



OCT 24 2012

To All Interested Government Agencies and Public Groups:

Under the National Environmental Policy Act, an environmental review has been performed on the following action.

**TITLE:** Final Environmental Assessment for Section 10 Permit Applications by the Washington State Department of Fish and Wildlife for Incidental Take of ESA-listed Rockfish and Other Listed Fish within the Puget Sound/Georgia Basin and Take Due to Scientific Research

**LOCATION:** Inland waters of the Puget Sound and the Straits of Georgia and Juan de Fuca westward to the town of Sekiu

**SUMMARY:** NMFS will issue scientific research permits and an incidental take permit to the Washington State Department of Fish and Wildlife. One permit will cover incidental take of ESA-listed rockfish, Chinook salmon, green sturgeon, and eulachon from one commercial and one recreational fishery in Puget Sound authorized by the State of Washington. The other permits will cover take of ESA-listed rockfish, Puget Sound Chinook salmon, Hood Canal summer-run chum salmon, Puget Sound steelhead, eulachon, and green sturgeon resulting from state-conducted scientific research activities.

**RESPONSIBLE**

**OFFICIAL:** William W. Stelle, Jr.  
Regional Administrator  
National Marine Fisheries Service, Northwest Region  
National Oceanic and Atmospheric Administration (NOAA)  
7600 Sand Point Way, NE  
Seattle, WA 98115

The environmental review process led us to conclude that this action will not have a significant impact on the environment. Therefore, an environmental impact statement was not prepared. A copy of the finding of no significant impact (FONSI), including the environmental assessment, is enclosed for your information.



Although NOAA is not soliciting comments on this completed EA/FONSI we will consider any comments submitted that would assist us in preparing future NEPA documents. Please submit any written comments to the Responsible Official named above.

Sincerely,

A handwritten signature in black ink, appearing to read "Patricia A. Montanio". The signature is fluid and cursive, with a large initial "P" and "M".

*for* Patricia A. Montanio  
NOAA NEPA Coordinator

Enclosure

# FINAL ENVIRONMENTAL ASSESSMENT

## Section 10 Permit Applications by the Washington State Department of Fish and Wildlife for Incidental Take of ESA-listed Rockfish and Other Listed Fish within the Puget Sound/Georgia Basin and Take Due to Scientific Research



National Marine Fisheries Service  
Northwest Region

October 2012



## COVER SHEET

### Title of Environmental Review:

Section 10 Permit Applications by the Washington State Department of Fish and Wildlife for Incidental Take of ESA-listed Rockfish and Other Listed Fish within the Puget Sound/Georgia Basin and Take Due to Scientific Research

### Listed Species and Evolutionarily Significant Units:

yelloweye rockfish (*Sebastes ruberrimus*)  
canary rockfish (*Sebastes pinniger*)  
bocaccio (*Sebastes paucispinis*)  
southern eulachon (*Thaleichthys pacificus*)  
Puget Sound Chinook salmon (*Oncorhynchus tshawytscha*)  
Puget Sound summer chum salmon (*Oncorhynchus omykiss*)  
Puget Sound steelhead (*Oncorhynchus keta*)  
bull trout (*Salvelinus confluentus*)  
southern green sturgeon (*Acipenser medirostris*)

### Responsible Agency Official and Contact:

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Seattle, WA 98115

Dan Tonnes  
National Marine Fisheries Service  
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### Legal Mandates:

Endangered Species Act of 1973 (ESA, 16 U.S.C. 1531 *et seq.*)  
National Environmental Policy Act (NEPA, 42 U.S.C. 4321 *et seq.*)

### Location of Proposed Activities:

Waters of the Puget Sound and the Strait of Georgia

### Actions Considered:

NMFS' approval or disapproval of the State of Washington Department of Fish and Wildlife applications for ~~two~~ ESA section 10 permits: ~~a~~ section 10(a)(1)(A) permits for take of ESA-listed rockfish and other listed fish as part of routine research activities, and a section 10(a)(1)(B) permit for incidental take from one commercial and one recreational fishery.

Cover photo courtesy of Janna Nichols.

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## LIST OF ACRONYMS

CEQ	Council on Environmental Quality
DPS	Distinct Population Segment
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EO	Executive Order
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FCP	Fishery Conservation Plan
ITP	Incidental Take Permit
MCA	Marine Catch Area
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NWIFC	Northwest Indian Fisheries Commission
PAHs	Polycyclic Aromatic Hydrocarbons
PFMC	Pacific Fisheries Management Council
SEPA	State Environmental Policy Act
TRT	Technical Recovery Team
USFWS	United States Fish and Wildlife Service
WDFW	Washington Department of Fish and Wildlife

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BY THE WASHINGTON STATE DEPARTMENT OF FISH AND WILDLIFE FOR  
INCIDENTAL TAKE OF ESA-LISTED ROCKFISH AND OTHER LISTED FISH WITHIN  
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1 EXECUTIVE SUMMARY

2 THE FOLLOWING IS NEW TEXT FROM THE DRAFT ENVIRONMENTAL ASSESSMENT AND  
3 IS PROVIDED AS AN EXECUTIVE SUMMARY OF THE REVIEW PROCESS AND PREFERRED  
4 ALTERNATIVE

5 On April 23, 2009, National Marine Fisheries Service (NMFS) proposed to list the Puget  
6 Sound/Georgia Basin Distinct Population Segments (DPSs) of yelloweye rockfish (*Sebastes*  
7 *ruberrimus*) and canary rockfish (*Seb. pinniger*) as threatened, and bocaccio (*Seb. paucispinis*) as listed  
8 species under the Endangered Species Act (ESA) (74 Fed. Reg. 18516). The proposal went final on  
9 April 27, 2010 and the species listings were effective on July 27, 2010. The Washington State  
10 Department of Fish and Wildlife (WDFW) manage fisheries in Puget Sound. In November of 2009,  
11 WDFW initiated discussions with NMFS on pursuing ESA take coverage for state-authorized fisheries  
12 and research activities that are likely to encounter yelloweye rockfish, canary rockfish, and bocaccio  
13 (ESA-listed rockfish) in state waters. Because of those discussions, and over the ensuing months and  
14 years, NMFS advised WDFW on development of a Fishery Conservation Plan (FCP)<sup>1</sup> and an  
15 application for an Incidental Take Permit (ITP) for ESA-listed rockfish and other listed species taken  
16 by the several state-authorized fisheries and state-conducted research efforts.

17 This final Environmental Assessment (EA) is for NMFS's issuance of section 10 of the Endangered  
18 Species Act (ESA) permits to WDFW for take due to scientific research and fisheries management of  
19 ESA-listed rockfish and other listed fish within the Puget Sound/Georgia Basin. NMFS has conducted  
20 this environmental review under the National Environmental Policy Act in support of evaluating  
21 WDFW's permit applications under section 10 of the ESA. The EA evaluates the environmental  
22 consequences of alternative actions for issuing incidental take permits to WDFW for scientific research  
23 and fisheries management in the Puget Sound/Georgia Basin. The analysis of alternatives and  
24 consequences will inform NMFS' decision regarding issuance of these section 10 permits. The covered  
25 species for these permits would include the Puget Sound/Georgia Basin DPSs of threatened yelloweye  
26 rockfish, canary rockfish, and endangered bocaccio. Additional covered species would include the  
27 threatened Evolutionarily Significant Units of Puget Sound Chinook salmon (*Oncorhynchus*  
28 *tshawytscha*), Puget Sound summer chum salmon (*O. keta*) and, the threatened DPS of Puget Sound  
29 steelhead (*O. mykiss*), and the threatened DPSs of southern green sturgeon (*Acipenser medirostris*)  
30 and southern eulachon (*Thaleichthys pacificus*).

1

2 **Introduction**

3 The final EA reflects changes from the draft EA based on new information collected since the draft was  
4 published. All new text is indicated in redline/strikeout format to show changes from the draft EA, or is  
5 indicated with a new subsection title and explanation of the new text, as illustrated under this Executive  
6 Summary.

7 **Preferred Alternative**

8 After close of the public comment period, NMFS developed a Preferred Alternative. The Preferred  
9 Alternative is the same as the Proposed Action and is described in detail in Subsection 1.2, Description  
10 of the Proposed Action.

11 **Public Comment Period**

12 NMFS published a document in the Federal Register on March 30, 2012 (77 Fed. Reg. 19225)  
13 concerning the availability of a draft document for public comment related to a Fishery Conservation  
14 Plan and Research Permits for the WDFW. The comment period for review of the EA on this action  
15 expired on April 23, 2012. The comment period was re-opened to provide additional opportunity for  
16 public comment (77 Fed. Reg. 26514, May 4, 2012). The comment period extension expired May 11,  
17 2012. No comments were received during either of the public comment periods.

18 **Changes to the Draft Environmental Assessment**

19 This final EA includes only the following revisions based on public comment and new information  
20 since the draft EA was published for comment. Revisions are illustrated in redline/strikeout format.

- 21
- 22 • Updated data in the table included as Appendix A: Estimated Numbers of ESA-listed Fish  
Species to be Incidentally Taken under the Various Alternatives.
  - 23 • Additional citations have been added to Section 7, References.

24

25

1 1. PURPOSE OF AND NEED FOR THE PROPOSED ACTION

2  
3 **1.1. Introduction and Background**

4 The ~~National Marine Fisheries Service~~ (NMFS) has prepared this EA in accordance with the National  
5 Environmental Policy Act (NEPA). NEPA provides an interdisciplinary framework for Federal  
6 agencies to evaluate environmental consequences of programs and projects over which they have  
7 discretionary authority. NMFS, of the National Oceanic and Atmospheric Administration (NOAA), has  
8 the authority to issue permits for the take of species listed under the ~~Endangered Species Act~~ (ESA).  
9 This EA considers the environmental consequences of NMFS issuing ~~two~~ such permits, and  
10 environmental consequences of alternatives to NMFS issuing such permits. One permit considered here  
11 would cover incidental take of ESA-listed rockfish, Chinook salmon, green sturgeon, and eulachon  
12 from one commercial and one recreational fishery in Puget Sound authorized by the State of  
13 Washington. The other permits would cover take of ESA-listed rockfish, Puget Sound Chinook salmon,  
14 Hood Canal summer-run chum salmon, Puget Sound steelhead, eulachon, and green sturgeon resulting  
15 from state-conducted scientific research activities.

16 On April 28, 2010, NMFS listed the Puget Sound/Georgia Basin ~~Distinct Population Segments~~ (DPSs)<sup>2</sup>  
17 of yelloweye rockfish (*Sebastes ruberrimus*) and canary rockfish (*Sebastes pinniger*) as threatened, and  
18 listed the Puget Sound/Georgia Basin DPS of bocaccio (*Sebastes paucispinis*) as endangered under the  
19 ESA (75 Fed. Reg. 22276). On May 17, 2010, NMFS listed the Southern DPS of eulachon  
20 (*Thaleichthys pacificus*) as a threatened species under the ESA (75 Fed. Reg. 13012, March 18, 2010).  
21 NMFS listed Puget Sound Chinook salmon (*Oncorhynchus tshawytscha*), as threatened under the ESA  
22 on March 24, 1999 (64 Fed. Reg. 14308). Figure 1 shows the geographic extent of the action area and  
23 ESA-listed rockfish DPSs. Figure 2 shows the Evolutionary Significant Units for Puget Sound Chinook  
24 salmon and Hood Canal summer-run chum salmon, a portion of which also occur within the action

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<sup>2</sup> Under the ESA, NMFS lists Pacific salmon as threatened or endangered according to the status of the “Evolutionarily Significant Unit” (ESU). An ESU is a population or a group of populations that 1) is substantially reproductively isolated from conspecific (another organism of the same species) populations and 2) represents an important component of the evolutionary legacy of the species. See <http://www.nwfsc.noaa.gov/trt/glossary.cfm#E> for formal definitions of ESA-related terms used by NMFS.

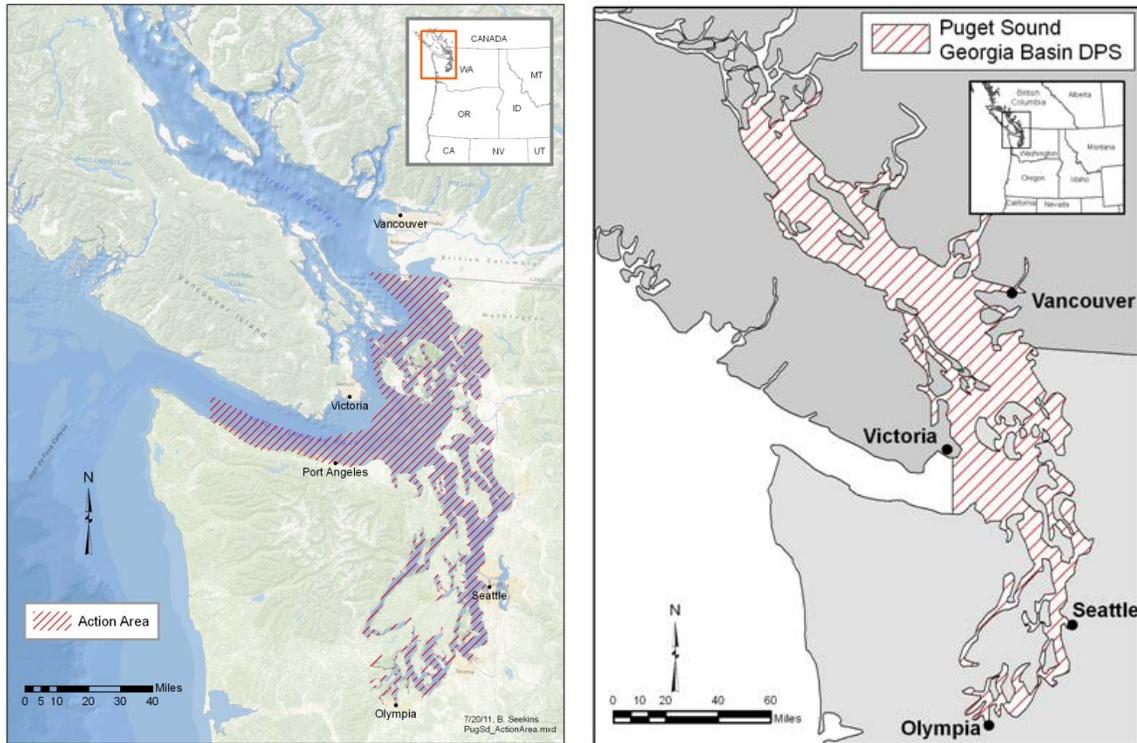
In contrast to salmon, NMFS lists steelhead runs under the joint NMFS-U.S. Fish and Wildlife Service policy for recognizing *Distinct Population Segments* (DPSs) under the ESA (61 Fed. Reg. 4722, February 7, 1996). This policy applies to all species except Pacific salmon. It adopts criteria similar to those in the ESU policy for determining when a group of vertebrates constitutes a DPS – the group must be discrete from other populations and it must be significant to its animal group, or taxon. A group is discrete if it is “markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological, and behavioral factors” (61 Fed. Reg. 4722, February 7, 1996). NMFS lists steelhead according to the status of the DPS.

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1 area. The action area is larger than the rockfish DPSs area because some WDFW research actions occur  
2 westward of the Puget Sound/Georgia basin DPSs boundary indicated in Figure 1.

3

4



5

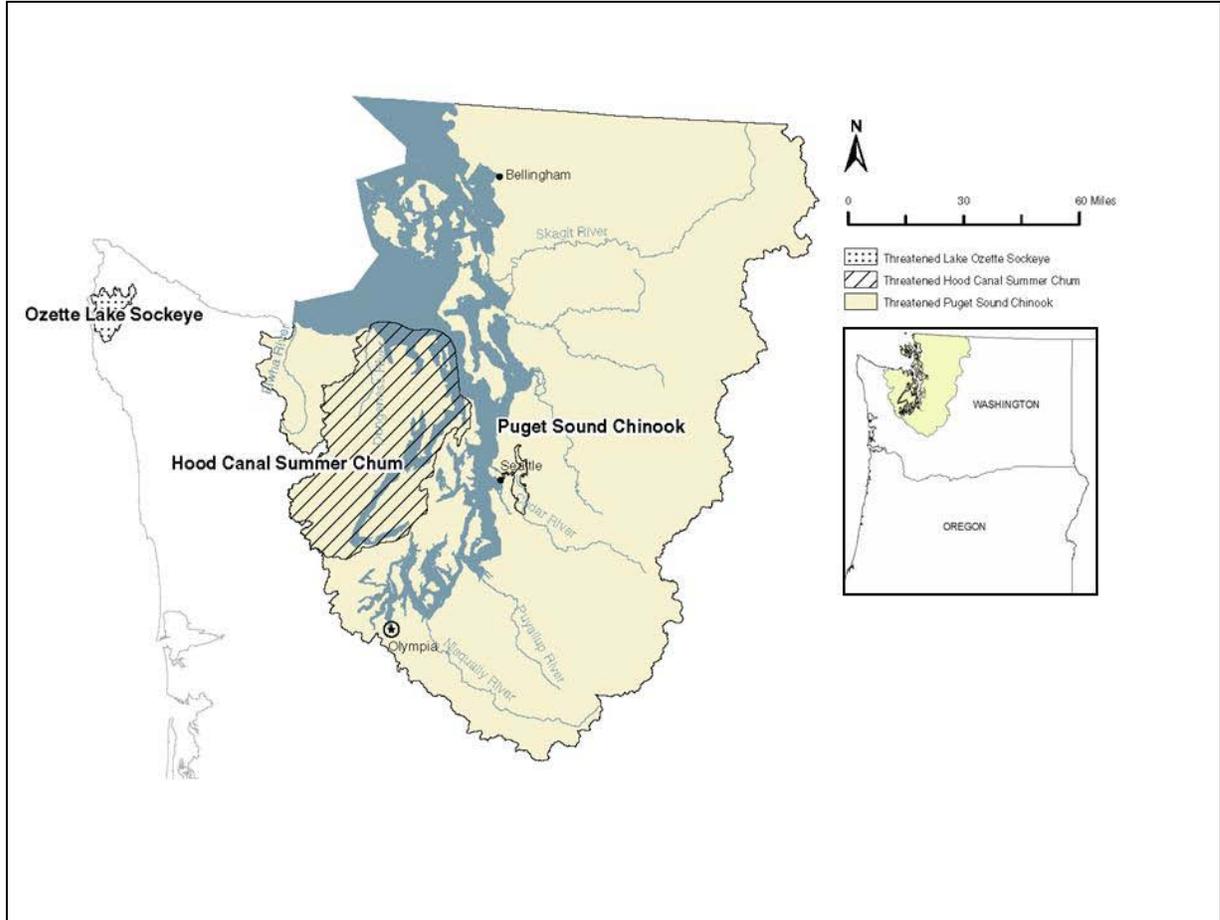
6 Figure 1. Action area for this Environmental Assessment (left) and ESA-listed rockfish DPSs (right).

7

8

1

2



3

4 Figure 2. Evolutionarily Significant Units (ESUs) of Puget Sound Chinook salmon and Hood Canal  
5 summer chum in the action area.

6

1 Fisheries within Puget Sound are managed by WDFW. ESA-listed rockfish and Puget Sound Chinook  
2 salmon are incidentally caught in the commercial shrimp trawl fishery and the recreational bottom fish  
3 and other fish fishery (herein referred to as the recreational bottom fish fishery) authorized by the state.  
4 Eulachon are caught in one state-managed commercial fishery. ESA-listed rockfish and Puget Sound  
5 Chinook salmon are also caught in Puget Sound commercial, recreational, and tribal salmon fisheries.  
6 Those takes are authorized by NMFS under other authorities<sup>3</sup> and are addressed in this EA as  
7 cumulative effects (Section 5.0, Cumulative Impacts).

8 In 2010, the Washington State Fish and Wildlife Commission formally adopted regulations that ended  
9 the retention of rockfish by recreational anglers in Puget Sound and closed fishing for bottom fish  
10 (often referred to as demersal fish, or groundfish; the terms bottom fish and groundfish are used  
11 interchangeably throughout this document) in waters deeper than 120 feet. On July 28, 2010, WDFW  
12 enacted the following package of regulations by emergency rule for the following commercial fisheries  
13 in Puget Sound (WDFW 2010a).

- 14 1) Closure of the set net fishery
- 15 2) Closure of the set line fishery
- 16 3) Closure of the bottom trawl fishery
- 17 4) Closure of the inactive scallop trawl fishery
- 18 5) Closure of the inactive pelagic trawl fishery
- 19 6) Closure of the inactive bottom fish pot fishery

20

21 As a precautionary measure, WDFW closed the above commercial fisheries westward of the ESA-  
22 listed rockfish DPSs boundary to Cape Flattery (Figure 1). WDFW extended the closure west of the  
23 rockfish DPSs boundary to prevent commercial fishermen from concentrating gear in that area. The  
24 WDFW made these fisheries adjustments as proactive implementation measures to minimize the  
25 possibility of take of yelloweye rockfish, canary rockfish, and bocaccio, as well as other depressed  
26 rockfish species.

