dams are in the process of having passage restored or improved, as well as about 8,000 culverts being identified for removal to improve steelhead habitat (NMFS 2019c). It is also anticipated that there will continue to be land development, loss of riparian and forest habitat, loss of wetlands, and demands on water allocation that will continue to degrade the quality and quantity of available fish habitat (Ford 2022).

Hatchery Production

There are currently 13 hatchery programs in Puget Sound that propagate steelhead. Five of these programs produce hatchery-origin steelhead that are similar to the natural-origin steelhead populations in the watersheds where those programs release fish. These programs are designed to conserve and rebuild ESA-listed populations and allow for natural spawning of hatchery-origin fish. They use broodstock founded from, and integrated with, the natural population for steelhead conservation purposes. Fish produced through these five programs are also included in the listed Puget Sound Steelhead DPS (79 FR 20802, April 14, 2014). In the Central/Southern Cascade MPG, one program operates to rebuild the native White River winter-run steelhead population. One additional rebuilding program is operated to conserve steelhead populations that are part of the Hood Canal and Strait of Juan de Fuca MPG. A newer, conservation program operated out of the North Fork Skokomish Hatchery by Tacoma Power and Utilities is currently supporting the recovery of native Skokomish River winter steelhead. The fourth program, the Elwha River Native Steelhead program, preserves and assists in the rebuilding of native Elwha River winter-run steelhead. The fifth program is a newly developed summer steelhead hatchery program, in the South Fork Skykomish River, which has been approved by NMFS under Limit 6 of the 4(d) Rule (NMFS 2021a). This program is transitioning to the use of a localized, within-basin natural-origin broodstock and is intended to maintain a locally-adapted population comprised of hatchery broodstock and naturally spawning fish from within the Puget Sound DPS (Ford 2022).

The remaining eight steelhead hatchery programs produce fish for harvest. In 2016, five early winter steelhead hatchery programs producing non-listed fish and operating within the Dungeness, Nooksack, Stillaguamish, Snohomish, and Skykomish River Basins received approval by NMFS under ESA 4(d) Rule, limit 6 for effects on ESA-listed steelhead and Chinook salmon (NMFS 2016a; 2016b). Lastly, there are three harvest augmentation programs currently propagating early summer-run steelhead (ESS), which were derived from Columbia River, Skamania stock, in the Green (Soos Creek), Skykomish (Reiter Ponds) and Stillaguamish (Whitehorse Ponds) River Basins and which are

not part of the Puget Sound DPS. WDFW has started phasing out these Skamania-origin (Columbia River) programs, the only programs that propagate stock from outside of Puget Sound. The last releases occurred in 2020 for the Whitehorse Ponds program (Stillaguamish River), and will occur in 2022 for the Reiter Ponds program (Skykomish River). The Soos Creek Hatchery summer steelhead program (Green River) will be transitioned to a within-Puget Sound stock by 2031 (NMFS 2019a).

Between 2007 and 2014 Puget Sound steelhead annual hatchery releases averaged about 2,500,000 annually (NMFS 2014). Reductions since 2014 from this average total have largely been in response to the need to reduce risks to natural Puget Sound steelhead after the 2007 listing and subsequent risk analyses (NMFS 2014; Warheit 2014). Reductions were focused on steelhead programs from outside the Puget Sound DPS, in response to the risk of genetic harm to native steelhead populations and from interbreeding with hatchery-origin fish. In addition, Chambers Creek (EWS) releases were discontinued in the Elwha and Skagit River basins during the last five-year period (Ford 2022). The Skagit River hatchery winter steelhead program was terminated after 2014. Currently, hatchery programs propagating unlisted steelhead in Puget Sound total 1,076,000 annually (Ford 2022). There have also been recent changes associated with several integrated rebuilding programs, including increased production goals for the Green River Native Winter Steelhead and White River Winter Steelhead Supplementation programs, as well as addition of the North Fork Skokomish Winter Steelhead program, which first released fish in 2017 (Ford 2022).

Harvest

With the implementation of the co-managers' 2016 RMP for Skagit Basin steelhead fisheries, harvest in the Puget Sound DPS increased in the Skagit River, causing a slight increase in DPS-wide harvest. For Skagit SMU-specific changes, refer to the Skagit SMU sections below in Section 3.2.1.2.

Harvest of Puget Sound steelhead is limited to terminal tribal net fisheries and recreational fisheries. In response to declining abundance throughout the 1990s, harvest rates were curtailed in 2003, with "wild" harvest rates reduced to below 10 percent. Recreational fisheries are mark-selective for hatchery stocks, but some natural-origin steelhead are encountered, with a proportion of those fish subject to hooking mortality and noncompliance. Hatchery steelhead production for harvest is primarily of Chambers Creek winter-run stock (South Puget Sound) and Skamania Hatchery summer-run stock, both of which have been selected for an earlier run timing than natural stocks to minimize fishery interactions. In tribal net fisheries, most indirect fishery impacts occur in fisheries directed at salmon and hatchery steelhead. Some additional impacts occur in pre-terminal fisheries, but these are negligible and data are insufficient to attribute them to individual populations. Consequently, harvest impacts are reported as terminal harvest rates (Ford 2022).

Terminal harvest rate estimates through 2020 for the five watersheds within the Puget Sound, where sufficient escapement and harvest data are available, indicate that harvest impacts to listed Puget Sound natural-origin steelhead are small in scope (Table 3-2). Since the completion of the 2018 EA, harvest rates of steelhead through 2020 in the Snohomish, Green, Puyallup, and Nisqually watersheds

decreased slightly from 2018 levels while the Skagit population harvest rates increased according to the abundance-based 2016 RMP rates, as shown in Figure 3-4.

Incidental take of ESA-listed steelhead occurs in fisheries throughout the action area in marine and freshwater areas, although incidental catch of ESA-listed steelhead is minimized primarily due to return timing differences for salmon species. In Puget Sound marine areas, bycatch of steelhead is minimal, and the steelhead caught are of mixed origin (hatchery-origin and natural-origin, listed and unlisted (Kondo 2017).

Table 3-2. Terminal natural-origin harvest rates on Skagit River summer/winter-run, Snohomish winter-run, Green River winter-run, Puyallup River winter-run, and Nisqually River winter-run steelhead, 2013-2020 (BIA 2021).

Management Unit	Terminal Harvest Rate (%)								
	2013	2014	2015	2016	2017	2018	2019	2020	Avg.
Skagit River summer/winter-run	2.9	2.3	2.6	1.2	1.7	1.87	7.04	2.32	2.1
Snohomish River winter-run	0.9	1.1	0.9	1.0	1.0	1.2	1.1	0.9	1.0
Green River winter-run	2.0	2.4	1.1	1.0	0.9	0.5	0.3	0.4	1.1
Puyallup River winter-run	0.4	0.7	0.6	0.5	0.1	0.1	0.0	0.4	0.3
Nisqually River winter-run	2.5	1.1	1.3	0.8	0.0	0.1	0.05	0.0	0.7

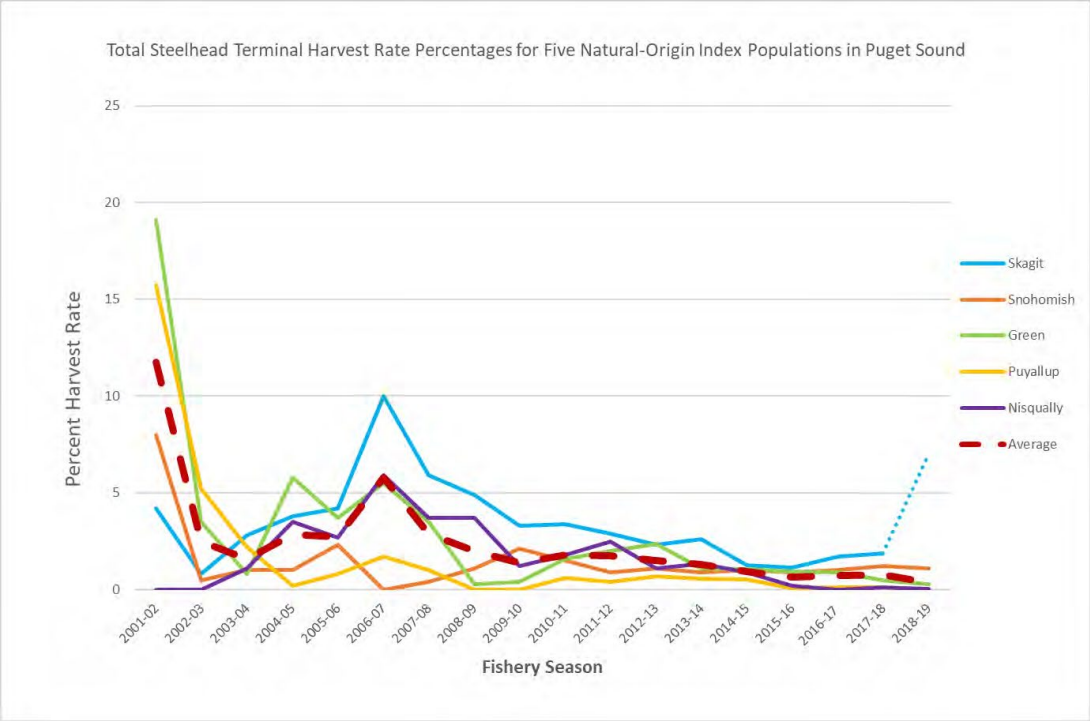

Figure 3-4. Total steelhead terminal harvest rate percentages for five natural-origin index populations in Puget Sound from 2001-2019 (NMFS 2021b). The dotted line represents harvest rates specific to natural-origin steelhead within the Skagit River Basin, as reported annually under the 2016 RMP (NMFS 2018a).

Additional information on Puget Sound steelhead VSP parameters (abundance, productivity, spatial structure, and diversity) can be found in NMFS' latest Puget Sound steelhead recovery plan (NMFS 2019c) and the NWFSC's 2022 biological viability assessment (Ford 2022).

3.2.1.2 *Skagit River Steelhead*

This section describes the current status of Skagit River steelhead VSP population characteristics (abundance, productivity, diversity, and spatial structure (McElhany et al. 2000) and harvest levels. For more detailed historic information regarding Skagit River steelhead, refer to Section 3.3.1.1, *Puget Sound Steelhead DPS*, of the 2018 EA, incorporated here by reference.

The co-managers propose a Skagit Steelhead SMU consisting of all extant steelhead populations in the Skagit Terminal Area (Skagit River Summer- and Winter-Run, Nookachamps Creek Winter- Run, Sauk River Summer- and Winter-Run, and Baker River[2] Summer- and Winter-Run steelhead). The 2021 RMP states that management at the SMU level, rather than the DIP level, is necessitated by the limited population-specific information available for steelhead in the Skagit River Basin (Sauk-Suiattle Indian Tribe et al. 2021). The co-managers use population-specific information, where available, in the development of the 2021 RMP's management objectives and guidelines.

Skagit River Steelhead Abundance and Productivity

Historically, the Skagit SMU has been one of the largest and most productive steelhead basins in the Puget Sound DPS (Busby et al. 1996; Hard et al. 2007). Reviews of the Skagit SMU population abundance depict a reduction of annual mean spawners 6,993 (years: 1980-2004) to 5,418 (2000-2004) to 4,078 (2007-2011) (Hard et al. 2015), though more recent reviews reported an increase to 7,181 annual mean spawners (2015-2019) (Ford 2022). This suggests that the Skagit steelhead population abundance, under current conditions, oscillates, but overall Skagit River steelhead have maintained abundances well above critical thresholds (Sauk-Suiattle Indian Tribe et al. 2021).

Population productivity of the Skagit SMU, defined as the total number of adult recruits produced per total number of spawners, has varied considerably over the period of record (see Figure 3-2). Specifically, the Skagit SMU exhibited a predominantly declining trend in productivity between the years 1978 and 2003, followed by a period of increasing productivity until brood year 2011, then more recent decline through the brood year 2015, but most recently, another increasing trend from 2015 to 2018 (Sauk-Suiattle Indian Tribe et al. 2021). Long term variability in productivity of the Skagit SMU has been shown to be correlated with annual variability in hydrologic and marine conditions (Scheuerell et al. 2021).

[2] Myers et al. (2015) noted that many of the members of the PSSTRT considered the Baker River Summer- and Winter-Run to have been extirpated

The most recent Skagit SMU productivity status is shown in Figure 3-5.

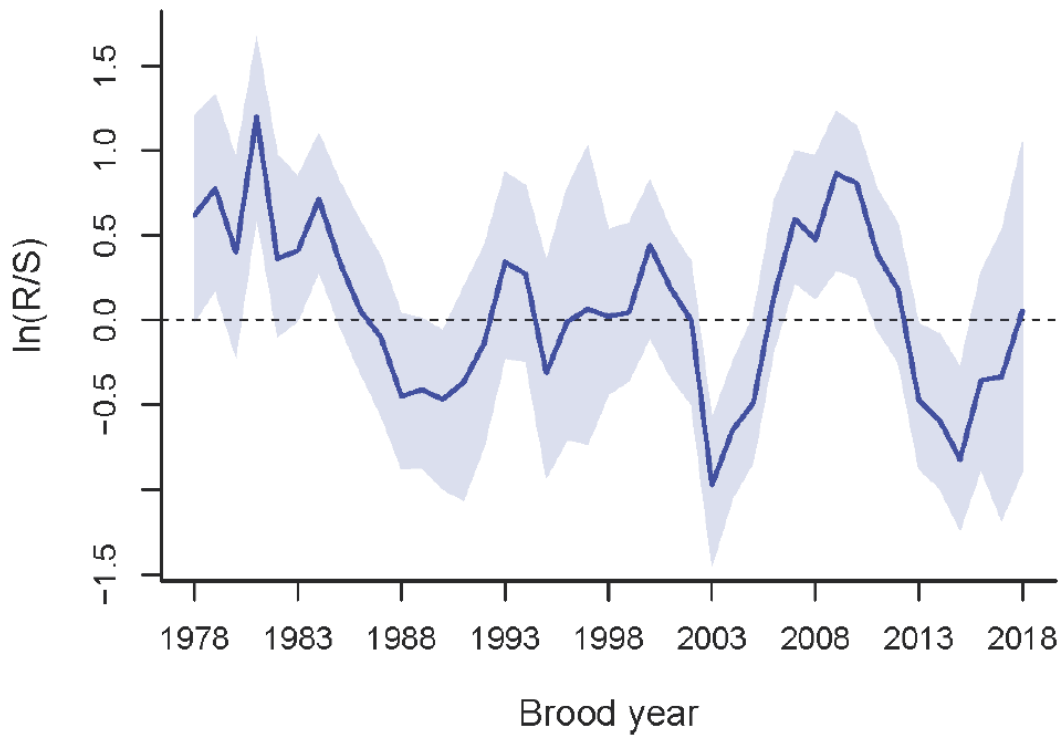

Figure 3-5. Estimated annual lifetime productivity of the Skagit SMU in units of total adult recruits produced per spawner. The blue line represents the median estimate and the shaded area is the 95% credible interval (Sauk-Suiattle Indian Tribe et al. 2021).

The Puget Sound Technical Recovery Team identified steelhead spawning in Nookachamps Creek as a DIP (Myers et al. 2015) although little information on the abundance of spawners was available. To address this shortcoming, the co-managers intensively monitored spawning in the anadromous area of the Nookachamps Basin in 2015 and 2016 (Fowler and Turnbull 2016; WDFW unpublished data). In both years, there were approximately 250 spawners in Nookachamps Creek and the mean annual spawner count in the Nookachamps from 2015 to 2019 was 211 spawners.

Skagit River Steelhead Populations' Spatial Structure and Diversity

Co-managers identified the limited information for each individual DIP's within the Skagit SMU, and are working to gather DIP level information into the future. The evaluation by Hard et al. (2015) using Bayesian Network analysis is still the most recent evaluation of Skagit SMU spatial structure viability. Each of the existing DIPs were deemed to have moderate or intermediate 40 to 85 percent viability.

The co-managers have assessed both adult and juvenile habitat occupancy within the Skagit SMU. Adult Skagit SMU. *O. mykiss* are found throughout the Skagit SMU anadromous zone and above

some impassable barriers. In 2011-2012, *O. mykiss* were ubiquitous across the Skagit SMU and occupied 95% of the sites surveyed (Upper Skagit Indian Tribe (Shannahan), unpublished data). Larger *O. mykiss* tended to occupy large log jams and tributary streams. In the snow and rain hydro-regions larger *O. mykiss* occurred in greater densities and appear to trend toward a tributary specialist habit (Upper Skagit Indian Tribe (Shannahan), unpublished data). Juvenile habitat occupancy surveys showed generally, when present, *O. mykiss* juveniles tended to be abundant with an average density of 0.34 juvenile *O. mykiss* per linear meter in the summer of 2011, and 0.16 juvenile *O. mykiss* per linear meter in the winter of 2012. The Upper Skagit Indian Tribe and WDFW have operated a variety of juvenile fish traps throughout the lower and upper Skagit Basin to monitor listed natural-origin juvenile steelhead production and collect data on age structure and life-stage, from 2012 to the present[3] (Kinsel et al. 2013; Kinsel et al. 2016; Sauk-Suiattle Indian Tribe et al. 2021).

Some hatchery programs and practices may pose ecological and genetic risks to natural populations and may represent a factor limiting the viability of the Skagit SMU. In April 2014, WDFW terminated the early-winter steelhead hatchery program in the Skagit Basin and agreed to not release steelhead from outside the region for 12 years, though the overall genetic effect these hatchery releases had on the Skagit DIPs are difficult to estimate. Hard et al. (2015) stated that the Skagit Basin steelhead hatchery program had only a nominal effect on the diversity of the listed Skagit natural origin steelhead populations.

Iteroparity, or repeat spawing, is also a factor for maintaining diversity and population persistence. The Puget Sound steelhead recovery plan recommends reducing impacts on kelts as one of the actions to implement to reduce harvest pressures on natural-origin fish (NMFS 2019c). The model results indicated that repeat steelhead spawners in Skagit Basin provide increased levels of resilience compared to populations without repeat spawners (Hard et al. 2015). During the 1985 to 1986 and 2004 to 2005 spawning years, repeat spawners averaged 6 percent (range 0 percent to 12 percent) of the total number of steelhead spawners in the Skagit River (Scott and Gill 2008). The highest number of kelts observed leaving the Skagit Basin occurred in May, followed by June (Pflug et al. 2013).

Even though we do not consider resident *O. mykiss* directly within this SEA, resident *O. mykiss* are contributing to anadromous production (Bodensteiner 2020). The presence of numerous rainbow trout populations reduces risk to steelhead population viability (Good et al. 2005; Courter et al. 2010; Courter et al. 2013; Ford 2022). An *O. mykiss* population expressing a combination of migratory strategies and a heritable propensity to produce both types of progeny means residents can serve as a buffer when anadromous productivity is low and extinction risk is lower when residents are abundant (Hard et al. 2015). Resident contributions have yet to be fully assessed at this time, and without reliable resident contribution data available to be considered, the estimation of risk is likely slightly

[3] Steelhead smolt traps operated on Bacon Creek (2012 and 2013), Finney Creek (2013), Hansen Creek (2014-2019), Illabot Creek (2013-present), Diobsud Creek (2018-2019), and East Fork Nookachamps Creek (2021) with steelhead smolts captured at each of these locations.

higher than if resident contributions were able to be included.

While there have been some significant improvements in spatial structure relative to the baseline of the 2018 EA, it is recognized that land development, loss of riparian and forest habitat, loss of wetlands, and demands on water allocation all continue to degrade the quantity and quality of available fish habitat (Ford 2022).

For additional information regarding the spatial structure and diversity of the Skagit SMU, refer to Section 3.3.1.1, *Puget Sound Steelhead DPS*, of the 2018 EA.

Harvest

On April 11, 2018, NMFS approved a five-year joint tribal and state RMP (2016 RMP) for a tribal harvest and recreational catch and release fishery for natural-origin steelhead in the Skagit River basin under the ESA 4(d) Rule (NMFS 2018b). The annual, allowable impact rate to Skagit steelhead in the Skagit area fisheries is determined using a sliding scale system based on the terminal run size forecast for the Skagit River. NMFS (2018b) concluded that the effects of the Skagit steelhead fishery on the viability and recovery of the Puget Sound steelhead DPS would be low and that the 2016 RMP met the requirements of the ESA 4(d) Rule.

Recreational steelhead fishing occurred under the 2016 RMP plan April 14, 2018 until April 29, 2018. No tribal directed steelhead fishery occurred in 2018. The 2018 steelhead run forecast was for 5,247, which limited the overall annual fishery impact on steelhead to 10%. During the short time the Skagit recreational catch-and-release fishery was open in 2018 an estimated total of 568 wild steelhead were caught and released, resulting in an estimated 57 mortalities (WDFW and PSTIT 2018). When combined with the estimated incidental mortalities from tribal and recreational fisheries targeting other species, the overall estimated steelhead mortalities during the 2017-18 Skagit steelhead management period, including the April 2018 directed recreational steelhead fishery, were 116. The 2017-18 post season run size estimate was 6,199 steelhead (WDFW and PSTIT 2018) which was larger than the pre-season forecast. The 116 estimated mortalities resulted in an overall impact rate of 1.87 percent, far lower than either the 20 percent or 10 percent limits that the final run size or the forecasted run size, respectively, would have allowed (Table 3-3) (NMFS 2022).