27 The commercial fisheries closures listed above were enacted on a temporary basis (up to 240 days), and  
28 WDFW permanently closed them in February 2011. The pelagic trawl fishery was closed permanently  
29 by rule on the same date. WDFW conducts Puget Sound fish research activities that include a bottom

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<sup>3</sup> NMFS has authorized take of ESA-listed rockfish, Puget Sound steelhead, and Puget Sound Chinook salmon in the Chinook salmon fisheries in the action area through consultations under ESA section 7 because of proposed approvals under ESA section 4(d) rules (see, for example, NMFS Biological Opinion F/NWR/2010/06051).

1 fish trawl census that has occurred on an annual basis since the late 1980s, a midwater trawl survey, an  
2 acoustic trawl survey of Pacific herring (*Clupea harengus pallasii*), and hook and line and tagging  
3 studies of non-listed rockfish.

4 WDFW has developed a Fishery Conservation Plan (FCP) for ESA-listed rockfish and seeks an  
5 ~~incidental take permit (ITP)~~ under ESA section 10(a)(1)(B) for incidental take of ESA-listed yelloweye  
6 rockfish, canary rockfish, and bocaccio from recreational bottom fishing, and incidental take of ESA-  
7 listed rockfish and eulachon (*Thaleichthys pacificus*) from commercial shrimp trawling in Puget Sound.  
8 WDFW also seeks to include in the ITP Puget Sound Chinook salmon incidentally caught within each  
9 fishery. Each fishery is authorized and managed by the State of Washington. Further, WDFW seeks ~~a~~  
10 scientific research permits under ESA section 10(a)(1)(A) for take of ESA-listed rockfish, Puget Sound  
11 Chinook salmon, Puget Sound steelhead (*Oncorhynchus omykiss*), Puget Sound summer chum salmon  
12 (*O. keta*), green sturgeon (*Acipenser medirostris*), and eulachon resulting from scientific research  
13 activities.

#### 14 **1.2. Description of the Proposed Action (Preferred Alternative)**

15 The Preferred Alternative is the same as the Proposed Action, which is for NMFS to issue the requested  
16 permits and for WDFW to implement the proposed Fishery Conservation Plan and Puget Sound fish  
17 research program. Specifically:

18 1) NMFS would issue an incidental take permit under section 10(a)(1)(B) of the ESA that would  
19 cover the incidental take of ESA-listed rockfish, Chinook salmon, and eulachon in two state-  
20 authorized fisheries in Puget Sound—the recreational bottom fish fishery and the commercial  
21 shrimp trawl fishery. Pursuant to the Fishery Conservation Plan, WDFW would implement the  
22 following measures:

- 23 a. Continue the permanent closure by regulation of the set net, set line, bottom fish trawl,  
24 bottom fish pot, and scallop trawl fisheries;
- 25 b. Continue to prohibit fishing for rockfish in Marine Areas 5 through 13;
- 26 c. Continue to prohibit retention of rockfish caught as bycatch in any fishery in Marine  
27 Areas 5 through 13;

- 1           d. Continue to prohibit bottom fishing in waters deeper than 120 feet throughout the  
2           geographic range of the U.S. waters of the Puget Sound/Georgia Basin rockfish DPSs  
3           (halibut and salmon fisheries would still be allowed in waters deeper than 120 feet);
- 4           e. Require permit holders in the shrimp trawl fishery to have on-board observers on 10  
5           percent of all trips, who would identify and track bycatch; and
- 6           f. Continue to allow only beam trawls in the shrimp trawl fishery (no rockhopper gear).

7 | 2) NMFS would issue ~~a~~scientific research permits under section 10(a)(1)(A) of the ESA that  
8       would cover the direct take of ESA-listed rockfish, Puget Sound Chinook salmon, Puget Sound  
9       steelhead, Hood Canal summer chum, green sturgeon, and eulachon resulting from WDFW  
10      scientific research activities on fish, including Puget Sound bottom fish. Activities for the  
11      Puget Sound fish research program would include continuation of a bottom fish trawl census  
12      that has occurred on an annual basis since the late 1980s, a midwater trawl survey, an acoustic  
13      trawl survey of Pacific herring , and hook-and-line and tagging studies of non-listed rockfish.

14      3) WDFW would report to NMFS annually on the above activities and adapt future fisheries and  
15      research efforts as necessary to avoid exceeding take requests.

16      The proposed permits, Fishery Conservation Plan, and research activities would continue for a period  
17      of 5 years. The WDFW has proposed to manage these activities to result in the number of takes shown  
18      in Table 1-1.

1 Table 1-1. Requested maximum annual and 5-year incidental takes for ESA-listed rockfish,  
 2 Chinook salmon, and eulachon by the commercial shrimp trawl and recreational  
 3 fisheries for bottom fish and other fish within Puget Sound DPSs.

Species	Recreational		Shrimp Trawl		Annual Takes		5-Year Takes	
	Nonlethal	Lethal	Nonlethal	Lethal	Nonlethal	Lethal	Nonlethal	Lethal
Bocaccio	26	12	0	5	26	17	130	85
Canary Rockfish	81	47	0	10	81	57	405	285
Yelloweye Rockfish	87	55	0	10	87	65	435	325
Eulachon, adult	0	0	0	3,240	0	3,240	0	16,200
PS Chinook salmon*	30	12	0	50	30	62	150	310

\*Number of Puget Sound Chinook salmon in the Recreational columns are estimated based on 2008-2010 creel data. These numbers assume a 20 percent sample rate and a 20 percent mortality rate for released Chinook salmon. Take requests for all species from research activities can be found in Appendix A: Estimated Numbers of ESA-listed Fish Species to be Incidentally Taken under the Various Alternatives.

4 **1.3. Purpose of and Need for the Proposed Action**

5 The purpose of and need for the Proposed Action is to allow two state-regulated fisheries to continue  
 6 by implementing a Fishery Conservation Plan (part of the basis for NMFS' issuance of an Incidental  
 7 Take Permit) that provides a proactive fisheries management and research/data collection program for  
 8 the conservation of yelloweye rockfish, canary rockfish, bocaccio, and other ESA-listed fish in the  
 9 Puget Sound/Georgia Basin DPSs, while at the same time providing commercial and recreational  
 10 fishing opportunities to the people in the State of Washington. Additionally, a scientific research  
 11 permits is needed to allow the WDFW Puget Sound fish research program to assess the overall  
 12 abundance, species assemblages, distribution, and health of a variety of fish including rockfish,  
 13 salmonids, groundfish, and non-groundfish (pelagic fish).

14 **1.4. Action Area**

15 The action area is all of Puget Sound and the Straits of Georgia and Juan de Fuca westward to the town  
 16 of Sekiu. The ESA-listed rockfish DPSs include all yelloweye rockfish, canary rockfish, and bocaccio  
 17 found in waters of the Puget Sound, the Strait of Georgia, and the Strait of Juan de Fuca east of  
 18 Victoria Sill (Figure 1). Research activities conducted by WDFW extend beyond the range of the ESA-  
 19 listed rockfish DPSs, westward to the town of Sekiu, located on the Strait of Juan de Fuca. Fishing  
 20 activities that would be covered by the ITP take place in the geographical area of the rockfish DPSs.

1 Puget Sound is the second-largest estuary in the United States, located in northwest Washington State,  
2 covering an area of about 900 square miles (2,330 square kilometers), including 2,500 miles (4,000  
3 kilometers) of shoreline and 14 major river systems, and is home to a rapidly-expanding human  
4 population. Puget Sound is part of a larger inland waterway, the Georgia Basin, situated between  
5 southern Vancouver Island, British Columbia, Canada, and the mainland coasts of Washington State.  
6 Puget Sound can be subdivided into five interconnected basins separated by relatively shallow sills  
7 (areas of relatively shallow bathymetry that separate two basins): (1) The San Juan/Strait of Juan de  
8 Fuca Basin (also referred to as “North Sound”), (2) Main Basin, (3) Whidbey Basin, (4) South Puget  
9 Sound, and (5) Hood Canal. The term “Puget Sound proper” within this EA refers to all of these  
10 basins except the San Juan/Strait of Juan de Fuca Basin. All five basins have unique temperature  
11 regimes, water residence times and circulation patterns, biological condition, depth profiles and  
12 contours, species compositions, and nearshore and benthic habitats (Ebbesmeyer et al. 1984; Burns  
13 1985; Rice 2007).

#### 14 **1.5. Relationship to Other Plans and Policies**

15 The Proposed Action and alternatives analyzed in this environmental assessment relate to other  
16 Federal, state, tribal, and local organizations’ plans and policies addressing rockfish conservation in the  
17 Puget Sound/Georgia Basin.

#### 18 Puget Sound Chinook Harvest Agreement

19 NMFS reviews harvest of Puget Sound Chinook salmon within section 4(d) of the ESA. Resource  
20 Management Plans (RMPs) are developed by the State of Washington and Puget Sound Treaty Tribes.  
21 Since 2001, NMFS has received, evaluated, and approved a series of jointly developed RMPs from the  
22 Puget Sound Treaty Indian Tribes and WDFW under Limit 6 of the 4(d) Rule. These RMPs provide the  
23 framework within which the tribal and state jurisdictions jointly manage all salmon and steelhead  
24 gillnet fisheries affecting listed Chinook salmon within the greater Puget Sound area. NMFS issued the  
25 current 4(d) determination in 2011, and it extends to April 30, 2014.

#### 26 Halibut Management Plan

27 Regulations governing the fisheries for Pacific halibut in the waters of the United States (including  
28 state waters) and Canada are developed by the International Pacific Halibut Commission (IPHC) and  
29 are accepted by the Secretary of State with the concurrence of the Secretary of Commerce. The IPHC  
30 develops its regulations governing the Pacific halibut fishery under the authority of the Convention

1 between the United States and Canada for the Preservation of the Halibut Fishery of the Northern  
2 Pacific Ocean and the Bering Sea. WDFW incorporates halibut fishing regulations within state waters  
3 in accordance with the annual allocations developed by the IPHC and approved by the Pacific Fishery  
4 Management Council and the Secretary of Commerce.

5 Puget Sound Groundfish Management Plan

6 Meaningful efforts to protect rockfish in Puget Sound from overharvest began in 1982 when the  
7 Washington Department of Fisheries (now WDFW) published their Puget Sound Groundfish  
8 Management Plan. This plan identified rockfish as an important commercial and recreational resource  
9 in Puget Sound, established catch levels to control harvest, and emphasized recreational fisheries for  
10 rockfish while limiting the degree of commercial fishing (Palsson et al. 2009). During the 1980s,  
11 WDFW continued to collect information on rockfish harvest with an emphasis on increasing the  
12 amount of information available on rockfish bycatch in nontargeted fisheries (e.g., salmon fishery).

13 WDFW updated the 1982 Groundfish Management Plan in 1986 and, during this same time, WDFW  
14 received a Federal grant to monitor recreational catches of rockfish and to collect biological data on  
15 rockfish populations in Puget Sound. The state collected information, and WDFW developed new  
16 management scenarios but never implemented them (Palsson et al. 2009).

17 In 1991, WDFW adopted a major change in strategy for rockfish management in Puget Sound. The  
18 strategy, called “passive management,” ended all monitoring of commercial fisheries for groundfish  
19 and collection of biological data (Palsson et al. 2009). In 1996, the Washington State Fish and Wildlife  
20 Commission established a new policy for Puget Sound groundfish management. The policy stated that  
21 the Commission would manage Puget Sound groundfish, especially Pacific cod, in a conservative  
22 manner to minimize the risk of overharvest and to ensure the long-term health of the resource. During  
23 the next 2 years, WDFW developed a Groundfish Management Plan (Palsson et al. 1998) that  
24 identified specific management objectives to achieve the Commission’s preference for a precautionary  
25 approach (Palsson et al. 2009). The plan also called for the development of species-specific (including  
26 many rockfishes) conservation and use plans. The next step in the sequence of groundfish management  
27 by the state was the development of the Puget Sound Rockfish Conservation Plan (WDFW 2010c;  
28 WDFW 2011a).

1 WDFW Puget Sound Rockfish Conservation Plan

2 WDFW conducted a State Environmental Policy Act (SEPA) review of its Rockfish Conservation Plan  
3 (WDFW 2010c). The plan (WDFW 2011a) encompasses more management actions than are addressed  
4 in the Fishery Conservation Plan (Subsection 1.2, Description of the Proposed Action) because WDFW  
5 is not seeking take coverage for all of the activities in the Rockfish Conservation Plan. The Fishery  
6 Conservation Plan is consistent with the Rockfish Conservation Plan’s goal of fishery management that  
7 will enable the health and productivity of rockfish populations. For instance, the Rockfish Conservation  
8 Plan discusses the future use of hatchery supplementation and artificial habitats as a proposed means to  
9 augment populations of rockfish and to improve their habitat, but these actions are not a component of  
10 this Proposed Action. Consequently, the SEPA review is more comprehensive than the scope of this  
11 EA regarding the full suite of possible environmental impacts from implementation of the Rockfish  
12 Conservation Plan.

13 Washington Department of Fish and Wildlife 2010/2011 and 2011/2012 Sportfishing Rules Pamphlet

14 The current sportfishing regulations for Washington State, which are administered and enforced by  
15 WDFW, include regulations specific to rockfish and bottom fish fishing, salmon fishing, halibut  
16 fishing, and other fish. The regulations state that “fishing for, or retention of, any species of rockfish is  
17 now prohibited in most of Puget Sound (Marine Areas 6 through 13).” Additionally, fishing for bottom  
18 fish “in waters deeper than 120 feet is now prohibited because of the need to reduce the catch of  
19 rockfish from deep water. Studies have shown that rockfish caught and released from waters deeper  
20 than 120 feet suffer high rates of mortality” (WDFW 2010b). This depth restriction does not apply to  
21 salmon or halibut fishing; however, any bottom fish caught must be returned to the water (WDFW  
22 2010b). The 2011/2012 pamphlet includes information on rockfish conservation that includes general  
23 information about rockfish biology and behavior, and instructions for releasing a rockfish to improve  
24 its chances of survival (WDFW 2011b).

25 Northwest Straits Conservation Initiative, Derelict Gear Program

26 The Northwest Straits Initiative oversees seven county-based Marine Resource Committees and  
27 administers the removal of derelict fishing gear within Puget Sound. The Marine Resource Committees  
28 conduct nearshore, intertidal, and estuarine restoration projects; support salmon and bottom fish  
29 recovery; and identify and carry out protection strategies for marine species and habitats. The derelict  
30 fishing gear program has removed nearly 3,850 derelict fishing nets and over 2,000 crab pots since  
31 2002. The Northwest Straits Initiative reports that more than 211,000 animals representing more than

1 223 species—including canary rockfish and several other rockfish species—were found entangled in  
2 derelict gear (Northwest Straits Initiative 2011).

3 Puget Sound Chinook Recovery Plan

4 The Puget Sound Chinook Recovery Plan encompasses 14 local watershed planning areas and the  
5 nearshore of Puget Sound with a tailored approach for restoration actions to enable recovery based on  
6 local characteristics and conditions. Although this plan focuses on Chinook salmon recovery, it  
7 encompasses the broader ecosystem, including the biological processes that create a healthy  
8 environment for salmon. NMFS prepared a Federal supplement to the plan and approved it in January  
9 2007 (72 Fed. Reg. 2493, January 19, 2007).

10 Southern Resident Killer Whale Vessel Regulations

11 New vessel regulations were recently issued for killer whales (76 Fed. Reg. 20870, April 14, 2011).  
12 These regulations prohibit vessels from approaching killer whales within 200 yards (182.9 m) and from  
13 parking in the path of whales when in inland waters of Washington State. Certain vessels are exempt  
14 from the prohibitions. The purpose of these regulations is to protect killer whales from interference and  
15 noise associated with vessels.

16

17

1 2. ALTERNATIVES INCLUDING THE PROPOSED ACTION

2 **2.1. Introduction**

3 NMFS selected alternatives for this analysis by developing selection criteria from key issues  
4 surrounding the incidental take of ESA-listed rockfish in Puget Sound. Selection criteria were  
5 developed to meet the purpose and need of the Proposed Action (i.e., the alternative must occur within  
6 the action area; restrictions could be imposed, but would need to meet the purpose and need). NMFS  
7 then used these criteria to assess the range of reasonable alternatives. The three alternatives selected for  
8 analysis met all or most of the criteria established; those that did not meet these criteria and did not  
9 meet the purpose of and need for the action were considered but not analyzed in detail, as described  
10 below (Subsection 2.2.3, Alternatives Considered but Not Analyzed in Detail). Table 2-1 at the end of  
11 this section summarizes key components among the three alternatives.

12 **2.2. Alternatives**

13 **2.2.1. No-action Alternative**

14 Under the No-action Alternative, NMFS would not issue an ITP under section 10(a)(1)(B) of the ESA,  
15 and WDFW would not implement a Fishery Conservation Plan. Additionally, NMFS would not issue a  
16 permit under section 10(a)(1)(A) of the ESA for research activities, and WDFW would not conduct  
17 research that may take ESA-listed rockfish. WDFW would continue to manage the commercial and  
18 recreational fisheries in Puget Sound that have ESA-coverage, and other fisheries that have no risk of  
19 catching ESA-listed rockfish, and would:

- 20 1) Continue the closure by permanent regulation of the set net, set line, bottom fish trawl, bottom  
21 fish pot, and scallop trawl fisheries (Subsection 1.1, Introduction and Background).
- 22 2) Close the recreational bottom fish fishery and commercial shrimp trawl fishery to eliminate the  
23 unpermitted bycatch of listed fish<sup>4</sup>.
- 24 3) Not conduct research on bottom fish and other fish if that research has a risk of taking ESA-  
25 listed rockfish.<sup>5</sup>

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<sup>4</sup> As mentioned previously, listed fish are also incidentally caught in salmon fisheries in Puget Sound, but those incidental catches are permitted by NMFS under other authorities.

<sup>5</sup> There is considerable research on ESA-listed Puget Sound Chinook salmon, which NMFS authorizes through separate section 4(d) authorizations.

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1    **2.2.2.   Alternative 2: Proposed Action**

2    Under the Proposed Action, NMFS would issue an ITP under section 10(a)(1)(B) of the ESA and  
3    WDFW would implement the Fishery Conservation Plan. Additionally, NMFS would issue a permit  
4    under section 10(a)(1)(A) of the ESA for scientific research activities and WDFW would implement  
5    the Puget Sound fish research program. Each permit would be effective for a period of 5 years. The  
6    plan incorporates fisheries management and research activities and would include the activities  
7    described above in Subsection 1.2, Description of the Proposed Action.

8    **2.2.2.1.   Fishing Activities under the Proposed Action**

9    The type of fishing that would occur under the Proposed Action includes recreational bottom fishing  
10   with hook-and line-gear, and commercial shrimp trawling using bottom trawls. Fishing activities would  
11   be representative of those that currently occur in the action area.

12   Recreational bottom fishing is open for various periods of time within portions of Puget Sound. A few  
13   species, such as flatfish (other than halibut) and surfperch, can be legally harvested year-round in most  
14   areas of Puget Sound, but other fisheries have defined seasons. During May and the first half of June,  
15   anglers are permitted to fish for lingcod (*Ophiodon elongates*) throughout most of Puget Sound. The  
16   lingcod fishery is the most popular of the bottom fish fisheries in Puget Sound (Pacunski and Palsson  
17   2001). Anglers use large jigs, artificial worms, and live bait such as herring, flatfish, and kelp greenling  
18   while targeting lingcod and other bottom fish (Olander 1991; Martinis 2008). Fishing for cabezon  
19   (*Scorpaenichthys marmoratus*) in Marine Catch Areas (MCAs) 6 to 13 is only permitted from May 1 to  
20   November 30, and fishing for codfishes is allowed year-round in MCAs 6 and 7, but prohibited in  
21   MCAs 8 to 13. Hood Canal (MCA 12) has been closed to bottom fishing since 2002 because of the  
22   adverse impacts of hypoxia. From 2004 through 2009 the number of angler trips targeting bottom fish  
23   ranged between 68,000 and 105,000 annually (compared to approximately 350,000 angler trips  
24   targeting salmon) and caught an average of 113,000 fish annually (WDFW 2011a), and NMFS expects  
25   similar fishing efforts to occur under the Proposed Action. Recreational salmon and halibut fisheries  
26   also result in bycatch of listed rockfish, though these fisheries are not addressed in WDFW's fishery  
27   conservation plan because each are permitted by NMFS under other authorities.

28   The shrimp trawl fishery occurs in the San Juan/Strait of Juan de Fuca Basin of Puget Sound. The  
29   fishery uses a beam trawl, consisting of a bag-shaped trawl net utilizing a beam to spread the mouth of  
30   the net horizontally as it is towed and does not have weighted otter frames or otter doors.

1 Only beam trawls are legal trawl gear in the Puget Sound commercial shrimp fishery. The minimum  
2 mesh size for Puget Sound beam trawl nets is 1.5 inches (3.8 centimeters) stretch measure. The  
3 maximum beam width is 60 feet (18.29 meters) in the eastern Strait of Juan de Fuca, and 25 feet (7.62  
4 meters) in the San Juan Islands.

5 From 2005 to 2010 the shrimp trawl fishery averaged 193 individual trips, with an average of 5 tows  
6 per trip (WDFW 2011d). Observers have not been regularly deployed in this fishery, though WDFW  
7 has observed several trips over the past 10 years that allow estimates and composition of bycatch. From  
8 this data, bycatch is estimated to be approximately 15,759 pounds of fish annually. Beam trawls are  
9 towed for several minutes in waters restricted to deeper than 120 feet. Beam trawls can only be  
10 operated effectively over level bottoms such as mud, sand, and gravel (Roberts 2008). Rockhopper  
11 trawl gear is not allowed by WDFW (WDFW 2011d).

#### 12 **2.2.2.2. Research Activities under the Proposed Action**

13 WDFW conducts research of Puget Sound fishes on an annual basis to assess their overall abundance,  
14 species assemblages, distribution, and health (WDFW 2011d). The type of research that would occur  
15 under the Proposed Action would be representative of the existing research program that occurs in the  
16 action area. The Puget Sound fish research program would include bottom and midwater trawl surveys,  
17 hook-and-line capture, and tagging of rockfish. Acoustic-midwater trawl studies for Pacific herring and  
18 Pacific hake (whiting, *Merluccius productus*) are designed to estimate the abundance of these pelagic  
19 species in key areas in Puget Sound. Midwater trawling operations are conducted from a 58-foot (17.7-  
20 meter) steel vessel that is used to tow a midwater rope trawl. The rope trawl has meshes ranging in size  
21 from 2.6 feet (0.8 meters) at the throat, to mesh sizes that decrease to 1.5 inches (3.8 centimeters) at the  
22 cod end of the net. There is a liner in the cod end that consists of 0.39-inch (1 cm) knotless mesh. The  
23 net is towed for a duration of 10 minutes to 2 hours, depending upon the needed sample amount.

24 WDFW conducts a systematic bottom trawl index survey of Puget Sound. The index survey deploys a  
25 bottom trawl twice at 51 pre-selected, permanent stations (between 102 to 200 trawls annually). The  
26 stations are stratified by depth and were initially selected at random within one of four depth zones.  
27 The depth zones are 30 to 120 feet (9 to 36.7 meters), 120 to 240 feet (36.7 to 73 meters), 240 to 358  
28 feet (73 to 109 meters), and greater than 358 feet (109 meters). The bottom trawl is a 400 mesh Eastern  
29 Trawl fitted with a 1.8-inch (3-centimeter) mesh liner. The net is attached to heavy steel doors on each  
30 side and the entire assembly is towed along the seafloor for a distance of approximately 0.46 miles  
31 (0.74 kilometers) at a speed of 2.3 miles per hour (2 knots). The trawl is towed for 5 to 20 minutes at

1 each station. Puget Sound assessment and monitoring program bottom trawl surveys occur during odd  
2 years. This index survey samples at fixed locations and places of interest to collect English sole  
3 (*Parophrys vetulus*) and other species of interest at selected sites throughout Puget Sound.

4 The final research category is biological sampling using hook-and-line. Fish are sampled for tissue,  
5 held for broodstock, or sacrificed for more in-depth analysis. The primary species of interest are  
6 lingcod, greenlings, flatfishes, wolf-eels, rockfishes, and codfishes. Hook-and-line gear are used to  
7 sample the adult and juvenile phases of non-listed rockfishes, lingcod, Pacific cod, flatfishes, and other  
8 groundfish species. No yelloweye rockfish, canary rockfish, or bocaccio are targeted, and sampling  
9 would occur in water depths less than 120 feet (39 meters), which is shallower than these fish are  
10 typically found and thus it is unlikely that they would be caught.

### 11 **2.2.3. Alternative 3: Similar to Proposed Action Alternative but with Fewer Restrictions**

12 Alternative 3 would be similar to Alternative 2; NMFS would issue an ITP under section 10(a)(1)(B) of  
13 the ESA, and WDFW would implement the Fishery Conservation Plan. As under the Proposed Action  
14 Alternative, NMFS would also issue a section 10(a)(1)(A) permit for scientific research activities and  
15 WDFW would conduct rockfish research. Each permit would be effective for a period of 5 years.  
16 Under this alternative, WDFW would take some of the same actions as under the Proposed Action  
17 Alternative (Subsection 1.2, Description of the Proposed Action), except:

- 18 1) WDFW would manage the recreational bottom fish fishery without a 120-foot depth restriction  
19 throughout Puget Sound, and
- 20 2) WDFW would not require on-board observers for the commercial shrimp trawl fishery. The  
21 absence of on-board observers would require commercial shrimp trawl fishermen to document  
22 their own bycatch.

23 These two measures are part of the Fishery Conservation Plan and the Proposed Action, but it is  
24 reasonable to consider an alternative that does not include them as they represent the recent  
25 characteristics of these fisheries prior to the rockfish ESA listing.

1 **2.2.4. Alternatives Considered but Not Analyzed in Detail**

2 **2.2.4.1. Additional Conservation Measures—Inclusion of Marine Protected Areas in the Fishery**  
3 **Conservation Plan**

4 The establishment of Marine Protected Areas within the DPSs would assist with ESA-listed rockfish  
5 conservation because it would prevent activities that could result in the catch of protected species in  
6 these specified areas. Establishment of Marine Protected Areas may be a valuable recovery action for  
7 ESA-listed rockfish; however, while this possible alternative would likely meet the purpose of and  
8 need for this action, NMFS does not have enough information to determine the actual value to the  
9 covered species of designating Marine Protected Areas. NMFS is currently collecting information to  
10 make an informed assessment of this management strategy. Consequently, inclusion of this alternative  
11 in this EA would be premature because the analysis would be speculative until more information is  
12 collected and analyzed.

13 **2.2.4.2. Continued Fisheries Management Without a Section 10(a)(1)(B) ITP and Do Not Issue a**  
14 **Research Permits**

15 Under this alternative, WDFW would continue to authorize the commercial and recreational fisheries  
16 that incidentally take ESA-listed rockfish, but without ESA coverage for the direct take of federally-  
17 listed species from research activities. This alternative would not further the purpose and need for  
18 conserving ESA-listed species because it would preclude fishery conservation efforts through valuable  
19 research, and thus would not provide conservation measures that address potential incidental take of  
20 ESA-listed rockfish in the two fisheries.

21 WDFW is mandated to maintain the economic well-being and stability of the fishing industry in the  
22 state while also conserving fisheries resources (RCW 77.04.012). As such, it seeks take coverage of  
23 some ESA-listed fish species to both provide a fishing opportunity for non-listed fish and to conduct  
24 research designed to gain further understanding of listed fish and their habitats. In addition, lack of  
25 Federal involvement in the fishery or research activities via an ITP and section 10(a)(1)(A) permit  
26 could limit or preclude collaborative work between NMFS and WDFW to conserve and protect ESA-  
27 listed rockfish.

28 For the EA analysis, a distinction was made between this potential alternative and the No-action  
29 Alternative. Under this potential alternative, WDFW would continue to approve fisheries that  
30 incidentally catch ESA-listed rockfish, but would not manage those fisheries to further reduce bycatch  
31 of ESA-listed rockfish and would not conduct research activities. Under the No-action Alternative,

1 WDFW would close the recreational bottom fish fishery and commercial shrimp trawl fishery to  
2 eliminate future bycatch from these two fisheries.

3 **2.2.4.3. Section 10(a)(1)(B) ITP Issuance for Fisheries Management, but No Section 10(a)(1)(A)**  
4 **Permit Issuance for Research Activities**

5 Providing ITP coverage for fisheries but eliminating section 10(a)(1)(A) permit issuance for WDFW  
6 research activities would not be consistent with the purpose and need because it would result in less  
7 future data regarding ESA-listed rockfish status and other listed fish, and thus less information for  
8 future species conservation efforts. This would be contrary to the need for more information regarding  
9 these species to inform management decisions intended to promote the survival and recovery of ESA-  
10 listed rockfish and other listed species. For instance, WDFW's research would be a valuable  
11 information source for recovery planning for ESA-listed rockfish. Because the No-action Alternative  
12 does not include research activities, a separate analysis to address impacts or benefits from eliminating  
13 research coverage would not likely garner a measurable distinction from the analysis under the No-  
14 action Alternative or the Proposed Action.

15 **2.2.4.4. No Section 10(a)(1)(B) ITP Issuance for Fisheries Management, Section 10(a)(1)(A)**  
16 **Permit Issuance for Research Activities**

17 WDFW is mandated to maintain the economic well-being and stability of the fishing industry in the  
18 state while also conserving fisheries resources (RCW 77.04.012). Further, the state must maximize  
19 public recreational fishing opportunities (RCW 77.04.012). Not issuing an ITP for each fishery would  
20 not preclude all saltwater fishing opportunities; however, because of the risk of incidentally taking  
21 ESA-listed rockfish, Puget Sound Chinook salmon, and eulachon, the recreational bottom fish and  
22 commercial shrimp trawl fisheries could be curtailed by the state to meet its mandate to conserve and  
23 protect fish in state waters (RCW 77.04.012). Lack of ESA coverage could, therefore, reduce  
24 opportunities for many residents of the Puget Sound/Georgia Basin area to fish for and/or purchase  
25 locally-caught non-ESA-listed fish and shrimp.

26 **2.2.4.5. Issuance of a Section 10(a)(1)(A) Permit for Research Activities and Section 10(a)(1)(B)**  
27 **ITP Issuance for Fisheries Management in an Expanded Geographic Area or in a Smaller**  
28 **Geographic Area**

29 Under this potential alternative, the ITP for recreational bottom fishing and commercial shrimp trawls  
30 would cover fisheries occurring in areas outside the action area, or in smaller areas within it. It would  
31 not be practical or necessary to analyze rockfish bycatch effects outside of the action area (i.e., an  
32 expanded geographic area from the area under the Proposed Action) because the scope of WDFW

1 research efforts on Puget Sound fish has established these boundaries. Additionally, ESA coverage of a  
2 smaller subset of the action area would not address take of listed species that may occur across the  
3 Puget Sound, and would thus preclude a more comprehensive fisheries and research management  
4 approach.

5 The section 10(a)(1)(A) permit would cover research efforts that occur in the Strait of Juan de Fuca,  
6 westward of, but near, the ESA-listed rockfish DPS. By including all DPSs and the Strait of Juan de  
7 Fuca in the research area, NMFS is able to work comprehensively with WDFW to collect research data  
8 on these protected species, learn more about the ecosystem, and limit and monitor bycatch across the  
9 entire range of the DPSs. Consequently, changing the geography of the fisheries and research activities  
10 covered by the ITP and 10(a)(1)(A) permit for EA analysis is not warranted because expanding or  
11 reducing the full covered area would not fully address impacts to each species from these activities.

#### 12 **2.2.4.6. ITP Issuance for an Expanded or Reduced Number of Listed Species**

13 Eliminating or adding species from the requested ITP coverage to form a new alternative was not  
14 warranted because the purpose and need is to specifically address ESA-listed rockfish and other listed  
15 fish. The purpose and need is intended to comprehensively address activities that have the potential to  
16 take ESA-listed rockfish directly or incidentally in a specific geographic area.

17

1 **2.3. Comparison of Alternatives**

2

3 Table 2-1. Comparison of Alternatives.

	No-action Alternative	Alternative 2: Proposed Action <u>(Preferred Alternative)</u>	Alternative 3: Similar to Proposed Action, but with Fewer Restrictions
ESA Section 10(a)(1)(B) Incidental Take Permit	No	Yes	Yes
ESA Section 10(a)(1)(A) Permit Issuance for Research Activities	No	Yes	Yes
Fishery Conservation Plan	No Fishery Conservation Plan would be implemented.	WDFW would implement a Fishery Conservation Plan to manage recreational bottom fishing and commercial shrimp trawl fisheries to track and reduce bycatch through adaptive management; 5-year term.	Same as Alternative 2.
WDFW Fishery Closures and Rockfish Regulations	<ul style="list-style-type: none"> <li>Continue the closure by regulation of the set net, set line, bottom fish trawl, bottom fish pot, and scallop trawl fisheries.</li> <li>Close recreational bottom fish fishery.</li> <li>Close shrimp trawl fishery.</li> <li>No guarantee fisheries would remain closed.</li> </ul>	<ul style="list-style-type: none"> <li>Continue the closure by regulation of the set net, set line, bottom fish trawl, bottom fish pot, and scallop trawl fisheries.</li> <li>Allow bottom fishing in waters less than 120 feet deep.</li> <li>Allow shrimp trawl fishery with observers on 10% of trips.</li> <li>5-year term.</li> </ul>	<ul style="list-style-type: none"> <li>Continue the closure by regulation of the set net, set line, bottom fish trawl, bottom fish pot, and scallop trawl fisheries.</li> <li>Allow bottom fishing in all waters.</li> <li>Allow shrimp trawl fishery without requiring observers (self-reporting).</li> <li>5-year term.</li> </ul>
WDFW Research on Puget Sound Fish	No research that has a chance of taking ESA-listed species.	WDFW would conduct research on bottom fish (including rockfish) and other fish.	Same as Alternative 2.
WDFW Reports to NMFS Annually on Above Activities	No report.	Annual report to NMFS on the above activities.	Same as Alternative 2.

1 3. AFFECTED ENVIRONMENT

2 This section describes those resources that may be affected by the Proposed Action and its alternatives,  
3 to the extent necessary to understand potential impacts. Resources that would not be potentially  
4 affected by the Proposed Action are not included in this review. For species addressed in this section,  
5 the term “life-history expression” is used. This term refers to the ability of a species to express its  
6 natural behavior and reproductive potential.

7 **3.1. Marine Ecosystem and Habitat**

8 The Puget Sound and Georgia Basin is the southern arm of an inland sea located on the Pacific Coast of  
9 North America and directly connected to the Pacific Ocean. Puget Sound is the second largest estuary  
10 in the United States, as described in Subsection 1.4, Action Area. Most of the water exchange in Puget  
11 Sound proper is through Admiralty Inlet (Figure 1), and the configuration of sills and deep basins  
12 results in the partial recirculation of water masses and the retention of contaminants, sediment, and  
13 biota (Rice 2007). Tidal action, freshwater inflow, and ocean currents interact to circulate and  
14 exchange salty marine water at depth from the Strait of Juan de Fuca, and less dense fresh water from  
15 the surrounding watersheds at the surface producing a net seaward flow of water at the surface (Rice  
16 2007).

17 Most of the benthic habitats of Puget Sound proper consist of unconsolidated sediments such as sand,  
18 mud, and cobbles. The vast majority of the rocky-bottom areas of Puget Sound occur within the San  
19 Juan Basin, with the remaining portions spread among the rest of Puget Sound proper (Palsson et al.  
20 2009). Depths in the Puget Sound extend to over 920 feet (280 meters). Mean depths in each of the  
21 major basins of the DPSs include 113 feet (34.7 meters) in the San Juan/Strait of Georgia Basin, 206  
22 feet (63 meters) in the Whidbey Basin, 323 feet (98.5 meters) in the Main Basin, 147 feet (45.1 meters)  
23 in the South Sound, and 176.5 feet (53.8 meters) in Hood Canal (Burns 1985). The nearshore of Puget  
24 Sound includes intertidal waters extending outward to the termination of the photic zone (upper layer  
25 of a water body delineated by the depth at which enough sunlight can penetrate to allow  
26 photosynthesis), which is approximately 90 feet (27 meters) deep. Habitats of the nearshore are  
27 naturally dynamic; wave energy and sediment inputs from local streams, rivers, and beach bluff erosion  
28 cause fluctuating habitat conditions and sediment levels (Downing 1983).

29 Habitats within the Puget Sound/Georgia Basin have been influenced by a number of factors. Nearly  
30 one-third of the nearshore habitat has been developed, which has degraded juvenile rockfish and  
31 salmonid rearing habitat (Subsection 3.2.1.1, Rockfish Life History). Benthic habitats have been altered

1 by derelict fishing gear and water quality problems such as reduced levels of dissolved oxygen and  
2 inputs of toxins such as metals, bioaccumulative chemicals, and petroleum products from sources such  
3 as surface runoff, wastewater discharges, spills, migration of contaminated biota, and groundwater  
4 discharge (Palsson et al. 2009; Washington State Department of Ecology 2011). The vast majority of  
5 derelict fishing gear is from gill nets used in salmon fisheries and crab pots; as of 2010, only two of  
6 902 recovered nets were trawl nets (Good et al. 2010). The most likely pollutants attributable to the  
7 operation of fishing and research vessels are in the class of compounds known as polycyclic aromatic  
8 hydrocarbons (PAHs). These include diesel fuel, gasoline, and lubricants that might be spilled directly  
9 into the water; unburned fuels and oils associated with the operation of two-cycle engines such as  
10 outboard motors; and deposition of the products of combustion from larger vessel engines. PAHs have  
11 limited solubility in water (Varanasi 1989) and are typically not found free in the water column.  
12 Lighter fractions tend to come to the surface where they evaporate. PAHs are not known to  
13 bioaccumulate within vertebrates such as fish.

14 These changes to habitat have occurred in each of the individual basins of Puget Sound, but the various  
15 levels-of-impact to ESA-listed rockfish from these stressors is dependent upon the particular basin. For  
16 instance, low levels of dissolved oxygen is a chronic issue within Hood Canal, while impacts from  
17 derelict fishing gear appear to be most acute within North Sound (Palsson et al. 2009; Good et al.  
18 2010). The removal of some derelict fishing gear has improved habitat conditions for rockfish and  
19 other biota (Palsson et al. 2009). As mentioned in Subsection 3.2.2, Salmonids, Subsection 3.2.4, Green  
20 Sturgeon, and Subsection 3.4, Marine Mammals and Turtles, critical habitat has been designated for  
21 Puget Sound Chinook salmon, Hood Canal chum salmon, bull trout, green sturgeon, and southern  
22 resident killer whales in portions of Puget Sound. Essential Fish Habitat (EFH) in Puget Sound has  
23 been listed for 44 species of groundfish, in addition to several species of salmonids and some coastal  
24 pelagic species (Appendix B: Species of Fishes with Designated EFH in the Action Area).

## 25 **3.2. ESA-listed Fish**

### 26 **3.2.1. Rockfish Species**

27 The Puget Sound/Georgia Basin DPSs of yelloweye rockfish and canary rockfish are listed as  
28 threatened, and bocaccio are listed as endangered under the ESA (75 Fed. Reg. 22276, April 28, 2010).

1 **3.2.1.1. Rockfish Life History**

2 The life histories of yelloweye rockfish, canary rockfish, and bocaccio include larval and pelagic  
3 juvenile stages followed by a juvenile stage in shallower waters, and a sub-adult/adult stage. Much of  
4 the life history of these three species is similar, with differences noted below.

5 Rockfish are iteroparous (i.e., have multiple reproductive cycles during their lifetime) and are typically  
6 long-lived (Love et al. 2002). As such, they are examples of populations that may persist through what  
7 has been termed “the storage effect” where long-lived species are able take advantage of sporadically  
8 good conditions for survival of offspring (Warner and Chesson 1985; Tolimieri and Levin 2005).

9 Recruitment is generally poor because larval survival and settlement are dependent upon the vagaries  
10 of climate, abundance of predators, oceanic currents, and chance events. Being long-lived allows each  
11 species to persist through many years of poor reproduction until a good recruitment year occurs. The  
12 relative importance of these factors are not readily understood in the Puget Sound/Georgia Basin.

13 **Larval and Pelagic Juvenile Stage**

14 Rockfish fertilize their eggs internally, and the young are extruded as larvae. Larvae can make small  
15 local movements to pursue food immediately after birth (Tagal et al. 2002), but are nonetheless  
16 distributed by prevailing currents (Drake et al. 2010). Larvae and pelagic juveniles occur throughout  
17 the water column (Love et al. 2002; Weis 2004). Oceanographic conditions within Puget Sound proper  
18 likely result in the larvae staying within the basin where they are born rather than being broadly  
19 dispersed by tidal action or currents (Subsection 1.4, Action Area) (Drake et al. 2010).