The 2018/2019 Skagit fishery represented the first full season for the steelhead directed fishery. The preseason forecast was 6,567 natural-origin steelhead, which would allow an up to 20 percent terminal impact rate. The co-managers post-season reported total mortality was 326 natural-origin steelhead for the July 1, 2018 through June 30, 2019 management period. The final post-season run size estimate was 4,636, which resulted in a total impact rate of 7.04 percent (WDFW 2019). This final rate was below both the 20 and 10 percent limits of either the pre-season forecasted rate or the rate that resulted from the lower post-season run estimate respectively (Table 3-3)(NMFS 2022).

Based on the 2019-2020 pre-season steelhead forecast of 3,963 natural-origin steelhead, the co-

managers did not implement any steelhead-directed fisheries in the Skagit Basin for the 2019-2020 season, which ended on June 30, 2020 (WDFW et al. 2021a; WDFW et al. 2021b). All incidental impacts on Skagit steelhead in fisheries directed at other species were managed under the 4 percent limit (Table 3-3)(NMFS 2022). The final post-season run size estimate was 3,092 and total mortality was estimated to be 72 steelhead. The final mortality rate was estimated at 2.32 percent, substantially under the maximum allowable harvest rate of 4 percent.

The 2020-2021 Skagit Basin pre-season steelhead forecast was 4,297 natural-origin steelhead. The final post-season run size estimate was 3,578, and total mortality was estimated to be 209 steelhead. The final mortality rate was estimated at 5.84 percent, substantially under the maximum allowable harvest rate of 10 percent allowed under the pre-season run size estimate of >4,000 (Table 3-3)(WDFW et al. 2022a).

The most recent 2021-2022 Skagit Basin pre-season steelhead forecast was 3,833 natural-origin steelhead. The final post-season run size estimate was 5,805, and total mortality was estimated to be 198 steelhead. The final mortality rate was estimated at 3.41 percent, under the maximum allowable harvest rate of 4 percent allowed under the pre-season run size estimate of <4,000 (Table 3-3)(WDFW et al. 2022a).

A summary of the results of the steelhead harvest under the 2016 RMP is shown in Table 3-3.

Table 3-3. Summary of Skagit steelhead harvest results under the 2016 RMP (WDFW and PSTIT 2018; WDFW 2019; WDFW et al. 2021b; Ford 2022; NMFS 2022; WDFW et al. 2022b; 2022a).

Fishery Season	Pre-Season Run-Size Estimate (steelhead)	Allowable Harvest Rate Under the 2016 RMP	Total Estimated Mortalities (steelhead)	Post-Season Run-Size Estimate (steelhead)	Post-Season Estimated Total Mortality Rate
2017-2018	5,247	≤10%	116	6,199	1.87%
2018-2019	6,567	≤20%	326	4,636	7.04%
2019-2020	3,963	<4%	72	3,092	2.32%
2020-2021	4,297	≤10%	209	3,578	5.84%
2021-2022	3,833	<4%	198	5,805	3.41%

Some Skagit steelhead are incidentally caught in the Skagit terminal area fisheries targeting other salmonids (e.g., spring-run Chinook salmon). These incidental catches of Skagit steelhead would also be managed under the annual total harvest rate limitations of the RMP.

As mentioned above, NMFS observed in the final Puget Sound steelhead listing determination (2007) that previous harvest management practices likely contributed to the historical decline of Puget Sound steelhead but concluded that the elimination of the direct harvest of wild steelhead in the mid -1990s

has largely addressed this threat. The NWFSC's last two viability reviews concurred that consistently low natural-origin steelhead harvest rates since ESA-listing are not likely to substantially affect steelhead spawner abundance in the DPS (NWFSC 2015; Ford 2022). The 2019 Puget Sound Steelhead Recovery Plan also concurred with this assessment (NMFS 2019c).

For additional information regarding past harvest of the Skagit SMU, refer to Section 3.3.1.1, *Puget Sound Steelhead DPS*, of the 2018 EA.

3.2.2 Unlisted Listed Salmon Species

Due to similarities in their habitat, some temporal overlap, and other biological features, the fisheries of the Proposed Action may have unintentional encounters with other salmon species that are not ESA-listed. New information about both Skagit River coho and Skagit River chum salmon is therefore described here, and impacts are analyzed in Section 4, Environmental Consequences. Impacts on pink and sockeye salmon populations within the action area are not anticipated because pink and sockeye salmon do not utilize the action area during the time specified for harvest in the Proposed Action.

3.2.2.1 *Puget Sound/Strait of Georgia Coho Salmon ESU*

As described in the 2018 EA, WDFW identified 40 coho salmon populations for the Puget Sound coho salmon ESU (Washington Department of Fisheries et al. 1993), which is not listed under the ESA. One coho salmon population occurs in the action area: the Skagit River coho salmon population (Washington Department of Fisheries et al. 1993). The Proposed Action is likely to overlap the end of the coho salmon spawning season in January for tribal fisheries and in February for non-tribal fisheries. Direct effects of harvest on coho salmon could include injury, latent mortality, and death. Indirect effects could include decreased juvenile productivity and increased susceptibility to predation shortly after release, though these impacts are difficult to predict or quantify given present data availability.

Historically, the Skagit River has had some of the largest escapements of coho salmon in Puget Sound, though, this population experienced unexpectedly low escapement during the 2015 (7,902) season. The Skagit River has both natural-origin and hatchery-origin coho salmon, which contribute to the spawning escapement. The 2001 to 2005 average total annual Skagit River coho salmon spawning escapement was 90,953; the 2006 through 2010 average total annual spawning escapement was 46,464; the 2011 through 2015 average total annual spawning escapement was 59,727, and most recently (2016-2020) was 35,145 (PFMC 2022b, Appendix Table B-42).

3.2.2.2 *Puget Sound/Strait of Georgia Chum Salmon ESU*

Washington Department of Fisheries et al. (1993) identified 45 fall-run chum salmon populations in Puget Sound, including one fall-run chum salmon population located in the proposed action area: the Mainstem Skagit River fall chum salmon population (Washington Department of Fisheries et al. 1993). The proposed Tribal steelhead fisheries would likely overlap the end of the chum salmon

spawning season in December. Non-tribal fisheries associated with the Proposed Action are unlikely to occur during the chum salmon spawning season.

Historically, the Skagit River has had one of the largest escapements of chum salmon in Puget Sound. The most recent available estimates of the Skagit River fall-run chum total run size are: an average run of 28,643 for return years 2009 to 2013; and 27,188 for years 2014 to 2018, including two very low run years in 2015 and 2017 (Pacific Salmon Commission Joint Chum Technical Committee 2022; Table 4-2). More recent year spawning escapement estimates are: 17,350 adults in 2020, 3,619 adults in 2021, and 20,141 adults in 2022 (WDFW 2020; 2021; 2022).

3.2.3 Other Fish Species

Marine fish, including groundfish and marine forage fish, may be found in the action area but have limited predator/prey, incidental catch, and derelict gear interactions with the fish and fisheries that are the subject of this SEA. Bull trout and freshwater fish, including rainbow trout, cutthroat trout, green sturgeon, suckerfish, and whitefish may be found in the action area and could be impacted by implementation of the Proposed Action through incidental harvest impacts and the removal of marine-derived nutrients. The descriptions from the 2018 EA for these other fish species are still relevant and are incorporated by reference (NMFS 2018b, see Table 3-10). Updated information available for bull trout is described in this section, and an updated analysis of impacts on bull trout is described in Section 4.2.3.

3.2.3.1 *Bull Trout*

Bull trout are an ESA-listed species (threatened status; 64 FR 58910, November 1, 1999) that prey on salmon and steelhead. The Coastal-Puget Sound bull trout species is found within the action area and can be incidentally caught during steelhead harvest of the Proposed Action, specifically the Lower Skagit River core area population; however, there is no bull trout retention allowed in the time and areas of the proposed recreational steelhead fisheries. Bull trout spawning primarily occurs in the Skagit River in early September to early November, prior to when the proposed steelhead fishery would occur, though after spawning, adults begin to out-migrate during the late fall and may be encountered in salmon fisheries before they enter the estuary in late spring. Bull trout remain non-target species in commercial fisheries in Puget Sound.

The Lower Skagit core area population is considered at 'low risk' for extirpation (USFWS 2008, p. 35). The Skagit River is considered to be a stronghold, and is one of the most stable and abundant bull trout populations in the recovery unit, although population estimates remain uncertain for this species (USFWS 2015; WDFW 2015; USFWS 2022). During the 5-year review conducted in 2008, the USFWS estimated bull trout adult abundance to be between 2,500 and 5,000 individuals based on partial spawner survey data from less than half of this core area (USFWS 2008). In 2020, redd numbers declined in streams where data were available, despite habitat quality remaining generally satisfactory across this core area. Following the overall decline in bull trout redd counts in the Lower Skagit River Core Area, the USFWS has observed similar declines in captures of juvenile bull trout in

the outmigrant smolt trap, operated by WDFW at RM 17 in the mainstem. Based on the available information, the USFWS estimates that the current bull trout population in the Lower Skagit River Core Area is likely less than half (1,000 and 1,500 breeding adults, approximately) of the abundance estimates presented in the 2008 status review, published 15 years ago (USFWS 2022).

3.3 Wildlife

Southern resident killer whales were the only species of wildlife determined to have potential adverse or beneficial impacts resulting from the implementation of the Proposed Action different than analyzed in the 2018 EA, and are therefore the only wildlife species described as part of the affected environment in section 3.3.1 and analyzed in section 4.3.1.

Minimal or negligible impacts on terrestrial mammals, birds, other marine mammals, and other relevant wildlife species related to steelhead carcass nutrient benefits, transfer of toxins, harvest habitat disturbance, bycatch, derelict fishing gear, and marine ecosystems were analyzed in Section 3.2, *Wildlife*, in the 2018 EA, and are incorporated here by reference.

3.3.1 Southern Resident Killer Whales

As discussed in the 2018 EA, Southern Resident Killer Whales (SRKWs) were listed as endangered under the ESA in 2005 (70 FR 69903, November 18, 2005). Critical habitat was also identified, including in Puget Sound (71 Fed. Reg. 69054, November 29, 2006).

A 5-year review under the ESA completed in 2016 concluded that SRKWs should remain listed as endangered and includes recent information on the population, threats, and new research results and publications (NMFS 2016c). A new 5-year review was completed in December, 2021 which also recommended SRKWs remain listed as endangered, despite some improvements in overall status since the 2016 5-year review (NMFS 2021d).

SRKWs continue to prey occasionally on steelhead that may belong to the Skagit Basin SMU as they pass through marine habitats. SRKWs continue to utilize only the marine waters of the Puget Sound and also continue to show preference for Chinook salmon as prey over steelhead in that area (Hanson et al. 2021; NMFS 2021d), though prey scarcity continues to be a concern impeding SRKW recovery (NMFS 2021d). In the most recently published a 5-year status review (NMFS 2021d), NMFS points out that in recent years there have been salmonid harvest reductions, hatchery modifications, and many habitat restoration projects implemented to improve the abundance and health of Pacific salmonids, and therefore support the prey base for SRKWs.

Since the 2018 EA, the Center for Whale Research's most recent report recorded the SRKW population size to be 73 whales as of December 31, 2021, down from the estimated population size of 77 from the 2018 EA (NMFS 2018b; 2021d; Center for Whale Research 2022).

Please refer to NMFS' latest 5-year review for more information regarding the status of SRKW

(NMFS 2021d).

3.4 Freshwater Fish Habitat

Fish habitat affected by the Proposed Action includes open water, substrates, river sediments and bottoms, and aquatic vegetated areas in fresh water. These habitats are affected by boat use and human disturbance and waste, light, and noise during fishing activities. Nets scour the substrate. Fishing gear may be lost or left as derelict fishing gear, which can degrade fish habitat. Stream wading by anglers can also result in trampling of salmon spawning redds, though stream wading has decreased through recent closures of fishing at important spawning areas.

In addition, steelhead carcasses, which occur in freshwater streams after spawning, provide a direct food source for juvenile salmonids and other fish, aquatic invertebrates, and terrestrial animals and enrich freshwater fish habitat (Cederholm et al. 1999; Cederholm et al. 2000; Merz and Moyle 2006). The decomposition of carcasses supplies the freshwater habitat with marine derived nutrients that increase primary and secondary production and benefit the ecosystem. Carcass biomass may be from both hatchery-origin and natural origin fish. Carcasses may be placed in streams by hatchery operators in addition to natural spawning of salmon and steelhead, although hatchery steelhead are not released in the Skagit River at this time.

The current status of fish habitat is difficult to quantify, but potential impacts are examined in Section 4.4.

3.5 Cultural Resources

As described in the 2018 EA, in *United States* v. *Washington* (1974), the United States District Court for the Western District of Washington ruled that the Puget Sound Treaty Tribes "shall have" the right to take up to 50 percent of the harvestable number of fish that may be taken by all fishermen at usual and accustomed grounds and stations in the state that would pass through tribal fishing grounds (*United States* v. *Washington* (1974)). This agreement, also known as the Boldt Decision, was upheld by the U.S. Supreme Court. This decision resulted in the tribes and WDFW becoming co-managers of Puget Sound fisheries.

Like other treaty obligations of the United States, treaties with Indian Tribes are considered to be “the supreme law of the land,” and they are the foundation upon which Federal Indian law and the Federal Indian trust relationship is based. Indian trust assets are legal interests in property held in trust by the United States for Indian tribes or individuals. Puget Sound treaty tribes who signed the Stevens Treaties, particularly those during 1854 and 1855 (10 Stat 1132, 12 Stat 927, 12 Stat 933, 12 Stat 939, 12 Stat 951, 12 Stat 971), secured the “right of taking fish at usual and accustomed grounds and stations…in common with all citizens of the Territory,” which provided these tribes the right to harvest a share of each run of anadromous fish passing through tribal fishing grounds in return for relinquishing their interest in certain lands in Washington State, including Puget Sound. The United

States, and thus federal agencies, have a trust responsibility to protect and maintain these rights reserved by or granted to Tribes or individuals by treaties, statutes, and executive orders[4]. Fishing is considered an Tribal trust asset because Puget Sound Indian Treaties (as well as other treaties) with the United States government guaranteed treaty tribes the right to fish.

To annually confirm an equitable sharing of the anadromous fisheries resource Puget Sound Treaty Tribes and WDFW meet during the spring of each year to review expected salmon and steelhead returns and agree on sharing of the fisheries resource for the upcoming year's harvest during the North of Falcon process[5]. The annual agreement is then published as the co-managers' List of Agreed Fisheries, the most recent of which is described by WDFW (2021).

3.5.1 Tribal Ceremonial and Subsistence Fish Uses

Cultural resources include tribal ceremonial and subsistence (C&S) uses pertaining to harvesting fish non-commercially by members of Puget Sound Tribes. Steelhead harvested for ceremonial and subsistence purposes provide basic nutritional benefits to tribal members and help to maintain the intrinsic and essential cultural values imbued in traditional fishing practices and spiritual links with natural resources (PSIT and WDFW 2004). Thus, ceremonial and subsistence fishing are important to maintaining cultural viability and provide valuable food resources, among other traditional foods, in tribal ceremonies. Examples of ceremonies that use traditional foods include winter ceremonies, first salmon ceremonies (Amoss 1987), naming ceremonies, giveaways, feasts, and funerals (Meyer Resources 1999).

Currently, members of the Puget Sound tribes prioritize their ceremonial and subsistence needs over commercial sales. Tribes may fish for ceremonial and subsistence uses when there are no concurrent commercial fisheries and may use some of their commercial harvest for ceremonial and subsistence purposes. Current commercial and subsistence levels are not quantified, but under the 2016 RMP, commercial and subsistence fisheries targeting natural-origin Puget Sound steelhead were not conducted when abundance was low.

The impacts of implementing Alternative 5, the Proposed Action/preferred alternative, on cultural resources are analyzed in Section 4.5.

3.6 Socioeconomics

Fishing activities associated with Skagit River steelhead fisheries contribute to the regional economy. Skagit steelhead fisheries currently generate revenue through the purchase of supplies, including food, fishing gear, bait, fishing licenses, guide services, boats, gas, hotel lodging, etc., though the proportion of revenue is likely small relative to revenue generated across the basin and across species.

[4] For more information on Sovereign Relations, please visit the National Marine Fisheries Service, West Coast Region website at https://www.fisheries.noaa.gov/west-coast/partners/sovereign-relations-west-coast

[5] For more information on the North of Falcon process, please visit: https://wdfw.wa.gov/fishing/management/north-falcon .

The main quantitative economic indicator used in this analysis is "personal income impact." Personal income impact is the income generated as a result of direct expenditures related to fishing (recreational and commercial), processing, and support industry activities. These include personal income earned directly by those participating in fishing and processing activities, personal income earned by those employed in businesses that supply and service commercial fishing and recreational fishing, and personal income generated by other businesses when those with direct and indirect income spend their money in the community. From best available information, number of trips and average trip expenditures are used to generate the baseline annual personal income impact resulting from the implementation of the 2016 RMP. The information resulting from this analysis is most useful in describing the differences in impact among the alternatives rather than the differences between any of the alternatives and the estimated baseline. As described in detail in the 2018 EA, non-use value also exists for persons who do not directly consume steelhead resources, though it is unable to be quantified economically (Gislason et al. 2017).

The socioeconomic status regarding steelhead fisheries in the action area has changed since the status was described in the 2018 EA. With the implementation of the 2016 RMP, limited Skagit River steelhead fisheries were conducted, generating new socioeconomic information. Recreational fishery metrics in the form of trips were recorded from the years 2018 to 2022 and are reported in Table 3-4. The annual economic impact estimates were generated by multiplying the number of trips by the estimated salmon expenditure value of $160 per freshwater trip (Gislason et al. 2017) and are also reported in Table 3-4.

Table 3-4. Fishery metrics and estimated generated personal economic impact from Skagit River sport fisheries for wild winter steelhead. Inflation adjusted value from July 2017 to November 2022, Bureau of Labor Statistics (2022) is listed in parentheses.

Year	Fishery Status	Total Season Trips	Estimated Personal Economic Impact Generated from Trips
2018	Open	1,967	$314,720 ($382,802)
2019	Open	8,172	$1,307,520 ($1,590,218)
2020	Closed	-	-
2021	Open	5,233	$837,280 ($1,018,308)
2022	Closed	-	-
Average*		5,124	$819,840 ($997,097)

*Average of open fishery years

Similar to the recreational socioeconomic status, with the implementation of the 2016 RMP, tribal commercial fisheries were also opened during the recent 5-year period. although the economic benefit was not quantifiable. Tourism and recreation in the Skagit River Basin provide non-quantified monetary and non-use or passive use values (BIA 2021).

3.7 Environmental Justice

NOAA's Policy and Procedures for Compliance with NEPA (Companion Manual for NAO 216-6A) requires that a determination be made as to "whether the Proposed Action has a disproportionately high and adverse human health or environmental impact on minority or low-income populations and on subsistence use in affected areas."

This subsection was prepared in compliance with Presidential Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (59 Fed. Reg. 7629, February 16, 1994) and Title VI of the Civil Rights Act of 1964. Executive Order 12898 states that federal agencies shall identify and address, as appropriate, "disproportionately high and adverse human health or environmental effects of [their] programs, policies and activities on minority populations and low-income populations."

For this analysis, a *meaningfully greater analysis* approach was used to distinguish populations of concern. A meaningful greater analysis compares population data to a reference population to determine communities of concern. Considering examples and guidance from NMFS (2014) (Federal Interagency Working Group on Environmental Justice and NEPA 2016; Clay and Colburn 2020), a threshold of 10 percent was considered for this evaluation. For the purposes of this SEA, a population is considered to be an environmental justice community of concern if the minority or low-income population of the county was greater than 10 percent higher than the population of the state of Washington.

Environmental justice data was analyzed from the counties within the action area. These counties include Skagit, Snohomish, and Whatcom Counties.

3.7.1 Low Income Populations

Using the United States Census Bureau data for 2021[6], the poverty levels for Washington State and counties within the action area are reported in Table 3-5. The 2021 per capita income level in Washington State was $46,177 and the median household income was $84,247. Two of the counties within the action area Skagit and Whatcom Counties, had poverty levels, per capita incomes, and median household incomes more than 10 percent different[7] than Washington State as a whole, and are therefore considered communities of concern for this analysis.

Table 3-5. 2021 Income data for counties within the action area relative to Washington State[1,2].

State/County	Percent below Poverty Level	Per Capita Income	Median Household Income
Washington State	9.9	$46,177	$84,247

[6] 2021 is the most recent American Community Survey estimate available from the U.S. Census Bureau site

[7] Greater than 10 percent below the poverty level, lower than $41,559 in per capita income, and lower than $75,822 in median household income

State/County	Percent below Poverty Level	Per Capita Income	Median Household Income
Skagit County	**12.7**	**$38,352**	**$72,648**
Snohomish County	7.1	$47,141	$100,042
Whatcom County	**13.8**	**$39,035**	**$72,055**

[1] Source: United States Census Bureau data, accessed 11/01/2022: https://www.census.gov/en.html
[2] Numbers in bold represent communities that exceed the threshold criteria.

3.7.2 Minority Populations

Using the United States Census Bureau data estimates for 2021, the percent minority[8] populations for Washington State and each county within the action area are reported in Table 3-6. The following county minorities, listed in bold in Table 3-6, were identified to be greater than 10 percent more than the state minority population[9]:

- Hispanic – Skagit County
- Asian – Snohomish County

American Indian/Alaska Native are considered separately below, regardless of threshold criteria.

Table 3-6. 2021 Percent of minority persons by county and race within the action area compared to Washington State[1,2].

State/County	Total WA Population	Hispanic (%)	Black/African American (%)	American Indian/Alaska Native[1] (%)	Asian (%)	Native Hawaiian/ Pacific Islander (%)
Washington State	7,738,692	13.0	4.4	1.9	9.6	0.8
Skagit County	116,901	**18.6**	1.1	**2.7**	2.3	0.4
Snohomish County	713,335	10.6	3.8	1.6	**12.0**	0.7
Whatcom County	201,140	9.8	1.3	**3.4**	4.8	0.3

[1] Source: http://www.ofm.wa.gov/pop/asr/default.asp.
[2] Numbers in bold represent communities that exceed the threshold criteria.