20 **Juvenile Stage**

21 When bocaccio and canary rockfish reach sizes of 1 to 3.5 inches (3 to 9 centimeters) or 3 to 6 months  
22 old, they settle into shallow, nearshore waters in rocky or cobble substrates with or without kelp (Love  
23 et al. 1991; Love et al. 2002). This habitat feature offers a beneficial mix of warmer temperatures, food,  
24 and refuge from predators (Love et al. 1991). Areas with floating and submerged kelp species support  
25 the highest densities of juvenile bocaccio and canary rockfish, as well as many other rockfish species  
26 (Carr 1983; Halderson and Richards 1987; Matthews 1989; Love et al. 2002; Hayden-Spear 2006).

27 Unlike bocaccio and canary rockfish, juvenile yelloweye rockfish do not typically occupy intertidal  
28 waters (Love et al. 1991; Studebaker et al. 2009), but are most frequently observed in waters deeper  
29 than 98 feet (30 meters) near the upper depth range of adults (Yamanaka et al. 2006).

1 **Sub-adult/Adult Stage**

2 Sub-adult and adult yelloweye rockfish, canary rockfish, and bocaccio typically use habitats with  
3 moderate to extreme steepness, complex bathymetry, and rock and boulder-cobble complexes (Love et  
4 al. 2002). Within Puget Sound proper, each species has been documented in areas of high relief rocky  
5 and non-rocky substrates such as sand, mud, and other unconsolidated sediments (Washington 1977;  
6 Miller and Borton 1980). Yelloweye rockfish remain near the bottom and have small home ranges,  
7 while some canary rockfish and bocaccio have larger home ranges, move long distances, and spend  
8 time suspended in the water column (Love et al. 2002). Adults of each species are most commonly  
9 found between 131 to 820 feet (40 to 250 meters) (Love et al. 2002; Orr et al. 2000). In British  
10 Columbia, Canada 5.5 percent of yelloweye rockfish were caught with recreational fishing methods in  
11 waters shallower than 131 feet (40 meters), and the rest of the caught fish were in depths from 131 to  
12 328 feet (40 to 100 meters) (Richards and Cass 1985). In the San Juan Basin, WDFW documented that  
13 the vast majority of yelloweye rockfish were observed in waters deeper than 120 feet (37 meters)  
14 (Pacunski et al. 2009).

15 Yelloweye rockfish are one of the longest lived of the rockfishes, reaching more than 100 years of age.  
16 Yelloweye rockfish reach 50 percent maturity at sizes of 16 to 20 inches (40 to 50 centimeters) and  
17 ages of 15 to 20 years (Rosenthal et al. 1982; Yamanaka and Kronlund 1997). The maximum age of  
18 canary rockfish is at least 84 years (Love et al. 2002), although 60 to 75 years is more common (Caillet  
19 et al. 2000). Canary rockfish reach 50 percent maturity at sizes around 16 inches (40 centimeters) and  
20 ages of 7 to 9 years. The maximum age of bocaccio is unknown, but may exceed 50 years. Bocaccio  
21 are reproductively mature near age 6 (FishBase 2010). The timing of larval release for each species  
22 varies throughout their geographic range of the west coast. In Puget Sound, there is some evidence that  
23 larvae are extruded in early spring to late summer for yelloweye rockfish (Washington et al. 1978). In  
24 British Columbia, parturition (the process of giving birth) peaks in February for canary rockfish (Hart  
25 1973; Westrheim and Harling 1975). Along the coast of Washington State, female bocaccio release  
26 larvae between January and April (Love et al. 2002). Mature females of each species produce from  
27 several thousand to over a million eggs annually (Love et al. 2002).

28 **3.2.1.2. Current Status**

29 In the following section, the status of yelloweye rockfish, canary rockfish, and bocaccio is summarized  
30 at the DPS level according to the following demographic viability criteria: abundance and productivity,  
31 spatial structure/connectivity, and diversity. These viability criteria are outlined in McElhaney et al.

1 (2000), and reflect concepts that are well-founded in conservation biology and are generally applicable  
2 to a wide variety of species. These criteria describe habitat limiting factors and demographic risks that  
3 individually and collectively provide strong indicators of extinction risk (Drake et al. 2010).

4 A number of factors affect the current status of rockfish and their prey in the Puget Sound/Georgia  
5 Basin (75 Fed. Reg. 22276, April 28, 2010). Derelict fishing gear, such as lost fishing nets and shrimp  
6 pots, kill rockfish and their various prey. Excess nutrients entering Puget Sound impact habitat  
7 suitability in some areas (e.g., Hood Canal) by creating low dissolved oxygen levels. Some  
8 contaminants within Puget Sound bioaccumulate, possibly resulting in reproductive impairment of  
9 rockfish. Nearly one-third of the nearshore of Puget Sound has been degraded by development. This  
10 development impairs the productivity of food sources of rockfish, as well as altering the quality of  
11 rearing habitats for juvenile canary rockfish and bocaccio. As with nearly all marine species of the  
12 Puget Sound, oil spills represent a significant risk to rockfish and their prey sources. Finally, bycatch in  
13 fisheries affects listed rockfish viability parameters.

#### 14 **Abundance and Productivity**

15 The abundance of individuals in a population is important to assessing two aspects of extinction risk.  
16 First, population size can be an indicator of whether the population can sustain itself in the face of  
17 environmental fluctuations, random behaviors, and unpredictability of reproductive success of a small-  
18 population. Second, abundance in a declining population is an indicator of the time expected until the  
19 population reaches critically low numbers (Drake et al. 2010). Rockfish species with low abundance  
20 are subject to the following risks: (1) environmental variation such as altered temperature regimes and  
21 circulation patterns that could disrupt food webs, larval dispersal, or juvenile rearing, (2) genetic  
22 processes such as the accumulation of negative mutations, (3) demographic unpredictability such as  
23 imbalanced gender ratios, (4) ecological feedback such as other fish species occupying the niche left by  
24 the depleted population, and (5) catastrophes such as oil spills that may disrupt benthic environments or  
25 larval/juvenile rearing habitats and food sources (McElhaney et al. 2000). Low abundance may also  
26 pose a risk to the species by making them vulnerable to depensatory processes (termed “Allee” effects)  
27 that occur when mates cannot find one another (Courchamp et al. 2008).

28 There is no single reliable historic or contemporary population estimate for any of the DPSs (Drake et  
29 al. 2010). Despite this limitation, there is clear evidence (based on catch data) that each species’  
30 abundance has declined dramatically (Drake et al. 2010). The total rockfish population in the Puget  
31 Sound region is estimated to have declined approximately 3 percent per year for the past several

1 decades, which corresponds to an approximate 70 percent decline from 1965 to 2007 (Drake et al.  
2 2010). Catches of yelloweye rockfish, canary rockfish, and bocaccio have declined as a proportion of  
3 the overall rockfish catch (Palsson et al. 2009; Drake et al. 2010).

4 Fishery-independent estimates of population abundance come from spatially and temporally limited  
5 research trawls, drop camera surveys, and underwater, remotely-operated vehicle (ROV) surveys  
6 conducted by WDFW. Using these methods, WDFW has estimated that 50,655 yelloweye rockfish,  
7 20,449 canary rockfish, and 4,487 bocaccio inhabit the North Sound, while there are no population  
8 estimates for the rest of the Puget Sound region (NMFS 2011). Most of the fish WDFW observed (and  
9 used to inform population estimates) were in the North Sound portion of the DPSs. These population  
10 estimates have generally large variances (or standard errors), and thus there remains uncertainty  
11 regarding the total abundance and distribution of ESA-listed rockfish in the Puget Sound/Georgia Basin  
12 DPSs. In addition, there have been no historic or contemporary population estimates for any ESA-listed  
13 rockfish species in Puget Sound proper.

14 Productivity is the measurement of a population's growth rate through all or a portion of its life cycle.  
15 Life history traits of yelloweye rockfish, canary rockfish, and bocaccio suggest generally low levels of  
16 inherent productivity because they are long-lived and mature slowly, with sporadic episodes of  
17 successful reproduction (Tolimieri and Levin 2005; Drake et al. 2010). This naturally low-productivity  
18 can be exacerbated by fishery removals, environmental toxicity, and habitat changes derived from  
19 environmental regime changes.

20 Historic overfishing can have dramatic impacts on the size or age structure of a population, with effects  
21 that can influence ongoing productivity. Similarly, fishery bycatch (including derelict fishing nets)  
22 affects ongoing productivity by removing larger individuals from the population. When the size and  
23 age of females decline, there are negative impacts to reproductive success. These impacts, termed  
24 maternal effects, are evident in a number of traits. Larger and older females of various rockfish species  
25 have a higher weight-specific fecundity (number of larvae per unit of female weight) (Boehlert et al.  
26 1982; Bobko and Berkeley 2004; Sogard et al. 2008). A consistent maternal effect in rockfishes relates  
27 to the timing of parturition. The timing of larval birth can be crucial in terms of coinciding with  
28 favorable oceanographic conditions because most larvae are released on only one day each year, with a  
29 few exceptions in the southern coastal populations and in yelloweye populations in Puget Sound  
30 (Washington et al. 1978). In several studies of rockfish species, larger or older females release larvae  
31 earlier in the season compared to smaller or younger females (Sogard et al. 2008; Nichol and Pikitch

1 1994). Larger or older females provide more nutrients to larvae by developing a larger oil globule,  
2 released at parturition, which provides energy to the developing larvae (Berkeley et al. 2004; Fisher et  
3 al. 2007) and enhances early growth rates (Berkeley et al. 2004).

4 Contaminants such as polychlorinated biphenyls (PCBs), chlorinated pesticides, polybrominated  
5 diphenyl ethers, polychlorinated dioxins/furans (collectively referred to as bioaccumulative chemicals)  
6 have been introduced into Puget Sound from industrial and non-point (e.g., roads) sources, and appear  
7 in rockfish collected in urban areas of Puget Sound, such as Port Gardner, Elliot Bay, and  
8 Commencement Bay (West et al. 2001; Palsson et al. 2009). While the highest levels of contamination  
9 are found in urban areas, toxins can be found in the tissues of salmon and forage fish throughout the  
10 region (Puget Sound Action Team 2007).

11 Reproductive function and therefore productivity of rockfish is likely affected by contaminants  
12 (Palsson et al. 2009). Adverse reproductive effects in rockfish could occur via maternal transfer of  
13 bioaccumulative chemicals to larvae.

14 Future climate-induced changes to rockfish habitat could alter their productivity (Drake et al. 2010).  
15 Harvey (2005) created a generic bioenergetic model for rockfish, showing that productivity of rockfish  
16 is highly influenced by climate conditions. For example, El Niño-like conditions generally lowered  
17 growth rates and increased generation time. The negative effect of the warm water conditions  
18 associated with El Niño appear to be common across rockfishes (Moser et al. 2000). Survival of  
19 juvenile rockfish may be correlated to climate conditions that occur across large areas of the ocean  
20 (Field and Rawson 2005). Exactly how climate influences rockfish in Puget Sound is unknown;  
21 however, given the general importance of climate to rockfish recruitment, it is likely that climate  
22 strongly influences the dynamics of the ESA-listed rockfish population productivity and therefore their  
23 overall population viability (Drake et al. 2010).

#### 24 **Spatial Structure and Connectivity**

25 Spatial structure consists of a population's geographical distribution and the processes that generate  
26 that distribution (McElhane et al. 2000). A population's spatial structure depends on habitat quality,  
27 spatial configuration, and dynamics as well as dispersal characteristics of individuals within the  
28 population (McElhane et al. 2000).

1 The apparent steep reduction of ESA-listed rockfish in Puget Sound proper leads to concerns about the  
2 viability of these populations (Drake et al. 2010). Yelloweye rockfish spatial structure and connectivity  
3 is likely threatened by the apparently severe reduction of fish numbers throughout all or portions of  
4 Hood Canal and South Puget Sound, combined with their apparently small home ranges as adults.  
5 Similarly, several historically large aggregations of canary rockfish in Puget Sound have been depleted,  
6 including an area of historic distribution in South Puget Sound (Drake et al. 2010). Bocaccio were  
7 historically most abundant in the Central and South Puget Sound (Olander 1991), but are now rarely  
8 observed in these areas (Drake et al. 2010).

9 For canary rockfish and bocaccio, positive signs for improved spatial structure and connectivity come  
10 from the propensity of some adults and pelagic juveniles to migrate long distances, which could  
11 reestablish aggregations of fish in formerly occupied habitat (Drake et al. 2010).

## 12 **Diversity**

13 Rockfish diversity characteristics are fecundity, timing of the release of larvae and their condition,  
14 morphology, age at reproductive maturity and physiology, and molecular genetic characteristics. In  
15 spatially and temporally varying environments, there are three general reasons why diversity is  
16 important for species and population viability: (1) diversity allows a species to use a wider array of  
17 environments, (2) it protects a species against short-term spatial and temporal changes in the  
18 environment, and (3) genetic diversity provides the raw material for surviving long-term environmental  
19 changes. Though there are no genetic data for any of the listed DPSs, the unique oceanographic  
20 features and relative isolation of some of its basins may have led to unique adaptations, such as larval  
21 release timing (Drake et al. 2010).

22 ESA-listed rockfish size (and age) distributions have been truncated, which likely hampers diversity in  
23 terms of larval release timing and energy reserves. Recreationally caught yelloweye rockfish, canary  
24 rockfish, and bocaccio in the 1970s spanned a broad range of sizes. By the 2000s, there was evidence  
25 of proportionately fewer older fish (Drake et al. 2010). For each species, the reproductive burden may  
26 be shifted to younger and smaller fish. This shift could alter the timing and condition of larval release,  
27 which may be mismatched with habitat conditions in Puget Sound, potentially reducing the offspring's  
28 viability (Drake et al. 2010).

1 **Incidental Catch in Current Recreational Bottom Fisheries, Commercial Shrimp Fisheries, and**  
2 **Research Activities**

3 Appendix A: Estimated Numbers of ESA-listed Fish Species to be Incidentally Taken under the  
4 Various Alternatives lists the total number of ESA-listed rockfish estimated to be taken under the  
5 various alternatives. Alternative 3 is the closest approximation to the number of ESA-listed yelloweye  
6 rockfish and canary rockfish taken in recent (pre-2010) recreational bottom fish fisheries because it  
7 does not include the 120-foot restriction. No bocaccio were reported as caught in pre-2010 recreational  
8 bottom fishing (WDFW 2011c).

9 There are a number of uncertainties related to catch estimates from the recreational bottom fish fishery,  
10 including anglers correctly identifying rockfish to species, and not all anglers being surveyed after  
11 every fishing trip. Anglers have a poor ability to correctly identify rockfish to species (Bargmann  
12 1981). Catch estimates are subject to non-sampling bias, especially under-reporting as observed by  
13 Diewert et al. (2005) who found higher proportions of released rockfish in independently observed,  
14 released catch compared to released catch reported during creel checks. These uncertainties are greater  
15 for bocaccio than yelloweye rockfish and canary rockfish because, as described in Subsection 3.2.1.2,  
16 Current Status, they are less abundant than either species, thus anglers are less familiar with them. The  
17 120-foot depth restriction was implemented in 2010; thus, bottom fish fisheries takes that occurred up  
18 to 2009 most approximate recent fisheries catch data. Year 2010 fisheries catch estimates for ESA-  
19 listed rockfish are not yet available.

20 **3.2.2. Salmonids**

21 ESA-listed salmonids in the action area include Puget Sound Chinook salmon, which were listed as  
22 threatened under the ESA on March 24, 1999 (64 Fed. Reg. 14308); Hood Canal summer chum  
23 salmon, which were listed as threatened under the ESA on March 25, 1999 (64 Fed. Reg. 14508); and  
24 Puget Sound steelhead, which were listed as threatened under the ESA on May 11, 2007 (72 Fed. Reg.  
25 26722). All bull trout (*Salvelinus confluentus*) in the coterminous United States were listed as  
26 threatened under the ESA on November 1, 1999 (64 Fed. Reg. 58909). NMFS has adopted a recovery  
27 plan for the listed Puget Sound Chinook salmon ESU (Figure 2) in 2007 (72 Fed. Reg. 2493, January  
28 19, 2007) and has proposed a recovery plan for the Hood Canal summer-run chum salmon ESU (Figure  
29 2) (Hood Canal Coordinating Council 2006). Both of these documents provide detailed information on  
30 abundance, productivity, and spatial structure and diversity (collectively termed “viability criteria”) for  
31 populations of each species. Viability criteria for Puget Sound steelhead can be found within the NMFS

1 status review (Hard et al. 2007). Viability criteria for bull trout are discussed in the draft recovery plan  
2 for this species (USFWS 2004).

### 3 **3.2.2.1. Puget Sound Chinook Salmon**

#### 4 **Life History**

5 Chinook salmon are anadromous, meaning they spawn as adults and rear as juveniles in fresh water,  
6 then travel to the ocean to feed and grow to maturity. After they hatch, juvenile Chinook salmon can  
7 remain in fresh water from several months to nearly 2 years prior to their movement to the ocean, and  
8 remain in the ocean from 1 to 6 years (Healey 1991). On an annual basis several million juvenile  
9 Chinook salmon use the nearshore and deeper waters of Puget Sound as they move toward oceanic  
10 feeding grounds (Rice 2007). Some juveniles remain in the Puget Sound for most or all of their lives  
11 prior to migration back into their natal rivers (Beamer et al. 2005). Adult Chinook salmon feed within  
12 the Puget Sound as they return to spawning grounds in the spring, summer, and fall.

#### 13 **Current Status**

14 On March 24, 1999, NMFS listed Puget Sound Chinook salmon as a threatened species (64 Fed. Reg.  
15 14308, March 24, 1999; 70 Fed. Reg. 37160, June 28, 2005). The ESU encompasses all runs of  
16 Chinook salmon (Figure 2) from rivers flowing into Puget Sound, including the Strait of Juan de Fuca  
17 from the Elwha River eastward, and rivers and streams flowing into Hood Canal, South Puget Sound,  
18 North Puget Sound, and the Strait of Georgia in Washington. A recovery plan for the ESU was adopted  
19 in 2007 (72 Fed. Reg. 2493, January 19, 2007; NMFS 2006). It describes the population structure,  
20 identifies populations essential to recovery of the ESU, and establishes recovery goals for each of the  
21 populations based largely on the recommendations of the Puget Sound Technical Recovery Team  
22 (TRT) (Ruckelshaus et al. 2002, 2006). The Puget Sound TRT identified 22 demographically  
23 independent populations within five geographic basins across the ESU, representing the primary  
24 historical spawning areas of Chinook salmon (Ruckelshaus et al. 2006). The Puget Sound TRT  
25 determined that all 22 populations are currently at high risk of extinction to varying degrees (NMFS  
26 2006). Historic abundance has been estimated to be approximately 609,000 adult returns (Myers et al.  
27 1998), while average recent abundance of natural origin spawners is 38,695 fish (Good et al. 2005).  
28 NMFS designated critical habitat for the Puget Sound Chinook salmon on September 2, 2006 (70 Fed.  
29 Reg. 52630). Critical habitat in the action area includes 2,182 miles (3,512 kilometers) of nearshore  
30 areas of Puget Sound from the line of extreme high tide out to a depth of 90 feet (30 meters).

1 Limiting factors in fresh water for the Puget Sound Chinook salmon populations include a range of  
2 adverse effects associated with land use activities including urbanization, past forestry practices,  
3 agriculture, and development. Limiting factors in the marine environment of Puget Sound include  
4 nearshore degradation and bioaccumulative contaminants within Chinook salmon prey. The severity  
5 and relative contribution of these factors varies by population.

### 6 **3.2.2.2. Hood Canal Summer Chum Salmon**

#### 7 **Life History**

8 Chum salmon spend more of their life history in marine waters than other Pacific salmonids. Chum  
9 salmon usually spawn in coastal areas, and juveniles out-migrate to seawater almost immediately after  
10 emerging from the gravel (Salo 1991). This ocean-type migratory behavior contrasts with the stream-  
11 type behavior of some other species in the genus *Oncorhynchus* (e.g., coastal cutthroat trout, steelhead,  
12 coho salmon, and most types of Chinook salmon and sockeye salmon), that usually migrate to sea at a  
13 larger size, after months or years of freshwater rearing. This means that survival and growth in juvenile  
14 chum salmon depend less on freshwater conditions (unlike stream-type salmonids that depend heavily  
15 on freshwater habitats) than on favorable oceanic conditions.