3.7.3 Native American Tribes

U.S. EPA guidance regarding environmental justice extends beyond statistical threshold analyses to consider explicit environmental justice effects on Native American Tribes (EPA 1998).

[8] As reported by the U.S. Census Bureau, includes Black/African American, Asian, American Indian and Alaskan Native, Native Hawaiian or other Pacific Islander, and Hispanic (which is an ethnic and cultural identity and is not the same as race)
[9] Greater than 14.3 percent Hispanic, greater than 4.88 percent Black/African American, greater than 2.09 percent American Indian/Alaska Native, greater than 10.56 percent Asian, greater than 0.88 percent Native Hawaiian/Pacific Islander.

Federal duties under Executive Order 12898, the presidential directive on government-to-government relations and the trust responsibility to Indian tribes, may merge when the action proposed by another federal agency or the U.S. EPA potentially affects the natural or physical environment of a Tribe. The natural or physical environment of a Tribe may include resources reserved by treaty or lands held in trust; sites of special cultural, religious, or archaeological importance (e.g., sites protected under the National Historic Preservation Act); and other areas reserved for hunting, fishing, and gathering (i.e., usual and accustomed area), which may include "ceded" lands that are not within reservation boundaries. Potential effects of concern may include ecological, cultural, human health, economic, or social impacts when the impacts are interrelated to impacts on the natural or physical environment (EPA 1998).

As described in Section 3.5, *Cultural Resources*, and 3.6*, Socioeconomics*, salmon and steelhead fishing has been central to tribal economics, cultures, lifestyles and identities for over 2,000 years. These activities continue to be important today both economically, and for subsistence and ceremonial purposes (Stay 2012; BIA 2017). Tribal fishing (including commercial, subsistence, and ceremonial) is considered essential to the way of life for all Puget Sound tribes. The Upper Skagit Indian Tribe, Sauk-Suiattle Indian Tribe, and Swinomish Indian Tribal Communities are federally-recognized treaty Indian tribes within the action area for the Proposed Action.

In summary, for the purposes of this SEA, the following are identified as environmental justice communities or user groups:

- Low income – Whatcom and Skagit Counties
- Minority – Skagit and Snohomish Counties
- Indian Tribes – Federal trust responsibility

4. Environmental Consequences of Alternative 5

4.1 Introduction

The environmental consequences of the four alternatives evaluated in the 2018 EA were described in Chapter 4 of the 2018 EA. This chapter provides an analysis of the direct and indirect effects associated with implementing Alternative 5 for each resource area identified during the scoping process.

Alternative 5 is consistent with how fisheries were implemented for the 2018 through 2022 timeframe. As described in Section 2, Alternative 5 represents a stepped harvest regime with allowable harvest rates of varying abundance, ranging from 4 percent to 25 percent (Sauk-Suiattle Indian Tribe et al. 2021), similar to Alternative 2 from the 2018 EA, but for a duration of 10 years.

The current status for resources (fish; wildlife, freshwater fish habitat; cultural resources; socioeconomics) that may be affected by Alternative 5, the Proposed Action/Preferred Alternative, as well as environmental justice are described in Chapter 3, *Affected Environment*. This chapter provides an analysis of the direct and indirect environmental effects associated with the new 10-year duration of Alternative 5. Cumulative effects for each of these resource areas are presented in Chapter 5, *Cumulative Effects*.

4.2 Fish

4.2.1 ESA-Listed Steelhead

This section describes the effects of Alternative 5, described above, which would include the implementation of the 2021 RMP, on ESA-listed steelhead.

4.2.1.1 *Puget Sound Steelhead*

As described in Section 3.2.1.1, *Puget Sound Steelhead*, the ESA-listed Puget Sound steelhead DPS utilizes the action area of the Proposed Action. The Proposed Action would affect four Skagit River DIPs within the Northern Cascades MPG. Impacts of Alternative 5 on the remaining Puget Sound DIPs are analyzed here. Potential direct effects from implementation of the 2021 RMP could include release mortality, injury, and death, and potential indirect impacts include decreases in juvenile productivity.

Under the Proposed Action/Preferred Alternative, Alternative 5, similar to Alternative 2, the preferred alternative in the 2018 EA, the allowable harvest rate on Skagit River steelhead could be between 4 percent and 25 percent, depending on the total abundance of the annual run. It is difficult to predict to and therefore quantify what the harvest rate would be each year, so the stepped abundance management strategy was developed that would allow for greater harvest at large abundances and minimize harvest if the annual abundance forecast was low.

The abundance and productivity of the Skagit SMU has not been adversely impacted by the implementation of the 2016 RMP, and because the 2021 RMP proposes management under the same abundance-based management regime, it is expected that the status of the Puget Sound steelhead DPS as a whole will also remain similar to current conditions, if not improving based on more recent data trends.

Incidental removal of steelhead adults from other (non-Skagit) Puget Sound Steelhead DPS populations would reduce spawner abundance and juvenile and adult productivity, as well as potentially limit expansion of spatial structure and genetic diversity, though incidental encounters remain highly unlikely due to the limited action area. As described in Section 4.2.1.2, *Skagit River Steelhead*, the proposed fishery regime, by design, would have little effect upon the frequency with

which the viable and rebuilding thresholds would be achieved. This means that Alternative 5 would not result in significant changes to the Skagit SMU level[10]. This, in turn, would not result in significant impacts to the MPG level, or the Puget Sound Steelhead DPS overall. The co-managers also took into consideration spatial structure and diversity VSP parameters by incorporating fishery conservation measures to protect the summer run, early returning winter run, and repeat spawners (Section 2.2.5, *Consideration of Viable Salmonid Population Parameters*).

In addition, the proposed action under Alternative 5 is also a relatively short-term harvest plan. Harvest would be enforced and monitoring of steelhead would occur annually (Sauk-Suiattle Indian Tribe et al. 2021). Information collected from annual steelhead fisheries monitoring would be used to adaptively manage harvest in-season to protect ESA-listed steelhead. At the end of ten years, the 4(d) authorization would cease and the co-managers would have to submit a new harvest plan.

In summary,

(1) abundance thresholds associated with rebuilding and viability can be achieved under the Proposed Action and were found not to significantly impact the Skagit SMU, and therefore the Puget Sound steelhead DPS;

(2) fishery conservation measures to protect summer-run, early returning winter-run, and repeat spawners are included under Alternative 5 to maintain spatial structure and diversity for the Skagit SMU, and therefore the Puget Sound steelhead DPS;

(3) increases in abundance estimates for the Skagit SMU (12 percent), Northern Cascade MPG (0.25 percent), and the Puget Sound DPS as a whole (40 percent) have been observed over the previous 5-year average to the 2015-2019 average (Table 3-1, Section 3.3.1.2, *Puget Sound Steelhead DPS*);

(4) despite overall decreases in productivity of the DPS over time, the DPS has demonstrated, most recently, stable population growth from 1977 to 2019 (Cram et al. 2018; Ford 2022); and,

(5) annual harvest monitoring results would be used to adaptively manage the fishery in-season over the short-term duration of the proposed action (10 years) (Sauk-Suiattle Indian Tribe et al. 2021).

Therefore, implementation of Alternative 5 is not likely to appreciably slow the achievement of the Skagit River steelhead from reaching viable function and is not likely to have a significant impact on the Puget Sound Steelhead DPS as a whole.

4.2.1.2 *Skagit River Steelhead*

[10] Under the 4(d) Rule, populations may be aggregated for management purposes when dictated by information scarcity, if consistent with the survival and recovery of listed DPS (NMFS 2003). Because limited data exists that prevent NMFS from determining impacts on the individual DIP level, NMS will determine impacts on the management unit level (Skagit SMU) as identified by the co-managers in the 2016 and 2021 RMPs

As described in Section 3.2.1.2, *Skagit River Steelhead*, abundance for Skagit River steelhead in current years has been variable.

Since the 2018 EA, steelhead harvest within the action area has been implemented in accordance with the 2016 RMP. Even with some years of relatively low abundance (Table 3-3), the co-managers have implemented fisheries below maximum harvest rates based on pre-season estimates to ensure that a sufficient number of Skagit steelhead escape to the spawning grounds to support steelhead VSP parameters, so as to not impede DPS survival and recovery. As shown in Table 3-1, after the 2016 RMP was implemented, the 5-year average abundance of the Skagit River population increased twelve percent (Ford 2022). Alternative 5, the Proposed Action, based on varying abundance of steelhead, would continue to limit the total allowable harvest rate on the overall Skagit Basin steelhead (Sauk-Suiattle Indian Tribe et al. 2021).

As discussed for steelhead across the Puget Sound DPS, Skagit River steelhead would also benefit from the additional precautions the co-managers included in the 2021 RMP as recommended in the latest Puget Sound steelhead recovery plan, including conducting management in accordance with Limits 4 and 6 of the 4(d) Rule, integrating the best available science, reducing impacts on kelts, annual harvest monitoring, and ensuring adequate escapement to maintain and enhance diversity.

Under the Proposed Action/Preferred Alternative, Alternative 5, harvest rates are proposed to range from 4 percent to 25 percent, depending on steelhead abundances of $\leq$ 4,000 to $\geq$ 8,001 fish. This would reduce the number of Skagit River steelhead by removing steelhead adults from the four Skagit River extant steelhead populations, reducing abundance and potentially reducing adult productivity (juveniles) as well as expansion of spatial structure and genetic diversity. However, no substantial effects are likely to occur under Alternative 5, during the 10-year duration, primarily due to the annual abundance-based management and the consideration of VSP parameters when developing the Proposed Action. The number of Skagit Basin steelhead adult spawners or recruits are not predicted to vary substantially from the existing conditions. No additional steelhead hatchery programs would be implemented under the Proposed Action, which would not further degrade the genetic diversity of natural-origin fish. With these actions combined to protect VSP parameters (abundance, productivity, spatial structure, and diversity), the Proposed Action is not likely to appreciably slow the Skagit SMU's achievement of viable function and no substantial impacts are likely to occur (NMFS 2019c).

4.2.2 Non-listed Salmon

4.2.2.3 *Puget Sound/Strait of Georgia Coho Salmon ESU*

Direct effects of harvest on coho salmon could include injury, latent mortality, and death. Indirect effects could include decreased juvenile productivity and increased susceptibility to predation shortly after release, though these impacts are difficult to predict or quantify given present data availability.

Under the Proposed Action/Preferred Alternative, Alternative 5, a maximum of up to 100 coho are anticipated to be encountered, annually, during tribal steelhead fisheries, and up to 10 coho are

anticipated to be encountered during non-tribal steelhead fisheries, for a maximum total 110 coho salmon under the highest proposed direct steelhead harvest rate of 25 percent (McClure 2017).

Under the recent average Skagit River coho salmon forecast estimate of 56,101 fish (2020 to 2022), the incidental coho salmon harvest rate would be less than 0.1 percent, even under the highest steelhead harvest rate of up to 25 percent. The low number of coho salmon encountered at the end of the spawning season (100 tribal fisheries + 10 non-tribal fisheries = 110 fish) compared to the lowest coho salmon escapement estimate on record (5,476 fish in 2015) represents a maximum incidental coho salmon harvest rate of up to 2 percent, under steelhead harvest rate of up to 25 percent, that would occur at the end of the season when the majority of the coho salmon run has spawned. Coho salmon harvest rates ranging from 0.1 percent (recent average coho salmon run) to 2 percent (lowest coho salmon run on record), annually, are likely to result in undetectable to negligible effects, to the Skagit River coho salmon population. Therefore, Alternative 5 is not likely to result in substantial impacts to coho salmon for the ten-year duration of the Proposed Action.

4.2.2.4 *Puget Sound/Strait of Georgia Chum Salmon ESU*

Under the Proposed Action/Preferred Alternative, Alternative 5, we estimate that up to 31 Skagit River chum salmon may be encountered in the tribal fishery and no chum in the non-tribal recreational fishery (McClure 2017). Although the Mainstem Skagit River fall-run chum salmon run peaks in the fall, there may be a small proportion of adult chum salmon in the action area during the proposed directed steelhead fisheries. Under the recent average chum salmon escapement estimate of 13,703 fish (2020 to 2022), the chum salmon harvest rate would be 0.3 percent under the maximum steelhead harvest rate of up to 25 percent. The low number of chum salmon (31 fish) encountered at the end of the spawning season compared to the lowest chum salmon escapement estimate on record (3,400 fish in 2019) represents a maximum incidental chum salmon harvest rate of up to 0.9 percent, under steelhead harvest rate of up to 25 percent. Chum salmon harvest rates ranging from 0.3 percent (average coho salmon run) to 0.9 percent (lowest coho salmon run on record) are likely to result in undetectable impacts (no effect) on the mainstem Skagit River chum salmon population. Therefore, Alternative 5 is not likely to result in substantial impacts to coho salmon for the ten-year duration of the Proposed Action.

4.2.3 Other Fish Species

Direct effects of harvest on other fish species also include injury, latent mortality, and death. Indirect effects include decreased juvenile productivity, though these impacts are difficult to predict or quantify given present data availability.

4.2.3.1 *Bull Trout*

For the Lower Skagit River bull trout core area population, the majority of fish are unlikely to be in the action area during the proposed fishery. Spawning of bull trout primarily occurs in the Skagit River in early September to early November, prior to when the proposed steelhead fishery occurs.

Direct impacts to adult bull trout may occur when they are out-migrating to the Skagit Bay estuary during late spring when the end of the timing of the steelhead fishery overlaps (Goetz et al. 2021), and indirect effects may also occur because bull trout feed on juvenile steelhead; however, there is extremely limited data available to determine either direct or indirect impacts on bull trout.

Under the Alternative 5, the co-managers estimated that under a scenario with the steelhead run size over 8,000, which would allow up to a 25% harvest rate, the likely full season timeframe and potential increased effort of the fishery could result in up to 201 bull trout being killed during the fishery from catch and release in the recreational and tribal fisheries. The most recent bull trout adult breeding population estimate is between 1,000 to 1,500 breeding adults for the Lower Skagit River bull trout core area population (USFWS 2022). This estimate does not include subadult bull trout abundance.

The U.S. Fish and Wildlife Service issued a special 4(d) Rule, which provides that the ESA's prohibition on the take of listed species does not apply to bull trout caught in fisheries regulated by tribal and state entities (64 FR 58910, November 1, 1999). Illegal harvest and ongoing incidental take of bull trout by recreational fishers catching and releasing fish or pursuing other species were identified as concerns at the time of the bull trout listing (63 FR 31647, June 10, 1998). Since the listing, angling regulations have restricted direct bull trout harvest to only a handful of locations since the early and mid-1990s where populations are considered healthy, such as in the Skagit Basin. These actions resolved most pre-listing concerns about the overutilization of bull trout by anglers who legally harvest fish (USFWS 2008).

4.3 Wildlife

This section describes the updated impacts of implementing the Proposed Action on other wildlife species that interact substantially with the four Skagit Basin steelhead DIPs. Minimal or negligible impacts on terrestrial mammals, birds, other marine mammals, other relevant wildlife species, steelhead carcass nutrient benefits, transfer of toxins, harvest habitat disturbance, bycatch, derelict fishing gear, and marine ecosystems were analyzed in the 2018 EA. Due to the similarities in the 2016 RMP and the Proposed Action, the analyses from the 2018 EA are still applicable to the proposed RMP for the 10-year duration and are therefore incorporated here by reference, see Section 4.2, *Wildlife*.

4.3.1 Southern Resident Killer Whales

As described in Section 3.3.1, SRKWs have a strong predator/prey relationship with salmon, but based on best available science, they have a weaker predator/prey relationship with steelhead (NOAA Fisheries and WDFW 2018). In the 2018 EA, NMFS considered the effects of the steelhead fisheries on ESA-listed species, including SRKW, and determined that those fisheries were not likely to jeopardize the continued existence of the SRKW species, or adversely modify its critical habitat (NMFS 2018a).

Although difficult to quantify, under the Proposed Action/Preferred Alternative, Alternative 5, harvest of adult steelhead from the four Skagit River DIPs would be expected to be similar to Alternative 2 from the 2018 EA, up to 25 percent depending on the forecast runs size. Even with a smaller population of 73 whales, relative to the previous analysis of 77 whales in 2018, significant impacts to SRKW are still not anticipated because the majority of harvested steelhead will be harvested in freshwater areas of the Skagit River Basin, and will have already passed through the marine environments as available prey for SRKW. In addition, based on the best available science, steelhead make up a small component of the SRKW diet < 3%) (NMFS 2016c; 2021d).

SRKWs are also unlikely to be encountered in the action area. The SRKW population has been detected in Puget Sound marine waters averaging 4 days per month (January through March). Although there is some temporal overlap (December through April), SKRW are likely to be outside the Puget Sound and outside the action area.

Data on steelhead as a prey resource for SRKW has yet to be analyzed specifically, but due to data about diet composition (Chinook salmon preference) and location of feeding (outside the action area), Alternative 5 is likely to result in negligible impacts on the SRKW population.

4.4 Freshwater Fish Habitat

No significant impacts on fish habitat disturbance as a result of the Proposed Action are anticipated to occur because, although the effects of fishing activities may result in some habitat disturbance, it is unlikely the impacts are detectable from fishing activities within the Puget Sound (NMFS 2004). The limited spatial and temporal scales also minimize fishery impacts on freshwater fish habitat.

The potential loss of steelhead carcasses as nutrient sources is also expected to be minimal because the duration of each season is relatively short, and under every harvest amount, the vast majority of steelhead are not harvested. These impacts may have low negative effects but are not considered a substantial impact (NMFS 2022).

4.5 Cultural Resources

The proposed commercial, ceremonial and subsistence, and recreational fisheries would not affect cultural resources as physical components, but would affect cultural resource values by providing continued harvest opportunity.

4.5.1 Treaty Indian Ceremonial and Subsistence Fish Uses

Alternative 5 would result in continued harvest opportunity for ceremonial and subsistence purposes similar to current conditions. Under the Proposed Action/Preferred Alternative, Alternative 5, tribes have the opportunity to harvest steelhead for ceremonial and subsistence uses according to the 2021 RMP for a duration of 10 years. Because treaty tribes prioritize ceremonial and subsistence harvest over commercial fisheries, harvest for ceremonial and subsistence purposes is expected to remain

unchanged. The current status shows that when abundance is low, commercial and subsistence fisheries targeting natural-origin Puget Sound steelhead are not conducted. Therefore, under the Proposed Action, commercial and subsistence fisheries would not result in significant adverse impacts, and would result in beneficial effects for treaty tribes including increased economic income due to increased harvest opportunities, increased dietary nutrients due to increased subsistence use and increased supply of fish for ceremonial purposes.

Because Alternative 5 supports continued harvest opportunity for ceremonial and subsistence purposes relative to current conditions, it would continue to have beneficial impacts similar to current conditions.

4.6 Socioeconomics

As shown in Table 3-4, under the Proposed Action, local tribal and non-tribal communities are likely to continue to benefit from socioeconomic impacts created by the implementation of the 2021 RMP. Although future annual benefits cannot be reliably estimated or quantified at this time, Table 3-4 at least displays for reference the recreational trip numbers and estimated economic income generated for past years when recreational fisheries under the 2016 RMP were open. Under the Proposed Action, anglers would likely continue to purchase goods, such as fishing supplies and gear, food, boat purchases, fishing licenses, guided trips, hotels, parking and launch fees, and other expenditures related to fishing. These activities may increase personal income and continue to have local socioeconomic benefits to good and service providers within the action area. However, steelhead fisheries make up a small proportion relative to other salmonid fisheries in the action area, and the positive socioeconomic impacts are still considered low, and not likely to have substantial effects.

As described in Section 3.6, *Socioeconomics*, tourism and recreation in the Skagit River Basin provide non-quantified monetary and non-use or passive use values (BIA 2021). Although we are not able to quantify or analyze non-use values for this assessment, their existence is acknowledged. Non-use value is not expected to be adversely impacted by the implementation of the Proposed Action because the resource will not be substantially diminished. Local tourism and recreation earnings could fluctuate annually based on steelhead abundance, but opportunity for local tourism and recreational socioeconomic benefits will remain similar to the conditions of the last several years under the 2016 RMP.

4.7 Environmental Justice

NOAA's Policy and Procedures for Compliance with NEPA (Companion Manual for NAO 216-6A) requires that a determination be made as to "whether the proposed action has a disproportionately high and adverse human health or environmental impact on minority or low-income populations and on subsistence use in affected areas."

The analysis of environmental justice is different from the analysis of effects on other resources in

Chapter 4, Environmental Consequences. First, it must be determined if impacts in other categories are adverse, and, if so, whether such impacts may be felt disproportionately by environmental justice populations.

4.7.1 Environmental Justice Analysis

Impacts of Alternative 5, themselves, would not directly or disproportionately impact environmental justice populations. The following analysis addresses the effects on cultural resources and economics, both of which may have beneficial impacts for environmental justice populations and are likely to affect these communities positively:

- Cultural Resources - As described in Section 4.5, *Cultural Resources*, Alternative 5, Proposed Action, would maintain a positive or beneficial effect on cultural resources among tribes by providing for continued fishing, and for tribes to maintain important Ceremonial & Subsistence (C&S) steelhead fishing in the Skagit River Basin. While the proposed steelhead fishery is important for non-tribal recreational anglers, the fishery is not considered a cultural resource for them in the way that it is considered for Indian tribes. Because positive cultural resource effects are anticipated under Alternative 5, no disproportionate adverse effects are anticipated.