#### 16 **Current Status**

17 The Hood Canal summer chum salmon ESU was listed as threatened under the ESA on March 25, 1999  
18 (64 Fed. Reg. 14508). Of the 16 populations of summer chum salmon identified in this ESU, seven are  
19 considered to be “functionally extinct” (Skokomish, Finch Creek, Anderson Creek, Dewatto, Tahuya,  
20 Big Beef Creek, and Chimacum). The remaining nine populations are well distributed throughout the  
21 ESU, except for the eastern side of Hood Canal. The ESU has two geographically distinct regions: the  
22 Strait of Juan de Fuca and Hood Canal. Although the populations all share similar life history traits, the  
23 summer chum salmon populations in the two regions are affected by different environmental and  
24 harvest impacts and display varying survival patterns and stock status trends (WDFW and PNPTT  
25 2000). NMFS designated critical habitat for Hood Canal chum salmon on September 2, 2006 (70 Fed.  
26 Reg. 52630). Critical habitat in the action area includes 377 miles (607 kilometers) of nearshore marine  
27 areas (including areas adjacent to islands) of Hood Canal and the Strait of Juan de Fuca (to Dungeness  
28 Bay) from the line of extreme high tide out to a depth of 90 feet (30 meters).

29 In the Hood Canal Basin, summer chum salmon are still found in the Dosewallips, Duckabush, Hamma  
30 Hamma, Big and Little Quilcene, and Union Rivers, and Lilliwaup Creek. Although abundance was

1 high in the late 1970s, abundance for most Hood Canal summer chum salmon populations declined  
2 rapidly beginning in 1979, and has remained at depressed levels. The terminal run size for the Hood  
3 Canal summer chum salmon stocks averaged 28,971 during the 1974-1978 period, declining to an  
4 average of 4,132 during 1979-1993 (WDFW and PNPTT 2000). Abundance during the 1995-1998  
5 period improved, averaging 10,844. However, much of the increase in abundance can be attributed to a  
6 supplementation program for the Big/Little Quilcene River summer chum salmon stock that began in  
7 1992. The observed reductions in the numbers of summer chum salmon in the basin are the result of the  
8 combined impacts of a number of factors (Johnson et al. 1997). Freshwater habitat degradation and loss  
9 from a variety of sources, including forest practices, road building, residential construction, stream  
10 flow alteration, diking, and channelization, have had major negative effects on summer chum salmon  
11 streams throughout the ESU.

### 12 **3.2.2.3. Puget Sound Steelhead**

#### 13 **Life History**

14 Anadromous steelhead can be divided into two basic reproductive life histories, based on the state of  
15 sexual maturity at the time of river entry and duration of spawning migration. The summer-run or  
16 “stream-maturing” type enters fresh water in a sexually immature condition between May and October,  
17 and requires several months to mature and spawn. The winter-run or “ocean-maturing” type enter fresh  
18 water between November and April with well-developed gonads (reproductive glands) and spawn soon  
19 after. Steelhead generally leave fresh water to rear in the ocean as juveniles around age 2, bypassing the  
20 extended estuary transition stage that many other salmonids need, and spend between 2 to 7 years in the  
21 ocean before re-entering fresh water to spawn. Of the Pacific salmonids, *O. mykiss* exhibits the most  
22 diverse and complex life-history traits; they can be anadromous (steelhead) or freshwater residents  
23 (rainbow trout), and under some circumstances, yield offspring of the opposite life history form.

#### 24 **Current Status**

25 The Puget Sound steelhead DPS was listed as threatened on May 11, 2007 (72 Fed. Reg. 26722). The  
26 DPS includes all naturally spawned anadromous winter-run and summer-run steelhead populations in  
27 streams in the river basins of Puget Sound, as well as the Green River natural and Hamma Hamma  
28 River winter-run steelhead hatchery stocks. The majority of hatchery stocks are not considered part of  
29 this DPS because they are more than moderately diverged from the local native populations (Hard et al.  
30 2007). Resident steelhead occur within the range of Puget Sound steelhead but are not part of the DPS

1 because of marked differences in physical, physiological, ecological, and behavioral characteristics (71  
2 Fed. Reg. 15666, March 29, 2006). The Puget Sound steelhead DPS includes more than 50 stocks of  
3 summer- and winter-run fish. Critical habitat for Puget Sound steelhead has not been designated.

4 Though there is a general dearth of abundance data for the DPS, an analysis of historical catch records  
5 from 1898 indicate that the catch peaked at 163,796 individuals in 1895 (Little 1898). Assuming a  
6 harvest rate of 30 to 50 percent, Little (1898) estimated that the peak run size ranged from 327,592 to  
7 545,987 fish. In the 1990s the total run size for major stocks in this ESU was greater than 45,000, with  
8 total natural escapement of about 22,000. The adult returns of most populations have declined in the  
9 last few years; recent means for many populations are 50 to 80 percent of the corresponding long-term  
10 means (Hard et al. 2007).

11 NMFS identified the principal factor for decline of Puget Sound steelhead as the present or threatened  
12 destruction, modification, or curtailment of its habitat or range (72 Fed. Reg. 26722, May 11, 2007).  
13 Barriers to fish passage and adverse effects on water quality and quantity resulting from dams, the loss  
14 of wetland and riparian habitats, and agricultural and urban development activities have contributed,  
15 and continue to contribute, to the loss and degradation of steelhead habitats in Puget Sound. Previous  
16 harvest management practices likely contributed to the historical decline of Puget Sound steelhead, but  
17 NMFS concluded that the elimination of the direct harvest of wild steelhead in the mid 1990s largely  
18 addressed this threat.

#### 19 **3.2.2.4. Bull Trout**

##### 20 **Life History**

21 The bull trout is known to occur from the Yukon River in the Northwest Territories of Canada south to  
22 northern Nevada. Within the action area, bull trout occur throughout the Puget Sound and Strait of Juan  
23 de Fuca. The bull trout is a char, which includes several fish species of the genus *Salvelinus* that are  
24 related to trout and salmon (such as brook trout, lake trout, arctic char, and Dolly Varden) and are  
25 adapted to living in colder water than are other salmon species. Some bull trout use the Puget Sound for  
26 feeding and movement from one river basin to another. Bull trout reach sexual maturity at between 4  
27 and 7 years of age and are known to live as long as 12 years. Adult bull trout typically begin migrating  
28 to spawning grounds in July, and spawn in fresh waters from August to December as water  
29 temperatures decrease. Bull trout have multiple life history forms, with resident, adfluvial, and  
30 anadromous forms found in Puget Sound. Bull trout may spawn every year or every other year. In

1 marine waters, bull trout typically occupy shallow, nearshore waters and feed on small invertebrates  
2 and fish found in the nearshore, such as surf smelt, Pacific herring, and sand lance in addition to  
3 juvenile salmonids (Goetz et al. 2004).

#### 4 **Current Status**

5 In 2002, a draft recovery plan for the ESA-listed bull trout was published by the U.S. Fish and Wildlife  
6 Service (USFWS) that included the Puget Sound (USFWS 2002), and areas were also identified as  
7 critical habitat for the species (67 Fed. Reg. 71236, November 29, 2002). Critical habitat was then  
8 finalized in 2004 (69 Fed. Reg. 59995, October 6, 2004), revised in 2005 (70 Fed. Reg. 56212,  
9 September 26, 2005), and revised again in 2010 with changes to bull trout recovery units (75 Fed.  
10 Reg.63898, October 18, 2010). Critical habitat in the action area includes some nearshore marine areas  
11 from the line of extreme high tide out to a depth of 90 feet (30 meters) in Hood Canal and South Puget  
12 Sound, the Main Basin, and the Whidbey Basin. Bull trout are found in most of the major river systems  
13 of the Puget Sound.

14 Both the distribution and abundance of bull trout has declined, the causes of which have been attributed  
15 to degraded or fragmented aquatic habitats throughout the species' historical range and the introduction  
16 of non-native fish species that eat bull trout and also outcompete them for habitat and food (e.g., lake  
17 trout, brook trout, northern pike). Bull trout habitat degradation has occurred from land use actions  
18 (timber harvest, road development, agriculture/livestock production, and urbanization) and instream  
19 water uses (which have blocked or restricted access to critical habitat) (NRCS 2006; USFWS 2008  
20 2010).

21 Freshwater temperature is a major factor influencing bull trout distribution, especially for spawning and  
22 early rearing. Other limiting factors leading to population declines include degradation of complex  
23 structural habitat, altered stream flow and temperature regimes, sedimentation of spawning grounds,  
24 redd scouring, loss of habitat connectivity, harvest, and decline or loss of juvenile salmon prey (NRCS  
25 2006; USFWS 2008, 2010).

#### 26 **3.2.2.5. Incidental Catch of Salmonids in Current Recreational Bottom Fisheries, Commercial** 27 **Shrimp Fisheries, and Research Activities**

28 Appendix A: Estimated Numbers of ESA-listed Fish Species to be Incidentally Taken under the  
29 Various Alternatives lists the total number of ESA-listed Puget Sound Chinook salmon, Hood Canal  
30 summer chum salmon, Puget Sound steelhead, and bull trout estimated to be taken under the various

1 alternatives. Most salmonids taken within these activities would be juveniles (WDFW 2011c). The  
2 Proposed Action and Alternative 3 have the closest approximation to the number of ESA-listed salmon  
3 taken in recent (pre-2010) fisheries and research regimes.

#### 4 **3.2.3. Eulachon**

##### 5 **Life History**

6 The Pacific eulachon are members of the osmerid family (smelts) and are endemic to the northeastern  
7 Pacific Ocean from northern California to southwest and south-central Alaska and into the southeastern  
8 Bering Sea. In 2009, NMFS determined that eulachon comprise two or more DPSs, and the southern  
9 DPS is likely to become endangered within the foreseeable future throughout all of its range (74 Fed.  
10 Reg. 10857, March 13, 2009). Eulachon look similar to other forage fishes in Puget Sound, such as  
11 Pacific herring, surf smelt, and sand lance.

12 Eulachon are semelparous (spawn once and die). These fish typically spend 3 to 5 years in salt water  
13 before returning to fresh water to spawn from late winter through early summer. Spawning grounds are  
14 typically in the lower-most reaches of large rivers fed by snowmelt; in many rivers, spawning is limited  
15 to the part of the river that is influenced by tides. Eulachon eggs hatch in 20 to 40 days. Shortly after  
16 hatching, the larvae are carried downstream and dispersed by estuarine and ocean currents. After  
17 leaving estuarine rearing areas, juvenile eulachon move from shallow nearshore areas to deeper areas  
18 over the continental shelf. Little information is currently available on their movements in nearshore  
19 marine areas and the open ocean. Eulachon do occur within Puget Sound, but are at very low  
20 abundance relative to coastal waters, and typically occupy deep waters (Donnelly and Burr 1995; 74  
21 Fed. Reg. 10857, March 13, 2009).

22 Eulachon feed on zooplankton (mainly crustaceans such as copepods and euphausiids). Eulachon  
23 larvae and post-larvae eat phytoplankton, copepods, copepod eggs, mysids, barnacle larvae, worm  
24 larvae, and eulachon larvae. In the ocean, adults and juveniles commonly forage at depths of 50 to 600  
25 feet (15 to 182 meters) (74 Fed. Reg. 10857, March 13, 2009).

26 Predators of eulachon include numerous species of birds, and marine mammals such as baleen whales,  
27 orcas, dolphins, pinnipeds, and beluga whales. Current harvest levels of eulachon are substantially  
28 lower than historic harvest levels, and are mostly attributable to catches from fisheries that target other  
29 species.

1 Eulachon were historically an important food source for many Native American tribes and Canadian  
2 First Nations from northern California to Alaska. More recently, tribal members in the U.S. harvest  
3 eulachon under recreational fishing regulations, and Canadian First Nation members are typically  
4 authorized a small subsistence fishery by Fisheries and Oceans Canada (74 Fed. Reg. 10857, March 13,  
5 2009).

### 6 **Current Status**

7 The abundance of eulachon in the Southern DPS has experienced an abrupt decline throughout its  
8 range. This decline is attributed to several factors, including degradation of freshwater habitats,  
9 changes in ocean conditions because of climate changes, commercial harvest, and bycatch in  
10 commercial fisheries (75 Fed. Reg. 13012, March 18, 2010). On March 18, 2010, NMFS listed the  
11 Southern DPS of eulachon as threatened under the ESA (75 Fed. Reg. 13012). Critical habitat  
12 designation was finalized on October 20, 2011, and encompasses select freshwater habitats (no marine  
13 waters are included) (76 Fed. Reg. 65324, October 20, 2011). There is no critical habitat designated for  
14 eulachon in the Puget Sound.

#### 15 **3.2.3.1. Incidental Catch of Eulachon in Current Recreational Bottom Fisheries, Commercial** 16 **Shrimp Fisheries, and Research Activities**

17 Appendix A: Estimated Numbers of ESA-listed Fish Species to be Incidentally Taken under the  
18 Various Alternatives lists the total number of eulachon estimated to be taken under the various  
19 alternatives. The Proposed Action and Alternative 3 have the closest approximation to the number of  
20 eulachon taken in recent (pre-2010) fisheries and research regimes.

#### 21 **3.2.4. Green Sturgeon**

##### 22 **Life History**

23 Southern green sturgeon (*Acipenser medirostris*) is a long-lived, slow-growing species. Green sturgeon  
24 use both freshwater and marine habitats, and adults are found in marine waters from Mexico to Alaska  
25 (Moyle et al. 1995 in NMFS 2010a). Male green sturgeon are considered mature at approximately 15  
26 years while females are not considered mature until approximately 17 years (NMFS 2010a).

27 Adult green sturgeon typically migrate into fresh water beginning in late February and spawn from  
28 March to July (NMFS 2010b). Green sturgeon are believed to spawn in the Rogue River, Klamath  
29 River Basin, and the Sacramento River; however, the Sacramento River is currently the only confirmed

1 spawning area (NMFS 2010a). Juvenile green sturgeon are believed to spend 1 to 3 years in fresh water  
2 before they enter the ocean (NMFS 2010b). Green sturgeon disperse widely in the ocean between their  
3 freshwater life stages (NMFS 2010b). Although little feeding data for green sturgeon exists, green  
4 sturgeon are known to eat benthic invertebrates including shrimp, mollusks, amphipods, and even small  
5 fish (Moyle et al. 1995 *in* NMFS 2010a).

## 6 **Current Status**

7 The abundance of the Southern green sturgeon DPS has declined over time and is attributed to habitat  
8 loss and degradation, overharvest and bycatch as part of other fisheries, poaching, and entrainment  
9 (NMFS 2010a, 2010b). Very few green sturgeon have been found in Puget Sound, with only two  
10 confirmed observations in Puget Sound in 2006 (NMFS 2010b). On June 6, 2006, the Southern green  
11 sturgeon DPS was listed as threatened under the ESA (71 Fed. Reg. 17757, April 7, 2006). Critical  
12 habitat was then finalized in 2009 (74 Fed. Reg. 52300, October 9, 2009). Critical habitat in the action  
13 area includes marine waters of the North Sound westward of a line between Partridge Point on  
14 Whidbey Island and Point Wilson at Port Townsend.

### 15 **3.2.4.1. Incidental Catch of Green Sturgeon in Current Recreational Bottom Fisheries, 16 Commercial Shrimp Fisheries, and Research Activities**

17 Appendix A: Estimated Numbers of ESA-listed Fish Species to be Incidentally Taken under the  
18 Various Alternatives lists the total number of green sturgeon estimated to be taken under the various  
19 alternatives. The Proposed Action and Alternative 3 have the closest approximation to the number of  
20 green sturgeon taken in recent (pre-2010) fisheries and research regimes.

## 21 **3.3. Non-listed Fish**

### 22 **3.3.1. Groundfish Species**

23 Groundfish (often referred to as demersal fish, or bottom fish) make up the majority of the estimated  
24 211 species of fish within Puget Sound (Donnelly and Burr 1995), and collectively occupy habitats  
25 ranging from intertidal zones to the deepest waters of the region. Essential Fish Habitat (EFH) has been  
26 designated by NMFS for 44 species of groundfish in the Puget Sound<sup>6</sup> (Appendix B: Species of Fishes

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<sup>6</sup> The Magnuson-Stevens Fishery Conservation and Management Act (MSA) requires NMFS to designate EFH needed by fish to carry out their life cycles, and requires Federal action agencies to consult with NMFS on their actions that may adversely affect EFH. The MSA provides for cooperation among NMFS, fishery management councils, fishing participants, Federal and state agencies, and others in achieving EFH protection, conservation, and enhancement. Section 3 of the MSA defines EFH as “those waters and substrate necessary to fish for

1 with Designated EFH in the Action Area). Limiting factors for groundfish include derelict fishing gear  
2 that kill fish, and water quality impairments such as reduced levels of dissolved oxygen and inputs of  
3 toxins (e.g., metals and petroleum products) (Palsson et al. 2009) that may kill fish or result in  
4 physiological problems such as reproductive impairment.

5 There are two general types of groundfish. Benthic groundfish generally rest on the sea floor, and  
6 benthopelagic fish float in the water column near the sea floor (Donnelly and Burr 1995).

7 Benthopelagic fish, such as rockfish, have neutral buoyancy, which allows them to suspend in the water  
8 column. Benthic fish, such as sole, have negative buoyancy so they can rest on the bottom. Benthic  
9 groundfish generally feed upon other groundfish species and/or prey living within the substrates of the  
10 sea floor, such as clams, worms, and other invertebrates. Benthopelagic fish also feed upon  
11 invertebrates and varied species of fish and are able to pursue pelagic prey that are suspended in the  
12 water column, such as herring. Within the two general groups of groundfish, the life histories of  
13 individual species are very diverse. Some species occupy relatively small areas throughout their adult  
14 lives (e.g., some rockfish species), while others are likely very mobile throughout their life cycle and  
15 occupy benthic areas of different depths on a seasonal basis (Donnelly and Burr 1995). Most  
16 groundfish are present at a variety of bottom depth-ranges in Puget Sound, but the largest overall  
17 number of species were found at depths from 69 feet to 164 feet (21 to 50 meters) (Donnelly and Burr  
18 1995). The WDFW has estimated that the abundance of benthic bottom fishes in Puget Sound is 220  
19 million pounds (WDFW 2010c).

20 A total of 28 species of rockfish have been documented in the Puget Sound region (Miller and Borton  
21 1980; Palsson et al. 2009), including the three species of ESA-listed rockfish (Subsection 3.2.1.1,  
22 Rockfish Life History). From these, all but a few species (such as black rockfish and Puget Sound  
23 rockfish) are considered by NMFS to be depleted<sup>7</sup> within Puget Sound (Palsson et al. 2009). The total  
24 rockfish population in the Puget Sound region is estimated to have declined approximately 3 percent  
25 per year for the past several decades, which corresponds to an approximate 70 percent decline from  
26 1965 to 2007 (Drake et al. 2010). Several rockfish species predominantly use deepwater habitats (i.e.,

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spawning, breeding, feeding, or growth to maturity.” If an action would adversely affect EFH, NMFS is required to provide the Federal action agency with EFH conservation recommendations (MSA section 305(b)(4)(A)). This consultation is based, in part, on information provided by the Federal agency and descriptions of EFH for Pacific coast groundfish, coastal pelagic species, and Pacific salmon contained in the Fishery Management Plans developed by the Pacific Fishery Management Council and approved by the Secretary of Commerce.

<sup>7</sup> Depleted fish stocks have indices that are negative and exceed the American Fisheries Society vulnerability criteria for stock productivity, may not have effective management measures in place, and the stock has additional risk factors such as rarity, limited range, or specialized habitat requirements (Musick 1999).

1 deeper than 120 feet), including greenstriped rockfish (*Seb. elongates*), redstripe rockfish (*Seb.*  
2 *proriger*), silvergray rockfish (*Seb. brevispinis*), and shortspine thornyheads (*Seb. alascanus*) (Palsson  
3 et al. 2009). Additional groundfish species include at least 13 species of sole (Family Pleuronectidae),  
4 12 species of sculpin that include cabezon (Family Cottidae), and 4 species of the family  
5 Hexagrammidae, including lingcod (Donnelly and Burr 1995). Other groundfish species of the Puget  
6 Sound include spiny dogfish (*Squalus acanthias*), Pacific tomcod (*Microgadus proximus*), walleye  
7 pollock (*Theragra chalcogramma*), Pacific hake (*Merluccius productus*), Pacific cod (*Gadus*  
8 *macrocephalus*), and sablefish (*Anoplopoma fimbria*). Rockfish and other groundfish species eat the  
9 abundant shrimp species in the action area, including pink shrimp (*Pandalus eous*), dock shrimp  
10 (*Pandalus danae*), coonstripe shrimp (*Pandalus hypsinotus*), and sidestripe shrimp (*Pandalus dispar*)  
11 (Palsson et al. 2009). Each of these shrimp species are primarily found in sand or mud habitats (Roberts  
12 2008). Aside from rockfish, the overall status of various groundfish in Puget Sound has not been  
13 comprehensively assessed; there have been no quantitative stock assessments that provide information  
14 about the current viability of various species of groundfish in Puget Sound. However, anecdotal reports  
15 have noted the decline of species such as Pacific tomcod, walleye pollock, Pacific hake, Pacific cod,  
16 and sablefish since the early 1990s (Olander 1991).

17 A total of 13 species of rockfish have been reported as caught by recreational anglers within the action  
18 area from 2003 to 2009 (WDFW 2011c). Most of these were copper rockfish (*Sebastes caurinus*) and  
19 quillback rockfish (*Sebastes maliger*). Aside from rockfish, at least 17 species or families of groundfish  
20 have been reported as caught by recreational anglers within the action area between 2003 and 2009  
21 (WDFW 2011a), averaging 113,000 bottom fish caught in Puget Sound from 2004 to 2009 (WDFW  
22 2011c). Of these, most caught fish were classified as within the sole (or “flatfish”) family  
23 (Pleuronectidae). Lingcod and kelp greenling (*Hexagrammos decagrammus*) were also a common fish  
24 reported by recreational anglers (WDFW 2011c).

### 25 **3.3.2. Non-groundfish Species**

26 Non-groundfish species include pelagic fish of the Puget Sound region and forage fish. The most  
27 common pelagic fish include Chinook salmon, Puget Sound steelhead, coho salmon (*O. kisutch*), pink  
28 salmon (*O. gorbuscha*), and chum salmon. Forage fish include herring, surf smelt (*Hypomesus*  
29 *prefiosus*), Pacific sand lance (*Ammodytes hexapterus*), and eulachon. Herring are a key food source for  
30 many marine fish, mammals, and birds. The spawning biomass of herring in Puget Sound fluctuates  
31 widely, but has averaged approximately 12,000 to 15,000 tons in recent times (Stick 2011). These  
32 species occupy a variety of depths throughout Puget Sound (Donnelly and Burr 1995). Essential Fish

1 Habitat has been designated by NMFS for several non-groundfish species in Puget Sound (Appendix B:  
2 Species of Fishes with Designated EFH in the Action Area). Common limiting factors for non-  
3 groundfish species include derelict fishing gear, and water quality impairments such as reduced levels  
4 of dissolved oxygen that can kill fish and inputs of toxins (e.g., metals and petroleum products)  
5 (Palsson et al. 2009) that can result in physiological problems. Limiting factors for non-groundfish that  
6 use the nearshore (i.e., sand lance, salmonids, and herring) include development that has reduced or  
7 eliminated rearing or spawning habitats in portions of Puget Sound.

8 Almost all pelagic fish in the action area live within the epipelagic zone (surface waters to around 650  
9 feet (200 meters)) that are influenced by the presence of light. Though most light in the action area is  
10 fully attenuated near 90 feet (27 meters), habitats below this zone are influenced by the presence of  
11 photosynthesis and nutrients in shallower waters. Like groundfish, pelagic fish have a wide variety of  
12 life histories. For instance, all salmonid species are anadromous (Subsection 3.2.2, Salmonids), while  
13 forage fish lay their eggs in the marine environment on aquatic vegetation that includes eel grass  
14 (herring), in bottom mud/sand habitats (sand lance), or in the upper intertidal zone (surf smelt). Pelagic  
15 fish are generally highly migratory, and can be found at various depths and basins throughout the  
16 action area. The diets of pelagic fish are often diverse; they feed upon species within the water column  
17 that include the smallest of zooplankton and other invertebrates, and other pelagic fish. Habitats and  
18 species assemblages among the basins of the action area are unique, and vary seasonally and  
19 temporally (Subsection 1.4, Action Area). For instance, the number of pelagic species is generally  
20 greater in the northern basins of the action area compared to the southern basins (Rice 2007). The  
21 overall status of many non-groundfish species in Puget Sound has not been comprehensively assessed;  
22 there have been no quantitative stock assessments that provide information about the current viability  
23 of these species in Puget Sound.

#### 24 **3.4. Marine Mammals and Turtles**

25 Cetaceans are aquatic mammals that include whales and dolphins. Relatively common cetaceans within  
26 Puget Sound include Minke whale (*Balaenoptera acutorostrata*), gray whale (*Eschrichtius robustus*),  
27 harbor porpoise (*Phocoena phocoena*), Dall's porpoise (*Phocoenoides dalli*), and killer whale (*Orcinus*  
28 *orca*). Pinnipeds are aquatic carnivorous mammals whose four limbs are adapted as flippers. Common  
29 pinnipeds within Puget Sound include California sea lion (*Zalophus californianus*) and harbor seal  
30 (*Phoca vitulina*). Steller sea lion (*Eumetopias jubatus*), northern fur seal (*Callorhinus ursinus*), and  
31 northern elephant seal (*Mirounga angustirostris*) also occur in Puget Sound, but are less abundant than

1 sea lions and harbor seals. Steller sea lions are listed as a threatened species under the ESA (62 Fed.  
2 Reg. 24345, February 5, 1997).

3 Marine mammals in Puget Sound feed on a wide variety of prey, and their diets vary not only  
4 according to each species' preferences, but also seasonally, depending on abundance and distribution of  
5 available prey. Rockfishes of all sizes are an important food resource for a variety of predators in Puget  
6 Sound, including some marine mammals (mostly pinnipeds) (Palsson et al. 2009).

7 Southern resident killer whales are observed in small pods of 3 to 40 individuals throughout Puget  
8 Sound (Kriete 2007). Transient killer whales are also occasionally observed in the region (Kriete 2007).  
9 Southern residents are primarily found in northern Puget Sound, and this group has been estimated at  
10 between 70 to 100 individuals since the 1970s. The southern resident population declined 20 percent  
11 from 1996 to 2001 (Krahn et al. 2004) and was listed as endangered under the ESA in 2005 (70 Fed.  
12 Reg. 69903, November 18, 2005). The causes of this decline are likely to include a combination of  
13 factors, such as exposure to bioaccumulative chemical contaminants, reduced availability of prey  
14 resources, and increased human activities (Krahn et al. 2004). Resident killer whales mainly feed on  
15 Chinook salmon, and to a lesser extent, chum salmon, and have been known to eat other fish species  
16 and squid (NMFS 2010c; Scheffer and Slipp 1948; Ford et al. 1998, 2000; Saulitis et al. 2000; Ford and  
17 Ellis 2006). Critical habitat for resident killer whales includes approximately 2,560 square miles of  
18 Puget Sound, excluding areas with water less than 20 feet (6 meters) deep relative to extreme high  
19 water (71 Fed. Reg. 69054, November 29, 2009). Rockfish are not known to be a substantial  
20 component of the Puget Sound resident killer whales' diet (Palsson et al. 2009). Transient killer whales  
21 feed on marine mammals such as harbor seals, Minke whales, sea lions, and porpoises (NMFS 2010c).  
22 Minke whales are also primarily observed in the same northern area as the killer whales, but their  
23 population size is unknown. Gray whales migrate past the Georgia Basin en route to or from their  
24 feeding or breeding grounds; a few of them enter Puget Sound during the spring through fall to feed  
25 (Krahn et al. 2004). Gray whales feed on benthic amphipods in sea floor sediments, while Minke  
26 whales opportunistically feed on crustaceans, plankton, and small schooling fish (e.g., anchovies, cod,  
27 herring, salmon) (NMFS 2010c).

28 Sea lion species feed on a variety of prey that includes rockfish, among other fish species, as well as  
29 squid and gastropods (snails) (NMFS 2010d). California sea lions, primarily males, reside in Puget  
30 Sound between late summer and late spring, and spend the remainder of the year at their breeding  
31 grounds in southern California and Baja California. Populations of the remaining species are quite low

1 in Puget Sound. Steller sea lions and elephant seals are transitory residents that are occasionally seen in  
2 Puget Sound. About 2,000 Steller sea lions occur seasonally in Washington waters, with dozens found  
3 in Puget Sound, particularly in the San Juan Islands (Palsson et al. 2009). Of 12 random Steller sea  
4 lions' scats analyzed, rockfish were found in one (8 percent) (Lance and Jeffries 2006).

5 Harbor seals are year-round residents, and their abundance has increased from in the 100s during the  
6 1970s to more than 10,000 at present (Jeffries et al. 2003). The harbor seal is the only pinniped species  
7 that breeds in Washington waters. In Puget Sound, harbor seals are considered opportunistic feeders  
8 that consume seasonally- and locally-abundant prey, including a variety of fish species and crustaceans  
9 (Olesiuk et al. 1990; London et al. 2002; NMFS 2010d). Rockfish predation by harbor seals varies  
10 annually by location and time of the year (Palsson et al. 2009). Rockfish (of all species) occurred in 12  
11 percent of diets of harbor seals in the San Juan Basin in 2006 and 2007, compared to 2.3 percent in  
12 2005 and 2006 (Lance and Jeffries 2006; Palsson et al. 2009). Most of these rockfish were juveniles.  
13 Rockfish were found in 1 percent of seal scats in Hood Canal (Palsson et al. 2009; London et al. 2002).

14 Although harbor porpoises are also abundant in the eastern North Pacific and were common in greater  
15 Puget Sound 50 or more years ago, they are now rarely seen in Puget Sound (Calambokidis and Baird  
16 1994). Low numbers of Dall's porpoise are observed in greater Puget Sound throughout the year, but  
17 little is known about their population size.

18 Sea-turtles are uncommon within the Puget Sound region, with only a few documented instances in  
19 waters off the Washington coast (Norberg 2009).

## 20 **3.5. Marbled Murrelet**

### 21 **3.5.1. Life History**

22 The marbled murrelet is a small seabird that inhabits the coastal forests and nearshore marine  
23 environment along the Pacific Coast of North America from southern California to southern Alaska and  
24 the Aleutian Islands. Throughout most of its breeding range the marbled murrelet uses old-growth  
25 forests for nesting and nearshore marine environments for foraging. In the Pacific Northwest, murrelets  
26 tend to forage near the coast during the breeding season, with somewhat greater dispersal during the  
27 non-breeding season. They lay a single egg clutch, with incubation and rearing occurring from late  
28 March (in California) or late April (Pacific Northwest) through the summer. Fledging ranges from late  
29 May (California) or late June (Pacific Northwest) through late summer and early fall (McShane et al.  
30 2004). Marbled murrelets feed on a large variety of small fishes such as sand lance, anchovy, Pacific

1 herring, capelin, and smelt species (such as eulachon), and invertebrates. Foraging occurs primarily in  
2 shallow water (less than 98 feet (30 meters) deep), and feeding has been observed at depths from 9.8 to  
3 approximately 90 feet (3 to 27 meters) (McShane et al. 2004).

#### 4 **3.5.2. Current Status**

5 The USFWS listed the Washington, Oregon, and California DPS of the marbled murrelet as threatened  
6 under the ESA in 1992 (57 Fed. Reg. 45328, October 1, 1992). The marbled murrelet recovery plan,  
7 “Recovery Plan for the threatened marbled murrelet (*Brachyramphus marmoratus*) in Washington,  
8 Oregon, and California,” was issued on September 24, 1997. A recent 5-year status review in 2009  
9 recommended no changes to the threatened status, noting the listed portion of the species had declined  
10 in abundance since the prior (2004) status review and that the recovery criteria for the species had not  
11 been met (USFWS 2009b).

12 The USFWS designated critical habitat for the marbled murrelet in Washington, Oregon, and  
13 California on May 24, 1996 (61 Fed. Reg. 26256). Federal and non-Federal lands totaling 3,887,800  
14 acres were designated to protect nesting habitats. The USFWS proposed to revise critical habitat for the  
15 marbled murrelet in June 2008 by removing approximately 250,000 acres in northern California and  
16 Oregon from the 1996 designation, based on new information indicating the areas did not meet the  
17 definition of critical habitat. This proposed rule has not been finalized and critical habitat for the  
18 marbled murrelet remains unchanged from the 1996 designation. Critical habitat in marine waters has  
19 not been designated.

20 The total marbled murrelet abundance in North America is estimated to be less than 900,000 birds, but  
21 most of these occur in Alaska (USFWS 2009b). The listed portion of the population has been declining  
22 since the initiation of monitoring programs in 2000 (USFWS 2009b). Terrestrial threats to marbled  
23 murrelet populations include the historic and ongoing loss and modification of nesting habitat through  
24 commercial timber harvests, human-induced fires, land conversions, and to a lesser degree, through  
25 natural causes, such as wild fires and wind storms. Marine threats to marbled murrelets include changes  
26 in the food web and prey quantity and quality, declining prey populations, commercial and recreational  
27 fisheries for some prey stocks, some continued (but not quantified) gill-net mortality, high body loads  
28 of PCBs in their prey base, and marine areas of low dissolved oxygen. During the most recent status  
29 review, these threats were somewhat ameliorated by a declining rate of annual habitat loss, particularly  
30 on Federal lands; improved regulatory mechanisms because of Federal and state listings and other state

1 and Federal regulation (especially the Northwest Forest Plan); and new gill-netting regulations in  
2 northern California and Washington, which reduced the threat to marbled murrelets (USFWS 2004).

### 3 **3.6. Socioeconomics**

4 The economy of the Puget Sound region includes manufacturing and technology sectors, forestry and  
5 agriculture, and tourism. The fishing industry is a major component of the local as well as the state-  
6 wide economy, with an estimated \$1.1 billion generated annually in Washington State by recreational  
7 fishing<sup>8</sup>. Fishing for rockfish by settlers has occurred since the late 1800s and early 1900s, and reached  
8 a peak in popularity and catch rates among modern anglers in the 1970s and 1980s (Palsson et al. 2009;  
9 Williams et al. 2010). The decline of rockfish populations led to a gradual reduction of catch limits and  
10 reduced popularity of the fishery in the 1990s and 2000s (Palsson et al. 2009) (refer to Subsection 3.8,  
11 Tourism and Recreation, for a detailed analysis of the recreational fishery).

12 The Washington Department of Ecology (2008), Cleveland (2007), and TCW Economics (2008) have  
13 provided information regarding the Puget Sound economy, including:

- 14 • Puget Sound is part of the natural environment that attracts people to the region. The Sound  
15 helps drive \$20 billion in economic activities annually.
- 16 • **Population** – Approximately 4.3 million people live in the 12 counties bordering Puget Sound.  
17 This figure includes about 1.6 million who live in the 90 cities and towns that directly border  
18 the Sound.
- 19 • **Fishing** – The net economic value and economic effects generated by the commercial fishery  
20 in Washington State in 2006 was \$38 million, while the direct impact of spending in the  
21 recreational fishery sector was estimated at \$165.7 million (and \$392.9 million when indirect  
22 and induced impacts are included) (TCW Economics 2008).
- 23 • **Tourism** – The Puget Sound area provides \$9.5 billion in tourism revenue, including 68,000  
24 tourism-related jobs and \$3 billion in income each year. The Puget Sound area generates  
25 approximately 80 percent of state-wide tourism revenues.

---

<sup>8</sup> For the purposes of this EA, the term recreational fishing will be used, and implies and includes the synonymous term sportfishing (WDFW 2010d).

1 A study by Responsive Management (2007) for the Washington State Recreation and Conservation  
2 Office consisted of focus groups of boating services providers, a telephone survey of boating services  
3 providers, a telephone survey of the general public in Washington, and a telephone survey of registered  
4 boaters in Washington. The assessment included information on the motivations for boating and  
5 preferred locations for boating.

6 Fishing was the most common activity in which boaters participated while boating in Washington (53  
7 percent of boaters fished). Other common activities included sightseeing/fish and wildlife viewing (34  
8 percent), water skiing (19 percent), relaxing or entertaining friends (17 percent), being with family and  
9 friends (17 percent), and water tubing (15 percent). When asked to say what motivates them to boat,  
10 boaters most commonly answered for relaxation (49 percent), followed by fishing (29 percent), to be  
11 with friends and family (26 percent), for general recreation (14 percent), and to be close to nature (11  
12 percent).

13 Commercial fishing and fish processing, and the recreational fishing industry, are important  
14 components of the Puget Sound economy (as described above under Subsection 3.6, Socioeconomics,  
15 Fishing). In 2006, 505,185 fishing licenses were issued, of which 23,770 were saltwater licenses  
16 (WDFW 2010e). In odd numbered years only, pink salmon return in large numbers to Puget Sound and  
17 support a popular fishery. For example, in 2008-2009 (a non-pink salmon fishing season), 38,649  
18 saltwater fishing licenses were issued to anglers fishing in Puget Sound; in 2009-2010 (a pink salmon  
19 fishing season), 51,083 saltwater fishing licenses were issued to Puget Sound anglers (S. Thiesfeld,  
20 pers. comm., Washington Department of Fish and Wildlife, Puget Sound Salmon Manager, October 12,  
21 2010).

22 The commercial, non-treaty set net, set line, and bottom trawl fisheries proposed for permanent closure  
23 as part of the Proposed Action have all experienced a decline in ex-vessel values between 2005 and  
24 2009. The otter bottom trawl ex-vessel value in 2005 was \$256,995, declining to a low of \$55,168 in  
25 2007, but showing a slight increase in 2009 to \$97,219. For the set line fishery, the average ex-vessel  
26 value for 2005 through 2008 was \$41,164, with an ex-vessel value of only \$1,697 in 2009. The ex-  
27 vessel value for the set net fishery in 2008 was \$6,236 and \$3,313 for 2009 (T. Tsou, pers. comm.,  
28 Washington Department of Fish and Wildlife, June 16, 2011). The economic contribution of  
29 commercial and recreational fishing to three representative Puget Sound communities are discussed in  
30 more detail below.

1 Seattle, Washington, an important port city in central Puget Sound, was home to at least seven fish  
2 processors in 2000 who often hire processing workers through their Seattle-based administrative  
3 offices. Also important to Seattle's economy is the recreational fishing industry. There were at least  
4 eight salmon charter fishing businesses and one non-salmon charter fishing business in Seattle in 2000;  
5 fifteen licensed vendors were selling fishing permits; and marine anglers made 49,865 trips in the  
6 recreational salmon fishery in Catch Record Card Area 10. In 2003, there were 39,263 recreational  
7 fishing license transactions in Seattle (Norman et al. 2007).

8 Anacortes, Washington, located on the northern shore of Fidalgo Island and considered "the gateway to  
9 the San Juan Islands," was home to at least three seafood processor plants in 2000, which employed on  
10 average 107 people. The tribal commercial fishery in Anacortes also plays a substantial role in the local  
11 commercial fishing industry. As in Seattle, the recreational fishing industry is an important component  
12 of the Anacortes economy. There were five salmon charter fishing businesses and one non-salmon  
13 charter fishing business operating in Anacortes in 2003; two licensed vendors were selling fishing  
14 permits; and marine anglers made 30,627 trips in the recreational (sport) salmon fishery in Catch  
15 Record Card Area 7 (San Juan Islands). In 2003, there were 8,704 recreational fishing license  
16 transactions in Anacortes, valued at \$121,250 (Norman et al. 2007).

17 Bellingham, Washington, located on Bellingham Bay in north Puget Sound, was home to at least nine  
18 seafood processors employing 676 individuals in 2000. The tribal commercial fishery plays a major  
19 role in the Bellingham economy, and the Lummi Natural Resource Department has offices in  
20 Bellingham. As in Seattle and Anacortes, the recreational fishing industry is an important component of  
21 the Bellingham economy. There were at least two salmon charter fishing businesses in Bellingham in  
22 2003; nine licensed vendors selling fishing permits; and data for number of trips in the recreational  
23 (sport) salmon fishery were the same as for Anacortes because they are both in Catch Record Card  
24 Area 7. In 2003, there were 20,090 recreational fishing license transactions in Bellingham, valued at  
25 \$339,527 (Norman et al. 2007).

26 As mentioned above, commercial and recreational fishing are important components of the Puget  
27 Sound economy. This EA specifically assesses the recreational bottom fish and commercial shrimp  
28 trawl fisheries as part of the Fishery Conservation Plan as described in the No-action Alternative, the  
29 Proposed Action, and Alternative 3 (Subsection 1.2, Description of the Proposed Action; Subsection  
30 2.2, Alternatives). WDFW provided performance and value measures for the recreational bottom fish  
31 fishery and the commercial shrimp trawl fishery as part of their Application for an Individual Incidental

1 Take Permit under the Endangered Species Act of 1973 that covers yelloweye rockfish, canary  
 2 rockfish, bocaccio, Puget Sound Chinook salmon, and eulachon<sup>9</sup>. As discussed in Subsection 2.2.2.1,  
 3 Fishing Activities Under the Proposed Action, the recreational fishery averaged approximately 100,000  
 4 fishing trips in recent years, with a catch of over 130,000 bottom fish annually. The annual average  
 5 economic value of this activity in 2008 and 2009 was approximately \$5.6 million annually (WDFW  
 6 2011c; TCW Economics 2008). The shrimp trawl fishery produced an annual average catch in 2008  
 7 and 2009 of approximately 400,000 pounds with an average value of approximately \$142,000 (WDFW  
 8 2011c). Table 3-1 and Table 3-2 below contain additional performance and value detail for these two  
 9 fisheries.