- Economics - As described in Section 4.6, *Socioeconomics*, Alternative 5, Proposed Action, would continue the current low levels of steelhead harvest on the Skagit River, would result in minimal (low) economic benefit to environmental justice communities, including the affected Native American Tribes in the action area. Alternative 5, the Proposed Action Alternative would provide opportunities for increased harvest rates of Skagit River steelhead that could provide for more fish available for commercial sales in tribal fisheries. Additionally, increased opportunity for recreational fisheries on steelhead may provide a limited benefit to environmental justice communities of concern through a general increase in seasonal economic benefit in the action area. Because positive cultural resource effects are anticipated under Alternative 5, no disproportionate adverse effects are anticipated.

5. CUMULATIVE EFFECTS

NEPA defines cumulative effects as "effects on the environment that result from the incremental effects of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR 1508.1[g][3]). The 2018 EA discusses past, present, and reasonably foreseeable future actions and the incremental effects of the alternatives on the resources analyzed. These cumulative impacts, from the 2018 EA, Section 5.0, *Cumulative Impacts*, are incorporated by reference. Updates to cumulative impacts are described in this section.

The descriptions in the 2018 EA for the resources in the context of climate change, development, habitat restoration, hatchery production, and fisheries in the cumulative impacts analysis area are adequate to evaluate the incremental effects of Alternative 5. The geographic action area for cumulative effects is incorporated from the 2018 EA (Section 1.4, *Project Area and Analysis Area*) and is the same as the action area shown in Figure 2-1. The temporal scope of present, and future actions includes cumulative effects within the action area through projected environmental conditions over the next 10 years.

5.1 Past Actions

Past actions were described in detail in the 2018 EA and incorporated here by reference (Section 5.1, *Past Actions*). In summary, declines in salmon runs started in the 1800s, occurring primarily from hydropower development, logging, farming, fishing, and fish canning (BIA 2017; NMFS 2021b; Ford 2022). Conservation laws and regulations to protect salmon and steelhead runs were initially passed in the 1800s, and continue into the present. Relative to fishery harvest those, include restrictions on gear, species caught, areas harvested, and extent of removal of eggs and natural-origin spawning fish for hatchery use. Additional measures to protect listed species have been ongoing with more recent efforts to better estimate salmon and steelhead returns and propose harvest plans that would better protect salmon and steelhead over the long term (PSIT and WDFW 2004).

5.2 Development and Habitat Loss

Development that has occurred over the past century and is ongoing has affected the abundance, distribution, and health of salmon and steelhead, other fish species, economic income, wildlife, air, and water quantity and quality. Generally, development has resulted in the loss of fish habitat along marine shorelines, estuaries, and freshwater streams and rivers. Most of the impacts have occurred from hydropower, logging alongside streams, farming and chemical releases, stormwater releases, and industrial and wastewater discharges. The effects include loss of spawning habitat and cover, and degraded water quality conditions, which has resulted in a decrease in overall fish abundance (Quinn 2010; NMFS 2022).

Across the action area, marine and aquatic habitat degradation and loss threaten primarily salmonid health and tribal culture and treaty rights. The 2019 Puget Sound steelhead recovery plan identified several primary pressures associated with habitat quality including fish passage barriers, flood control and floodplain and impairments, impervious runoff associated with residential, commercial, and industrial development, timber harvest management, water withdrawals and altered flows (NMFS 2019c).

Although there are a number of development and habitat loss concerns that are likely to persist, there are also several existing programs in Washington that have improved habitat and fish passage over the last 20 years. There are still many barriers remaining to be repaired, especially on non-forest private lands and local government roads. State and private industrial forest landowners committed to repairing fish passage barriers on their roads under the Road Maintenance and Abandonment Program's Road Maintenance and Abandonment Planning process. Twenty years later, nearly all of those barriers (7,300 statewide) have been fixed. From 2001 through 2017, forest landowners removed over 7,900 barriers to fish passage, opening up more than 5,200 miles of historic fish habitat in addition to maintaining forested buffers on fish bearing streams that provide cool, clean water, spawning habitat and large woody debris (NMFS 2019c).

Unfortunately, successful programs in non-forest landscapes are still developing or are under-funded. Among the programs showing the most promise for successfully prioritizing and removing barriers to steelhead are the Fish Barrier Removal Board and the Family Forest Fish Passage Program. Programs within local governments (cities and counties) are among the most in need of development and progress. Although Washington State has been correcting fish passage barriers for more than 20 years, approximately 415 salmon/steelhead barriers remain to be repaired on state-owned roads by 2030 at an estimated cost of $3.8 billion (WSDOT 2018; NMFS 2019c).

In Puget Sound, Lead Entities (local, citizen-based organizations that develop watershed-scale recovery strategies and coordinate salmon recovery efforts in their watersheds) work with local and state agencies, tribes, citizens, and other community groups to adaptively manage their watershed recovery plans to recover salmon and steelhead and ensure that recovery actions are implemented on the ground. To date, only the Nisqually Lead Entity has a locally written steelhead recovery strategy/chapter. Others are under preparation for the Hood Canal, Skagit, and East Kitsap populations (West Sound) (NMFS 2019c).

There are a number of planned, ongoing, and completed events that will likely benefit Puget Sound's steelhead populations in the future, but have not yet effected changes in adult abundance. Among these are the removal of the diversion dam on the Middle Fork Nooksack River, passage improvements at Mud Mountain Dam, the ongoing passage program in the North Fork Skokomish River, and the planned passage program at Howard Hansen Dam (Ford 2022).

5.3 Hatcheries

Hatchery development in the Pacific Northwest was initially responsible for loss of natural-origin salmon and steelhead through genetic introgression of hatchery-origin fish into natural-origin fish populations; competition and predation by hatchery-origin fish on natural-origin fish; and impacts from construction and operation of hatchery facilities that blocked fish passage, removed water from streams, and released contaminated water into streams (HSRG et al. 2004). Interactions of hatchery- and natural-origin steelhead pose different risks to abundance, productivity, genetic diversity, and fitness of fish spawning in the natural environment depending on how hatcheries are operated (NMFS 2019c). Over time, many of these hatchery impacts on natural-origin fish have been corrected and recently, integrated and conservation hatchery programs have sought to protect against the loss of diversity and bolster the productivity of native stocks (PSIT and WDFW 2004; Anderson et al. 2020; NMFS 2022).

Reductions in the diversity and fitness of natural-origin steelhead populations have resulted from the use of out-of-basin stocks (i.e., Skamania Hatchery summer-run steelhead; see Hard et al. (2007) and Warheit (2014)), which has precluded the stocks from being included in the DPS (73 FR 55451). Similarly, the wide-spread use of Chambers Creek Hatchery early winter-run stocks (a hatchery stock originating in South Puget Sound) have caused deleterious ecological effects to native steelhead populations throughout the region by increasing harvest pressures on natural-origin steelhead (Hard et al. 2015). There are currently no steelhead hatchery programs in the Skagit Basin (NMFS 2019c).

5.4 Hydropower and Culvert Blockage

Use of hydropower and placement of incorrectly sized culverts at stream crossings have been responsible for blocking fish passage to upstream habitat (Harrison 2008; NMFS 2019c). Over time, many dams have attempted to restore fish passage and fish habitat through a series of fish ladders upstream and trucking fish downstream of the dams. Dams have also modified operations to restore river flows, more effectively control sediment and manage erosion, and provide more natural temperature and oxygen levels of water released from dams. Some hydropower projects are being removed altogether. Culverts are being restored and/or replaced to allow increased fish passage (WSDOT 2016). Implementation of this corrective action has taken on a greater emphasis in response to the culvert decision within *U.S.* v. *Washington*[11] in which Washington State was required to replace

[11] *United States* v. *Washington* is the ongoing federal court proceeding that enforces and implements reserved tribal treaty fishing rights with regard to salmon and steelhead returning to western Washington. Five treaties between the United States and various Washington tribes (1854 through 1856) described the reserved tribal fishing rights in common with citizens of the territory. The "Culvert Case" is a designated subproceeding of *United States, et al.,* v. *State of Washington, et al*., C70-9213. The United States, in conjunction with the tribes, initiated this sub- proceeding in early 2001, seeking to compel the State of Washington to repair or replace any culverts that are impeding salmon migration to or from the spawning grounds. On March 29, 2013, United States District Judge Ricardo S. Martinez ordered the state of Washington to replace culverts under state-owned roads that block the passage of salmon to critical habitat. The court earlier found those culverts violated tribal treaty rights. The reasoning is that the Stevens treaties of 1855 require protection of the environment including protecting the viability of treaty-protected fish. The Ninth Circuit Court of Appeals affirmed the lower court decision. *United States* v. *Washington*, No. 13-35474, June 27, 2016. The Supreme Court has accepted the State of

blocked culverts over time. As a result, the impact of hydropower development and culvert blockage has decreased over time and culvert blockage can be reasonably expected to decrease in the foreseeable future. The 2019 steelhead recovery plan also recommends that where Federal Energy Regulatory Commission relicensing efforts are anticipated (e.g., Skagit River), managers utilize relicensing as opportunities to repair floodplain function, through restoring large wood loading and transport, optimizing sediment supply and transport, and forming and maintaining in- and off- channel habitat features (NMFS 2019c).

5.5 Harvest

During the 18th and 19th centuries when Europeans began to populate Puget Sound, harvest of salmon and steelhead was uncontrolled, which was an early factor in the substantial decline in steelhead abundance. Over time, as regulations to protect salmon and steelhead resources were developed, harvest decreased to protect and conserve remaining salmon and steelhead resources.With implementation of the Puget Sound Chinook Harvest Management Plan (PSIT and WDFW 2004), planned harvest relied on escapement estimates to protect and conserve weaker stocks. In addition, *U.S.* v. *Washington* also helped in fisheries management through the sharing of fish resources between treaty tribes and Washington State.

Currently, and as expected in the future, harvest management plans between WDFW and the treaty tribes, as co-managers, would continue to help conserve salmon while allowing for harvest that would not result in depletion of fish stocks. Other regulations, policies, treaties, and practices that help protect Puget Sound fishery resources, while allowing for controlled harvest, include the Magnuson-Stevens Fishery Conservation and Management Act, U.S./Canada Pacific Salmon Treaty, case law and executive orders related to the exercise of treaty tribal fishing rights, WDFW fish policies and regulations, Pacific Fishery Management Council's (PFMC's) Framework Salmon Management Plan (PFMC 2022a), pertinent state/tribal agreements, and the North of Falcon and PFMC processes. NMFS also reviews and advises on planned fisheries harvest so that listed salmon and steelhead stocks are protected as needed from excessive exploitation. Based on these practices, WDFW and the Puget Sound Treaty Tribes, as co-managers, issue agreed-upon harvest regulations to protect salmon and steelhead resources over the long term (NMFS 2022).

In the action area prior to the implementation of the 2016 RMP, directed non-tribal commercial steelhead harvest had not occurred for many decades, and the current level of recreational and tribal harvest is not considered to be a prominent factor in the decline of Puget Sound steelhead (Hard et al. 2015; NMFS 2019c).