10 Table 3-1. Catch, effort, and economic value associated with the recreational fishery for bottom  
 11 fish and other fish within the Puget Sound DPS area.

	2008	2009	2008-2009 AVERAGE
CATCH (number of fish)	86,812	179,923	133,368
NUMBER OF ANGLER TRIPS	82,182	102,767	92,475
VALUE PER TRIP	\$60	\$60	\$60
ANNUAL ECONOMIC VALUE	\$4,930,920	\$6,166,020	\$5,548,470

12 Source: WDFW unpublished data 2011c; TCW Economics 2008.

13 Table 3-2. Catch and economic value associated with the trawl fishery for shrimp within the  
 14 Puget Sound DPSs area.

	2008	2009	2008-2009 AVERAGE
CATCH (pounds of shrimp)	630,787	217,380	424,084
ANNUAL ECONOMIC VALUE (ex-vessel)	\$216,065	\$69,620	\$142,842

15 Source: WDFW unpublished data 2011c.

### 16 3.7. Environmental Justice

17 This section was prepared in compliance with Presidential Executive Order 12898, Federal Actions to  
 18 Address Environmental Justice in Minority Populations and Low Income Populations (EO 12898),  
 19 dated February 11, 1994, and Title VI of the Civil Rights Act of 1964. Both EO 12898 and Title VI  
 20 address persons belonging to the following target populations:

<sup>9</sup> Because of the differences in the two fisheries, the performance and value are measured in different ways. Recreational fishing performance is measured in number of fish landed and the value in expenditures. The shrimp trawl fishery performance is measured in catch (pounds of shrimp) and value in the ex-vessel (as the catch is offloaded from the fishing vessel) in dollars (TCW Economics 2008). Because of changes in fishing opportunities, weather, and economic conditions, both the performance and value of these fisheries can change from year-to-year.

- 1 • Minority – all people of the following origins: Black, Asian, American Indian and Alaskan  
2 Native, Native Hawaiian or Other Pacific Islander, and Hispanic.
  
- 3 • Low income – persons whose household income is at or below the U.S. Department of Health  
4 and Human Services poverty guidelines.

5 Definitions of minority and low income areas were established on the basis of the Council on  
6 Environmental Quality (CEQ) document, Environmental Justice Guidance Under the Environmental  
7 Policy Act of December 10, 1997. CEQ’s guidance states that “minority populations should be  
8 identified where either (a) the minority population of the affected area exceeds 50 percent or (b) the  
9 population percentage of the affected area is meaningfully greater than the minority population  
10 percentage in the general population or other appropriate unit of geographical analysis.” The CEQ  
11 further adds that “The selection of the appropriate unit of geographical analysis may be a governing  
12 body’s jurisdiction, a neighborhood, a census tract, or other similar unit that is chosen so as not to  
13 artificially dilute or inflate the affected minority population.” The CEQ guidelines do not specifically  
14 state the percentage considered meaningful in the case of low income populations. For this  
15 environmental analysis, the assumptions set forth in the CEQ guidelines for identifying and evaluating  
16 impacts on minority populations are used to identify and evaluate impacts on low income populations.  
17 More specifically, potential environmental justice impacts are assumed to occur in an area if the  
18 percentage of minority, Hispanic, and low income populations are meaningfully greater than the  
19 percentage of minority, Hispanic, and low income populations in the general population.

20 In addition, U.S. Environmental Protection Agency guidance specifically addresses environmental  
21 justice effects on Indian tribes:

22 Federal duties under the Environmental Justice E.O., the Presidential directive on  
23 government-to-government relations, and the trust responsibility to Indian tribes may  
24 merge when the action proposed by a Federal agency or EPA potentially affects the  
25 natural or physical environment of a tribe. The natural or physical environment of a  
26 tribe may include resources reserved by treaty or lands held in trust; sites of special  
27 cultural, religious, or archeological importance, such as sites protected under the  
28 National Historic Preservation Act or the Native American Graves Protection and  
29 Repatriation Act; other areas reserved for hunting, fishing, and gathering (usual and  
30 accustomed), which may include “ceded” lands that are not within reservation  
31 boundaries. Potential effects of concern...may include ecological, cultural, human

1 health, economic, or social impacts when those impacts are interrelated to impacts on  
2 the natural or physical environment.

3 Through the NEPA process, NMFS will ensure that the requirements of Executive Order 12898  
4 regarding environmental justice are implemented, including all appropriate tribal consultation  
5 activities.

6

1 Table 3-3. Minority and Hispanic populations in counties bordering inland waters of Washington from the 2000 U.S. Census.

	Total	White	Black or African American	Indian and Alaska Native	Asian	and Other Pacific Islander	Some other Race	Two or more races	Hispanic or Latino (of any race)	Percent Hispanic (%)	Percent minority (%)
<b>Counties Bordering inland Waters of Washington</b>											
Clallam County	64,525	57,505	545	3,303	731	104	761	1,576	2,203	3.41	10.88
Island County	71,558	62,374	1,691	693	3,001	314	1,025	2,460	2,843	3.97	12.83
Jefferson County	25,953	23,920	110	599	309	34	197	784	535	2.06	7.83
King County	1,737,034	1,315,507	93,875	15,922	187,745	9,013	44,473	70,499	95,242	5.48	24.27
Kitsap County	231,969	195,481	6,648	3,760	10,192	1,805	3,309	10,774	9,609	4.14	15.73
Mason County	49,405	43,705	587	1,840	519	221	1,036	1,497	2,361	4.78	11.54
Pierce County	700,820	549,369	48,730	9,963	35,583	5,922	15,410	35,843	38,621	5.51	21.61
San Juan County	14,077	13,372	36	117	125	12	128	287	338	2.40	5.01
Skagit County	102,979	89,070	450	1,909	1,538	163	7,381	2,468	11,536	11.20	13.51
Snohomish County	606,024	518,948	10,113	8,250	35,030	1,705	11,629	20,349	28,590	4.72	14.37
Thurston County	207,355	177,617	4,881	3,143	9,145	1,078	3,506	7,985	9,392	4.53	14.34
Whatcom County	166,814	147,485	1,150	4,709	4,637	235	4,159	4,439	8,687	5.21	11.59
<b>County Average</b>										4.79	13.62
<b>Other Counties</b>											
Gray's Harbor County	67,194	59,335	226	3,132	818	73	1,527	2,083	3,258	4.85	11.70
Yakima County	222,581	146,005	2,157	9,966	2,124	203	54,375	7,751	79,905	35.90	34.40
<b>State</b>											
Washington	5,894,121	4,821,823	190,267	93,301	322,335	23,953	228,923	213,519	441,509	7.49	18.19

2 Source: www.census.gov

3

1 Table 3-4. Low income information for Washington counties from 2004 estimates from the  
 2 Annual Social and Economic Supplements of the Current Population Survey.

<b>Counties Bordering Inland Waters of Washington</b>	<b>2004 Population Estimate</b>	<b>Number in Poverty</b>	<b>Percent in Poverty (%)</b>
Clallam County	67,867	8,446	12.3
Island County	79,293	6,442	8.3
Jefferson County	28,110	3,076	10.9
Mason County	1,777,143	6,429	12.2
King County	239,138	176,928	10
Kitsap County	53,637	21,616	9.3
Pierce County	745,411	87,131	11.8
San Juan County	15,190	1,279	8.4
Skagit County	111,064	13,660	12.2
Snohomish County	644,274	61,500	9.5
Thurston County	224,673	21,309	9.4
Whatcom County	180,167	23,742	13.2
<b>County Average</b>	<b>347,163</b>	<b>35,963</b>	<b>10.6</b>
<b>Surrounding Counties</b>			
Gray's Harbor	70,338	10,807	15.8
Yakima	229,094	42,704	18.6
<b>State</b>			
Washington	6,203,788	715,271	11.6

3 Source: www.census.gov

4 The Native American tribes in the action area include (NWIFC 2010a):

- Lummi Nation
- Muckleshoot Tribe
- Nisqually Indian Tribe
- Nooksack Tribe
- Port Gamble S'Klallam
- Puyallup Tribe of Indians
- Sauk-Suiattle Tribe
- Skokomish Tribe
- Squaxin Island Tribe
- Stillaguamish Tribe
- Suquamish Tribe
- Swinomish Tribe
- Tulalip Tribes
- Upper Skagit Tribes

5 The native peoples of the Puget Sound historically harvested a diverse array of marine species,  
 6 including various species of rockfish (Palsson et al. 2009). The Puget Sound is still of particular  
 7 historic and cultural importance to the native tribes who continue to harvest marine species such as crab  
 8 and other shellfish, and salmon within the action area. In contemporary times, rockfishes harvested by  
 9 tribal fishermen have contributed less than 2 percent to the total Puget Sound harvest for most years  
 10 since 1991 (Palsson et al. 2009).

11 Native American tribes are sovereign governments. In Washington State, each tribe manages its own  
 12 fisheries according to guidelines developed jointly with WDFW. Each tribe issues and enforces its own  
 13 fishing regulations. These regulations “specify fishery openings, gear restrictions, non-retention rules,  
 14 and other requirements for harvesting a given species in marine and/or freshwater areas.” Each tribe

1 fishes only in those marine and freshwater areas that have been legally defined by the court as their  
2 usual and accustomed area. In areas where two or more tribes operate, they issue identical regulations  
3 or develop agreements for sharing harvest (NWIFC 2010b, 2010c).

#### 4 **3.8. Tourism and Recreation**

5 Tourism in the action area is centered on the region’s natural beauty and historical attributes related to  
6 the natural environment. Tourists visit several national and state parks throughout the Puget Sound  
7 region, as well as urban centers such as Seattle, Washington. Tourism associated with Puget Sound  
8 includes day-cruises centered near major cities such as Seattle and Bellingham, and whale watching,  
9 which is concentrated within the San Juan Basin and the North Puget Sound. Recreational fishing in the  
10 Puget Sound is an important component to the tourism industry (refer to Subsection 3.6,  
11 Socioeconomics, for additional detail), though most tourist-based recreational fishing is associated with  
12 salmon fishing because opportunities to fish for other species such as cod and rockfish have diminished  
13 in the past few decades (Olander 1991; Martinis 2008; WDFW 2010b). Additionally, WDFW promotes  
14 scuba diving in Puget Sound waters, and specifically lists rockfish among the “amazing diversity of sea  
15 life” that recreational scuba divers may encounter (WDFW 2010f).

##### 16 **3.8.1. Recreational Rockfish Fisheries**

17 Several recreational fisheries have targeted rockfish within the past several decades. They include  
18 anglers on boats with a hook-and-line, the recreational dive-spear fishery, and the shore-based hook-  
19 and-line fishery (Palsson et al. 2009). Rockfish have also been bycatch to other recreational fishing  
20 activities such as halibut and lingcod fishing or salmon fishing using mooching or downriggers.  
21 Palsson et al. (2009) report that historical (prior to the 1970s) recreational harvests of rockfish in Puget  
22 Sound were likely minimal. There are no specific economic data for historic or recent rockfish  
23 fisheries, as this data has been grouped within the overall groundfish category by WDFW.

24 A number of rockfish species, including yelloweye rockfish and canary rockfish, were more commonly  
25 caught in North and South Puget Sound during the 1960s than subsequent decades (Palsson et al.  
26 2009). Recreational harvests of rockfish in Puget Sound averaged 261,000 pounds per year between  
27 1970 and 1993. Between 2004 and 2007, recreational harvests of rockfish averaged 37,000 pounds per  
28 year (an 86 percent reduction from earlier years) (Palsson et al. 2009).

29 Since 1983, regulations for rockfish fishing in Puget Sound have become more restrictive, with a one  
30 fish daily retention limit and the prohibition of spearfishing of rockfish enacted in 2004 (Palsson et al.

1 2009). Since 2002, regulations prohibited the retention of yelloweye rockfish and canary rockfish.  
2 Yelloweye rockfish comprised between 2 and 5 percent of the North Sound recreational harvest prior to  
3 2001, and are still caught by anglers targeting salmon and other marine species (WDFW 2011c); canary  
4 rockfish constituted an average 1.4 percent of the recreational catch from 1980 to 1989, but their  
5 frequency decreased to an average of 0.6 percent of the catch from 1996 until 2002 when their retention  
6 was prohibited; bocaccio comprised less than 0.2 percent of the recreational rockfish catch between  
7 1980 and 2007 (Palsson et al. 2009). In the South Sound, canary rockfish comprised an average 1.0  
8 percent and 1.4 percent of the recreational rockfish catch for 1980 to 1989 and 1996 to 2002,  
9 respectively; bocaccio averaged 0.2 percent during the 1980s (Palsson et al. 2009), and have only been  
10 sporadically encountered within Puget Sound in the past 15 years.

11 Currently, Puget Sound is closed to rockfish fishing; no targeted fishing for or retention of any species  
12 of rockfish is allowed in Marine Areas 5 through 13. Additionally, fishing for bottom fish in waters  
13 deeper than 120 feet is prohibited because of the resulting injuries and mortality from this fishery  
14 (WDFW 2010b) (Subsection 1.5, Relationship to Other Plans and Policies). When rockfish are brought  
15 from depths of deeper than 60 feet (18 meters), the rapid decompression causes over-inflation and/or  
16 rupture of the swim bladder (termed barotrauma), which can result in multiple direct injuries. In  
17 addition, these injuries cause various levels of disorientation among rockfish species, which can result  
18 in fish remaining at the surface for various periods after they are released (Hannah and Matteson 2007).  
19 These injuries are generally more pronounced in fish brought up from deeper waters. Rockfish at the  
20 surface are susceptible to predation by birds, sharks, or marine mammals; damage from solar radiation;  
21 and gas embolisms (Palsson et al. 2009). These factors, separately or in combination, often result in  
22 death.

23

1 4. ENVIRONMENTAL CONSEQUENCES

2 The following analyses address the seven resources identified as having the potential to be impacted by  
3 the alternatives. The analyses describe expected direct and indirect effects under the three alternatives  
4 when compared to the affected environment or existing conditions described in Section 3.0, Affected  
5 Environment. Cumulative impacts are analyzed in Section 5.0.

6 The terms “effect” and “impact” are used synonymously under NEPA; consequently, both terms are  
7 used in the following analyses (40 CFR 1508.8). Impacts include effects on the environment that are  
8 direct, indirect, or cumulative. Direct effects are caused by the action itself and occur at the same time  
9 and place (40 CFR 1508.8). Indirect effects are caused by the action and are later in time or farther  
10 removed in distance than direct impacts, but are still reasonably foreseeable (40 CFR 1508.8).

11 Cumulative impacts are those impacts on the environment that result from the incremental impact of  
12 the action when added to other past, present, and reasonably foreseeable future actions, regardless of  
13 what agency (Federal or non-Federal) or person undertakes such other actions (40 CFR 1508.7).

14 Cumulative impacts can result from individually minor but collectively significant actions taking place  
15 over a period of time.

16 This Environmental Assessment analyzes in detail three alternatives: the No-action Alternative, the  
17 Proposed Action, and a Similar to Proposed Action Alternative but with Fewer Restrictions, as  
18 described in Subsection 1.2, Description of the Proposed Action and Subsection 2.2, Alternatives.  
19 Under Alternative 2 (Proposed Action) and Alternative 3 (Similar to Proposed Action Alternative),  
20 WDFW would be committed to the activities described below and in Subsection 1.2, Description of the  
21 Proposed Action and Subsection 2.2, Alternatives, for a period of 5 years. Under the No-action  
22 Alternative, WDFW’s commitment to these activities would be uncertain, and WDFW could suspend  
23 the fishery closures or fishing regulations of the listed fisheries at any time as deemed appropriate.

24 The Proposed Action is for NMFS to issue the requested permits and for WDFW to implement the  
25 proposed Fishery Conservation Plan and Puget Sound fish research program. Specifically:

- 26 1) NMFS would issue a permit under section 10(a)(1)(B) of the ESA, which would cover the  
27 incidental take of ESA-listed rockfish, Chinook salmon, and eulachon in two state-authorized  
28 fisheries in Puget Sound—the recreational bottom fish fishery and the commercial shrimp trawl  
29 fishery. Pursuant to the Fishery Conservation Plan, WDFW would implement the following  
30 measures:

- 1 a. Continue the closure, by regulation, of the set net, set line, bottom fish trawl, bottom  
2 fish pot, and scallop trawl fisheries;
  - 3 b. Continue to prohibit fishing for rockfish in Marine Areas 5 through 13;
  - 4 c. Continue to prohibit retention of rockfish caught in any fishery in Marine Areas 5  
5 through 13;
  - 6 d. Continue to prohibit bottom fishing in waters deeper than 120 feet throughout the  
7 range of the U.S. waters of the Puget Sound/Georgia Basin rockfish DPSs (halibut and  
8 salmon fisheries would still be allowed in waters deeper than 120 feet);
  - 9 e. Require permit holders in the shrimp trawl fishery to have on-board observers on 10  
10 percent of all trips, who would identify and track bycatch; and
  - 11 f. Continue to allow only beam trawls in the shrimp trawl fishery (no rockhopper gear).
- 12 2) NMFS would issue a permit under section 10(a)(1)(A) of the ESA, which would cover the  
13 direct and incidental take of ESA-listed rockfish, Chinook salmon, and eulachon resulting from  
14 WDFW research activities on Puget Sound bottom fish and other fish. Activities for the Puget  
15 Sound fish research program would include continuation of a bottom fish trawl census that has  
16 occurred on an annual basis since the late 1980s, a midwater trawl survey, an acoustic trawl  
17 survey of Pacific herring, and hook-and-line and tagging studies of non-listed rockfish.
  - 18 3) WDFW would report to NMFS annually on the above activities and adapt future fisheries and  
19 research activities as necessary.

20 The proposed permits, Fishery Conservation Plan, and research activities would continue for a period  
21 of 5 years.

## 22 **4.1. Marine Ecosystem and Habitat**

### 23 **4.1.1. No-action Alternative**

#### 24 | **NMFS Issues No ITP or Research Permits; WDFW Authorizes No Bottom Fish Fishery or** 25 **Shrimp Trawl Fishery; WDFW Conducts No Research that Might Take Rockfish**

26 Under the No-action Alternative, no activities would occur in the marine ecosystem related to gear and  
27 vessels for recreational bottom fishing or commercial shrimp trawling; WDFW research; and the set

1 net, set line, bottom fish trawl, bottom fish pot, and scallop trawl fisheries because WDFW would no  
2 longer permit or conduct these activities. Critical habitat for resident killer whales, green sturgeon,  
3 Puget Sound Chinook salmon, Hood Canal chum salmon, and bull trout, and essential fish habitat  
4 would not be altered by these closed fisheries and research activities.

5 The cessation of WDFW-conducted research about stock status, abundance, and distribution of Puget  
6 Sound fishes would result in less information for management of fisheries (such as the Puget Sound  
7 Chinook salmon fishery) described in Subsection 1.5, Relationship to Other Plans and Policies, and  
8 thus would provide less information for designing management actions (such as restoration projects,  
9 fisheries, development projects) that could affect the marine ecosystem.

10 The No-action Alternative could result in a slight reduction in the level of new contaminants within the  
11 marine environment that impact rockfish and other salmonids, groundfish, and forage fish such as  
12 herring, from the lack of recreational bottom fishing trips and the shrimp trawl fishery, and possible  
13 spills of fuels and inputs of PAHs from these boats. However, as discussed in Subsection 3.1, Marine  
14 Ecosystem and Habitat, these contaminants would continue to be introduced mostly through sources  
15 unrelated to the fisheries and research activities associated with the No-action Alternative. The marine  
16 ecosystem would also not be exposed to any lost fishing gear from these closed fisheries. The overall  
17 status of the marine ecosystem, as described in Subsection 3.1, Marine Ecosystem and Habitat, would  
18 remain the same under the No-action Alternative. Threats such as nearshore development, derelict  
19 fishing gear, and water quality problems such as low dissolved oxygen and inputs of bioaccumulative  
20 chemicals would continue.

#### 21 **4.1.2. Alternative 2: Proposed Action**

##### 22 | **NMFS Issues an ITP and Research Permits; WDFW Authorizes Bottom Fishing in Waters Less 23 than 120 Feet and the Shrimp Trawl Fishery with a Requirement for Observers; WDFW 24 Conducts Rockfish Research**

25 Under the Proposed Action, there would be increased activity in the marine ecosystem as a result of the  
26 authorized bottom fish fishery, shrimp trawl fishery, and WDFW research activities compared to the  
27 No-action Alternative. Similar to the No-action Alternative, there would be no change to the marine  
28 ecosystem related to the set net, set line, bottom fish trawl, bottom fish pot, and scallop trawl fisheries  
29 for a period of 5 years, as these fisheries would remain closed for the agreed term under the Proposed  
30 Action.