Washington's petition for certiorari. While that decision is pending, the Ninth Circuit decision stands.

5.6 Climate Change

The changing climate is recognized as a long-term trend that is occurring throughout the world. For the Pacific Northwest portion of the United States climate change will have multiple effects. These effects may in turn also affect the resources under consideration in this SEA. Expected effects include:

- Overtaxing of stormwater management systems at certain times
- Increases in sediment inputs into water bodies from roads
- Increases in landslides
- Increases in debris flows and related scouring that damages human infrastructure
- Increases in fires and related loss of life and property
- Reductions in the quantity of water available to meet multiple needs at certain times of year (e.g., for irrigated agriculture, human consumption, and habitat for fish)
- Shifts in irrigation and growing seasons
- Changes in plant, fish, and wildlife species' distributions and increased potential for invasive species
- Declines in hydropower production
- Changes in heating and energy demand
- Impacts on homes along coastal shorelines from beach erosion and rising sea levels (NMFS 2021c)

The 2019 steelhead recovery plan, reiterates that climate change is likely to cause changes in temperature, precipitation, wind patterns, ocean acidification, and sea level height, which could impact Puget Sound steelhead survival in their freshwater, estuarine, and marine habitats, including in the Skagit River Terminal Area. Throughout their life cycles, steelhead are predicted to be primarily impacted by five climate change conditions (Beechie et al. 2013; NMFS 2019c):

1. Warmer water temperatures,
2. Higher peak flows,
3. Lower base flows
4. Increased sediment, and
5. Altered marine environment.

The direct and indirect effects from climate change on Skagit River steelhead and the Puget Sound DPS are difficult to predict or quantify due to the complex interactions of biotic and abiotic factors, the plasticity of steelhead life history patterns, and uncertainties in our understanding of the rate at which adaption would occur (NMFS 2019c; Sauk-Suiattle Indian Tribe et al. 2021).

The 2021 RMP is proposed for a period of ten years. Direct and indirect effects of the Proposed Action are of relatively short duration, and climate change predications for that period are not likely to differ from current climate conditions and their associated variability (Thom 2016).

All resources considered in this EA will continue to be affected by climate change, especially through changes to stream temperature and flow, which contribute to habitat modification for various species. The effects of climate change on each of the resources are described below in Section 5.7, *Cumulative Effects by Resource.*

5.7 Cumulative Impacts by Resource

Below is an analysis of the effects on each resource and a discussion of disproportionality of effects for environmental justice communities and groups listed in Chapter 3, Affected Environment, when considered cumulatively with Alternative 5 and the cumulative actions discussed above. The "No Action/Status Quo" Alternative 1 is from the 2018 EA (NMFS 2018b).

5.7.1 Fish

Puget Sound DPS and Skagit River Steelhead (ESA-Listed species)

Further habitat loss, lingering hatchery effects, and existing hydropower and culvert blockage would continue to have a negative effect on Puget Sound steelhead, while habitat restoration would partially offset this trend. Under Alternative 5, the stepped harvest regime would result in a slight difference between the amount of total adult spawners or steelhead recruits for the Skagit SMU (four DIPs combined), though it is a small component of the DPS as a whole and is the only directed steelhead harvest in the Puget Sound DPS. Climate change, particularly changes in streamflow and water temperatures over the near- and long-term, is an important factor likely to affect natural-origin steelhead. Ford et al. (2022) supplemented their biological viability assessment with a climate vulnerability assessment based on the work of Crozier et al. (2019) that indicated that Puget Sound steelhead are likely to have a high exposure and a high sensitivity to climate change, though it was noted that Puget Sound steelhead are likely to also have a high adaptive capacity to climate change, largely due to their flexibility in migration and spawn timing.

Effects from Alternative 5 on abundance and productivity of natural-origin Puget Sound steelhead would be expected to continue, but negative effects are minimized by using an abundance-based management structure. The RMP explored the resilience of the abundance-based management to potential downturns in survival and concluded that the framework was robust even to significant sustained reductions in survival, i.e., 35%. The changes associated with the Alternative 5 would comprise a small increment of the overall impacts on steelhead from past, present, and foreseeable actions.

Coho Salmon (Not ESA-listed species)

Although development and habitat loss, hatcheries, hydropower, and climate change may impact coho salmon, the impacts from Alternative 5 would not be a substantial increment of cumulative impacts on coho salmon in the action area. Under Alternative 5 steelhead harvest would occur, but the impact is unlikely to be substantial because of the low overlap in timing and therefore low number of coho salmon encounters in the proposed fisheries. The changes associated with Alternative 5 would comprise a minimal increment of the overall impacts on coho salmon from past, present, and foreseeable actions.

Chum Salmon (Not ESA-listed species)

Although development and habitat loss, hatcheries, hydropower, and climate change may impact chum salmon, the impacts from Alternative 5 would not be a substantial increment of cumulative impacts on chum salmon in the action area. Under Alternative 5 steelhead harvest would occur, but the impact is unlikely to be substantial because of the low overlap in timing and therefore low number of chum salmon encounters in the proposed fisheries. The changes associated with Alternative 5 would comprise a minimal increment of the overall impacts on chum salmon from past, present, and foreseeable actions.

Other Fish Species

Although development and habitat loss, hatcheries, and hydropower, may impact other fish species, the impacts from Alternative 5 would not be a substantial increment of cumulative impacts on chum salmon in the action area. The impact of Alternative 5 harvest on the survival and reproduction of other fish would range from negligible impacts to moderate predator/prey impacts depending on the species. However, these effects are not expected to have substantial impacts because of the relatively small number of steelhead harvested (relative to other species of salmon in the basin) and the restricted area and time where harvest would occur.

Of the other fish species in the action area, bull trout are likely to experience the greatest harvest impact. These impacts, which may be moderate, are not expected to be substantial significant because the Lower Skagit River bull trout core area population is generally healthy. Climate change and resulting warmer stream temperatures would have a negative effect on the distribution and abundance of other fish species, and in particular bull trout. Bull trout generally require cold water temperatures, clean stream substrates for spawning and rearing, complex habitats, and connections among streams, lakes, and ocean habitats for annual spawning and feeding migrations, and they can be more sensitive to habitat degradation than steelhead (USFWS 2015). When combined with the cumulative effects of habitat modification, climate change, and hydropower facilities, the changes associated with Alternative 5 would comprise a small increment of the overall impacts on other fish from past, present, and foreseeable actions.

5.7.2 Wildlife

Southern Resident Killer Whales

The potential benefits of habitat restoration actions within the action area may not fully, or even partially, mitigate for the effects of climate change and development on salmon and steelhead abundance as prey for wildlife. The availability of steelhead affects Southern Resident killer whales because salmon and steelhead are their prey base, though steelhead are not the preferred salmonid prey for this species. While the harvest described under the Alternative 5 contributes to a small reduction of the prey base, the contribution to overall cumulative impacts on Southern Resident killer whales would not be substantial because steelhead are not a high-priority component of the whales' diet (NOAA Fisheries and WDFW 2018; Hanson et al. 2021) and the fisheries occur after the fish are available to the whales as prey. The changes associated with Alternative 5 would comprise a minimal increment of the overall impacts on Southern Resident killer whales from past, present, and foreseeable actions.

5.7.3 Freshwater Fish Habitat

Under cumulative effects and considering all temporary and long- term contributors that impact fish habitat, the incremental contribution of fish harvest would be minimal under Alternative 5. The implementation of Alternative 5 would increase the likelihood lost fishing gear associated with the fishery would pollute freshwater habitat. From a cumulative standpoint, these impacts are not considered to be substantial due to the use of best management practices and fishing measures to reduce, report, and recover derelict fishing gear. The co-managers conduct outreach and education for the public on the importance of not trampling fish redds, avoiding light and noise pollution, and reducing contaminants to avoid significant impacts. The cumulative contribution of Alternative 5 to freshwater habitat degradation is small considering the relative limited geographic and temporal scopes of the fishery.

Freshwater fish habitat is also enhanced by marine derived nutrients provided by steelhead carcasses returning to spawning grounds. The number of steelhead carcasses would be reduced under Alternative 5, though steelhead carcasses are not considered a primary source of marine derived nutrient benefits when compared to salmon, primarily due to steelhead spawn timing. In addition, the stepped harvest of the Alternative 5 still allows for ample steelhead to return to the riverine habitats and provide nutrients. Therefore, the changes associated with Alternative 5 would comprise a minimal increment of the overall impacts on freshwater fish habitat from past, present, and foreseeable actions.

5.7.4 Cultural Resources

Treaty Indian Ceremonial and Subsistence Salmon Uses

Although unquantifiable, climate change, development, and habitat loss may reduce the number of steelhead, which provide an important cultural value and are harvested by Puget Sound Indian tribes.

These effects may be partially offset by habitat restoration actions, although the potential benefits of these actions are difficult to quantify and may not accrue fully within the next 10 years. When considering past and present development and climate change effects to treaty Indian ceremonial and subsistence uses, Alternatives 5 provides a small, but important, incremental effect by providing steelhead harvest. However, the effect is not likely to be substantial cumulatively because steelhead fisheries are a very small component of the overall magnitude of fisheries occurring in Puget Sound and in the Skagit Terminal Area.

5.7.5 Socioeconomics

Alternative 5 would increase the amount of harvest, and therefore the number of trips and expenditures from fishing and fishing related income within a localized region of the action area. This effect is not likely to be substantially beneficial cumulatively because steelhead fisheries are a small component of the overall magnitude of fisheries occurring in Puget Sound and in the Skagit Terminal Area, and anglers may harvest other species in the absence of harvestable steelhead. The changes associated with the Alternative 5 would comprise a small increment of the overall impacts on socioeconomics from past, present, and foreseeable actions.

5.8 EnvironmentalJustice

Cumulative effects such as development and habitat loss, hatcheries, hydropower and culvert blockage, harvest, and climate change have reduced the overall abundance of steelhead in the Skagit River. The long-term decline in steelhead abundance has resulted in the loss of fishing opportunity and income over the long-term for environmental justice communities of concern. When considering the effect of Alternative 5 in addition to those cumulative effects, there would not be a disproportionate adverse impact to environmental justice communities of concern. Alternative 5 is likely to provide an incrementally small beneficial impact, which would vary in amount according to the annual abundance of salmon and the proposed harvest rates, due to the increase in fishing opportunities that Alternative 5 would provide to low income, minority, and Native American peoples. Under Alternative 5, steelhead harvest would continue to provide steelhead for harvest, partially offsetting decreases in salmon and steelhead from other development, habitat loss, and climate change.

6. AGENCIES CONSULTED

- Northwest Indian Fisheries Commission
- Sauk-Suiattle Indian Tribe
- Swinomish Indian Tribal Community
- Upper Skagit Tribe Indian Tribe
- U.S. Fish & Wildlife Service
- Washington Department of Fish & Wildlife

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