1 As described in Subsections 2.2.2.1, Fishing Activities Under the Proposed Action, and 2.2.2.2,  
2 Research Activities Under the Proposed Action, research trawls include mid-water and bottom trawls.  
3 Mid-water trawls would not come into contact with benthic habitats and, therefore, would not cause  
4 any habitat alterations. Research bottom trawls would result in over 100 tows annually that would  
5 occur in each of the major basins of Puget Sound, and the shrimp trawl fishery would result in  
6 approximately 965 shrimp tows annually in North Sound (WDFW 2011d). As described in Section 3.0,  
7 Affected Environment, these trawls would occur in portions of areas designated as critical habitat for  
8 resident killer whales, green sturgeon, Puget Sound Chinook salmon, Hood Canal chum salmon, and  
9 bull trout. Similarly, these trawls would occur in areas designated as EFH for 44 species of groundfish,  
10 several salmonids, and coastal pelagic species (Appendix B: Species of Fishes with Designated EFH in  
11 the Action Area). Critical habitat for green sturgeon and salmonids, and EFH for several salmonids and  
12 groundfish would be altered in several ways because of the shrimp trawl fishery and research trawls.  
13 As described in Subsection 2.2.2, Alternative 2: Proposed Action, the shrimp trawls use beam trawl  
14 gear (no rockhopper gear would be allowed) and thus would not alter areas of rocky bottoms. Trawl  
15 gear would be used in sandy, muddy/cobble habitats and would alter portions of the sea floor of Puget  
16 Sound (mostly concentrated in North Sound) by suspending sediment and changing habitat complexity,  
17 smoothing of sand waves, and changing bottom roughness in localized areas. Trawls in less structurally  
18 complex habitats, such as areas fished by the commercial shrimp trawlers, are less affected than areas  
19 of more complex habitat (Roberts 2008). The effect of suspended sediment would be small and  
20 temporary as sediment would re-settle to local habitats. Effects to EFH for coastal pelagic EFH would  
21 be minimal because trawl gear does not alter the pelagic environment.

22 For the shrimp trawl fishery, temporary sediment suspension would not alter light levels (and thus,  
23 would not interrupt photosynthesis or affect species such as eelgrass or kelp) because this suspended  
24 sediment is limited to waters deeper than 120 feet, which are deeper than the photic zone. Some  
25 WDFW research trawls would occur in the photic zone (such as the nearshore of Puget Sound); thus,  
26 temporary sediment suspension could reduce light levels on a short-term basis. Temporarily reduced  
27 light levels would be unlikely to alter benthic habitats because, as mentioned in Subsection 3.1, Marine  
28 Ecosystem and Habitat, habitat conditions and sediment levels in the nearshore are naturally dynamic.  
29 It is possible that a research or shrimp trawl net could be lost and subsequently kill marine fish and  
30 invertebrates. However, as described in Subsection 3.1, Marine Ecosystem and Habitat, only two of  
31 902 recovered nets were from trawl fisheries. Based on this evidence, the probability of the future loss  
32 of a trawl net from research activities or the commercial shrimp trawl fishery is considered  
33 discountable.

1 As described in Subsection 2.2.2.1, Fishing Activities Under the Proposed Action, the recreational  
2 bottom fish fishery in all waters of Puget Sound shallower than 120 feet would likely result in  
3 approximately 100,000 angler trips annually. In addition, as discussed in Subsection 2.2.2.2, Research  
4 Activities under the Proposed Action, some WDFW research activities would use recreational fishing  
5 methods. Jigs, weights, and hooks used by anglers have the potential to alter benthic habitats by  
6 snagging structure, and some gear can be lost. However, adverse effects to the seafloor from lost  
7 recreational fishing gear have not been observed in WDFW habitat surveys (Pacunski 2011).

8 Unlike the No-action Alternative, the additional information available from WDFW-conducted  
9 research about stock status, abundance, and distribution of Puget Sound fishes under the Proposed  
10 Action would be available to inform adaptive management of fisheries and other rockfish recovery  
11 efforts. These management efforts could subsequently influence the overall condition of the Puget  
12 Sound marine ecosystem and its habitats.

13 Similar to the No-action Alternative, the overall status of the marine ecosystem, as described in  
14 Subsection 3.1, Marine Ecosystem and Habitat, would remain the same. Threats such as nearshore  
15 development, water quality problems such as low dissolved oxygen, and input of bioaccumulative  
16 chemicals would continue. Unlike the No-action Alternative, a slight increase in the level of new  
17 contaminants within the marine environment could occur from fuel spills and PAHs associated with  
18 recreational vessels used on bottom fishing trips and the shrimp trawl fishery. However, as discussed in  
19 Subsection 3.1, Marine Ecosystem and Habitat, contaminants are introduced mostly through sources  
20 unrelated to the fisheries and research activities associated with the Proposed Action, and the effects of  
21 any additional contaminants from fishing activities would be a small proportion of all boating activity  
22 in the rockfish DPSs. The research activities and fisheries occurring under the Proposed Action would  
23 not degrade the overall condition of the marine ecosystem of Puget Sound and its habitats because they  
24 are unlikely to result in changes to habitat structure and function beyond short term and transitory  
25 effects.

#### 26 **4.1.3. Alternative 3: Similar to Proposed Action Alternative but with Fewer Restrictions**

##### 27 | **NMFS Issues an ITP and Research Permits; WDFW Authorizes Bottom Fishing without Depth** 28 **Restrictions and Does Not Require Observers in the Shrimp Trawl Fishery; WDFW Conducts** 29 **Rockfish Research**

30 Impacts to the marine ecosystem under Alternative 3 would be similar to those described under the  
31 Proposed Action compared to the No-action Alternative. However, under Alternative 3, the 120-foot

1 depth restriction for the recreational bottom fishery would not be in effect. This alteration could result  
2 in more angler trips for bottom fish, and result in fishing in waters deeper than 120 feet. The few  
3 additional fishing trips and fishing gear in waters deeper than 120 feet would result in additional lost  
4 recreational fishing gear in deeper waters, and a greater potential for fuel spills and input of PAHs.  
5 However, adverse effects to the seafloor from lost recreational fishing gear have not been observed in  
6 WDFW habitat surveys (Pacunski 2011), contaminants are introduced mostly through sources  
7 unrelated to the fisheries and research boating activities, and the effects of any additional contaminants  
8 from boating activities would be a small proportion of all boating activity in the action area. As such,  
9 effects to the marine ecosystem and to critical habitat for resident killer whales, green sturgeon, Puget  
10 Sound Chinook salmon, Hood Canal chum salmon, and bull trout, and EFH for 44 species of  
11 groundfish from the lack of a 120-foot fishing restriction would be small.

12 Similar to the Proposed Action and the No-action Alternative, the overall status of the marine  
13 ecosystem, as described in Subsection 3.1, Marine Ecosystem and Habitat, would remain the same.  
14 Threats such as nearshore development and water quality problems (e.g., low dissolved oxygen and  
15 bioaccumulative chemicals) would continue. The research activities and fisheries would not degrade  
16 the overall condition of the marine ecosystem of Puget Sound and its habitats because they are unlikely  
17 to result in changes to habitat structure and function beyond short-term and transitory effects.

## 18 **4.2. ESA-listed Fish**

### 19 **4.2.1. Rockfish Species**

#### 20 **4.2.1.1. No-action Alternative**

21 | **NMFS Issues No ITP or Research Permits; WDFW Authorizes No Bottom Fish Fishery or**  
22 **Shrimp Trawl Fishery; WDFW Conducts No Research that Might Take Rockfish**

#### 23 **Life History**

24 Under the No-action Alternative, there would be no injury to or mortality of ESA-listed rockfish in the  
25 set net, set line, bottom fish trawl, bottom fish pot, and scallop trawl fisheries, as these fisheries would  
26 remain closed. There would also be no change in life history expression or injury to or mortality of  
27 ESA-listed rockfish through either direct or indirect take from recreational bottom fish fisheries or  
28 commercial shrimp trawl fisheries in Puget Sound because WDFW would not authorize these fisheries  
29 (Appendix A: Estimated Numbers of ESA-listed Fish Species to be Incidentally Taken under the  
30 Various Alternatives). Additionally, WDFW would no longer conduct research activities that may  
31 catch ESA-listed rockfish so none would be injured or killed in research actions. The closure of the

1 shrimp trawl fishery would also result in no removals of shrimp, which are prey for rockfish, from the  
2 North Sound.

3 **Abundance and Productivity**

4 The No-action Alternative would not impact the abundance and spatial structure of yelloweye rockfish,  
5 canary rockfish, and bocaccio because bycatch from closed recreational and commercial fisheries and  
6 Puget Sound fish research program activities would be eliminated. The result of these closures would  
7 protect some mature yelloweye rockfish, canary rockfish, and bocaccio from being killed, and therefore  
8 these species would continue to produce larvae. In particular, the preservation of larger rockfish that  
9 are typically taken in recreational fisheries, as described in Subsection 3.2.1.2, Current Status, would in  
10 turn lead to enhanced productivity as they release more and larger larvae. As discussed in Subsection  
11 3.1, Marine Ecosystem and Habitat, the No-action Alternative could result in a slight reduction of the  
12 level of contaminants within the marine environment that impact rockfish or their prey, though as  
13 discussed in Subsection 3.2.1.2, Current Status, most of these contaminants are/have been introduced  
14 through sources unrelated to the fisheries and research activities associated with the No-action  
15 Alternative. Similarly, the No-action Alternative would have no impact on other habitat limiting factors  
16 such as derelict fishing gear and nearshore degradation. Habitat limiting factors and the legacy effects  
17 of past overfishing would remain as threats to the viability of yelloweye rockfish, canary rockfish, and  
18 bocaccio.

19 Though abundance and productivity would be expected to improve under the No-action Alternative for  
20 yelloweye rockfish, canary rockfish, and bocaccio, pre-existing habitat limiting factors, as described in  
21 Subsection 3.2.1.2, Current Status, including derelict fishing gear, degraded water quality from excess  
22 nutrients and bioaccumulants, and nearshore development would remain. These factors, in addition to  
23 bycatch associated with recreational salmon and halibut fisheries (as described in Subsection 2.2.2.1,  
24 Fishing Activities under the Proposed Action, and Subsection 3.2.1.2, Current Status) would continue  
25 to limit the full recovery of abundance and productivity for these species under the No-action  
26 Alternative because rockfish experience naturally low productivity levels that are exacerbated by  
27 fishery removals (that affect size and age structures of these species), environmental toxicity (that can  
28 affect reproduction function), and habitat changes derived from environmental regime changes (that  
29 affect the dynamics of population productivity).

1 **Spatial Structure and Connectivity**

2 The elimination of bycatch from the closed fisheries associated with the No-action Alternative would  
3 incrementally improve spatial structure of listed rockfish and, therefore, viability of these species. As  
4 discussed in Subsection 3.2.1.2, Current Status, some canary rockfish and bocaccio can migrate long  
5 distances and colonize habitats while yelloweye rockfish are thought to have smaller home ranges. The  
6 lack of bycatch associated with the closed fisheries would thus enable possible natural colonization and  
7 improvement of spatial structure for canary rockfish and bocaccio, and to a lesser degree yelloweye  
8 rockfish.

9 **Diversity**

10 The No-action Alternative would incrementally improve some diversity parameters that include life-  
11 history characteristics (such as timing of reproduction, ability to adjust to habitat changes, and habitat  
12 usage) as described in Subsection 3.2.1.2, Current Status, because some mature fish would not be  
13 caught and, therefore, continue to reproduce young; in turn, this would enable a greater likelihood that  
14 adaption to changing habitat conditions could occur over the long term. The No-action Alternative  
15 would have no impact on molecular genetic characteristics because, as described in Subsection 3.2.1.2,  
16 Current Status, they are only influenced by longer term factors such as environmental variation.

17 Because WDFW would not conduct some of its planned research of ESA-listed rockfish, the only  
18 available information about stock status, abundance, and distribution would be available from research  
19 that could be conducted without risk of take. This would limit acquisition of new information to  
20 understand the abundance, spatial structure, and habitat associations of rockfish.

21 **4.2.1.2. Alternative 2: Proposed Action**

22 | **NMFS Issues an ITP and Research Permits; WDFW Authorizes Bottom Fishing in Waters Less**  
23 **than 120 Feet and the Shrimp Trawl Fishery with a Requirement for Observers; WDFW**  
24 **Conducts Rockfish Research**

25 Similar to the No-action Alternative, under the Proposed Action there would be no injury to or  
26 mortality of ESA-listed rockfish in the set net, set line, bottom fish trawl, bottom fish pot, and scallop  
27 trawl fisheries, as these fisheries would remain closed for a period of 5 years. There would be a small  
28 change in life history expression from mortality of ESA-listed rockfish through direct take from  
29 recreational bottom fish fisheries or commercial shrimp trawl fisheries (Appendix A: Estimated  
30 Numbers of ESA-listed Fish Species to be Incidentally Taken under the Various Alternatives). These

1 fisheries would kill some sub-adult and mature adult fish, thus slightly reducing reproductive output for  
2 the species as a whole.

3 Bycatch of ESA-listed rockfish would increase relative to the No-action Alternative, as the recreational  
4 bottom fish fishery and commercial shrimp trawl fishery would be open. Under the Proposed Action,  
5 these takes from bycatch would be an estimated 152 yelloweye rockfish, 138 canary rockfish, and 43  
6 bocaccio annually (Appendix A: Estimated Numbers of ESA-listed Fish Species to be Incidentally  
7 Taken under the Various Alternatives). As mitigation, recreational bottom fish and commercial shrimp  
8 trawl fisheries could be modified to reduce rockfish bycatch during the 5-year term as a result of  
9 information gained through research and monitoring from on-board observers, so these levels of injury  
10 and mortality could be less during the term of the action. Because of the likelihood that most  
11 incidentally caught rockfish would die, this analysis assumes 100 percent mortality of incidentally  
12 caught fish.

13 The increased mortality of ESA-listed rockfish from the fisheries and research activity compared to the  
14 No-action Alternative would have a minor negative effect on the abundance and productivity of each  
15 species because the overall number of fish killed would be a small proportion of the overall population.  
16 Although these species are listed under the ESA, they are sufficiently abundant that they can withstand  
17 a small number of mortalities. Productivity would be slightly reduced by the loss of adult fish  
18 (particularly larger adults) resulting from bycatch. Mature fish produce larvae, but rockfish populations  
19 experience naturally low productivity levels. Further, rockfish species have been suppressed by the  
20 legacy effects of past overfishing, which would continue to impact this species when combined with  
21 fishing activities under the Proposed Action.

22 Similar to the No-action Alternative, the Proposed Action would have no impact on the level of habitat  
23 limiting factors, such as derelict fishing gear and nearshore degradation. As discussed in Subsection  
24 4.1, Marine Ecosystem and Habitat, the input of some contaminants from fishing and research vessel  
25 activities would increase relative to the Proposed Action, though this input would be small compared to  
26 all boating activity in the action area. Habitat limiting factors and the legacy effects of past overfishing  
27 would remain threats to the viability of yelloweye rockfish, canary rockfish, and bocaccio.

28 The spatial structure of listed rockfish, described in Subsection 3.2.1.2, Current Status, would be  
29 slightly negatively impacted by the death of listed rockfish in various basins of Puget Sound and from  
30 the shrimp trawl fishery in North Sound. Similarly, diversity parameters that include life-history  
31 characteristics such as timing of reproduction, ability to adjust to habitat changes, and habitat usage

1 would be slightly negatively influenced by the removal of some sub-adult and adult fish. As discussed  
2 above, the removal of reproductively mature fish affects life-history expression and diversity.

3 Listed rockfish would still be vulnerable to risks discussed in Subsection 3.2.1.2, Current Status,  
4 including environmental variation such as altered temperature regimes and circulation patterns, genetic  
5 processes such as the possible accumulation of negative mutations, demographic unpredictability such  
6 as imbalanced gender ratios, ecological feedback such as other fish species occupying the niche left by  
7 the depleted population, and catastrophes such as oil spills that may disrupt benthic environments or  
8 larval/juvenile rearing habitats and food sources (McElhane et al. 2000). Low abundance may also  
9 continue to pose a risk to the species by making them vulnerable to compensatory processes (termed  
10 “Allee” effects). The relative risks associated with these factors are imprecise, as they have not been  
11 quantified for listed rockfish in Puget Sound, but such risks are anticipated to continue under the  
12 Proposed Action.

13 Under the Proposed Action, the combined effects to yelloweye rockfish, canary rockfish, and bocaccio  
14 from fishing, research activities, and other continued risk factors would likely result in a small  
15 reduction in abundance and productivity, spatial structure, and diversity. This small reduction is  
16 unlikely to exceed levels that would hinder population viability.

17 Compared to the No-action Alternative, the Proposed Action would result in additional information  
18 about stock status, abundance, and distribution of ESA-listed rockfish. This information would come  
19 from two sources. The first would be the Puget Sound fish research program. The second would be  
20 from fisheries data. Although the bottom fish fishery and shrimp trawl fishery would kill and injure  
21 rockfish, the monitoring and reporting from these fisheries (enabled for the shrimp trawl fishery by on-  
22 board observers) would also provide information about abundance, spatial structure, and habitat  
23 associations.

#### 24 **4.2.1.3. Alternative 3: Similar to Proposed Action Alternative but with Fewer Restrictions**

##### 25 | **NMFS Issues an ITP and Research Permits; WDFW Authorizes Bottom Fishing without Depth** 26 **Restrictions and Does Not Require Observers in the Shrimp Trawl Fishery; WDFW Conducts** 27 **Rockfish Research**

28 Compared to the No-action Alternative, impacts to ESA-listed rockfish under Alternative 3 would be  
29 the same as those described under the Proposed Action, with two exceptions. Bycatch levels for ESA-  
30 listed rockfish from anglers targeting bottom fish would be similar to recent years, with an annual  
31 estimated total of 219 yelloweye rockfish and 194 canary rockfish caught under Alternative 3. These

1 numbers of take would be greater than under the Proposed Action because of the lack of a 120-foot  
2 depth restriction described in Subsection 1.2, Description of the Proposed Action, and would be similar  
3 to catch levels that occurred prior to implementation of this restriction (Appendix A: Estimated  
4 Numbers of ESA-listed Fish Species to be Incidentally Taken under the Various Alternatives). The  
5 number of bocaccio that would be taken by recreational bottom fishing under Alternative 3 is  
6 undetermined because of a number of uncertainties described in Subsection 3.2.1.2, Current Status,  
7 Incidental Catch in Current Recreational Bottom Fisheries, Commercial Shrimp Fisheries, and  
8 Research Activities, but the lack of the 120-foot depth restriction would place them at greater risk of  
9 bycatch compared to the Proposed Action because adults typically occupy water deeper than 120 feet  
10 (Subsection 3.2.1.1, Rockfish Life History).

11 Consequently, impacts related to life history, abundance and productivity, spatial structure, and  
12 diversity when combined with fishing activities and expected increases in bycatch when compared to  
13 the Proposed Action, would result in greater risks to the overall viability of each species in each of the  
14 basins of the DPSs. The lack of a depth restriction for recreational fishing could result in more fishing  
15 trips and, therefore, a greater potential for fuel spills and input of PAHs. However, contaminants are  
16 introduced mostly through sources unrelated to the recreational bottom fish activities and the effects of  
17 any additional contaminants would be a small proportion of the total occurring from boating activity in  
18 the rockfish DPSs.

19 Bycatch impacts from the shrimp trawl fishery would also be similar to the Proposed Action, compared  
20 to no bycatch under the No-action Alternative (Appendix A: Estimated Numbers of ESA-listed Fish  
21 Species to be Incidentally Taken under the Various Alternatives). However, information about bycatch  
22 levels from the shrimp trawl fishery would be less precise under Alternative 3 than under the Proposed  
23 Action, because no monitoring of bycatch by on-board observers would occur under Alternative 3. The  
24 absence of on-board observers would require that commercial shrimp trawl fishers document their own  
25 bycatch. There are 28 species of rockfish within Puget Sound, many of which look similar to each other  
26 (Palsson et al. 2009). Thus, without the assistance of trained observers, the identification of rockfish to  
27 species would likely be imprecise and thus hinder the reliability of information that would enable  
28 adaptive management measures to further reduce ESA-listed rockfish bycatch, as necessary.

29 Compared to the No-action Alternative, impacts to ESA-listed rockfish from research activities under  
30 Alternative 3 would be the same as those described under the Proposed Action.

1 **4.2.2. Salmonids**

2 The following analysis of each alternative's relative effect on listed Puget Sound Chinook salmon,  
3 Hood Canal summer chum salmon, Puget Sound steelhead, and bull trout is less comprehensive  
4 compared to listed rockfish. This is because the fishery conservation plan was developed for the  
5 purpose of reducing bycatch of rockfish from state-authorized fisheries, and the closed set net, set line,  
6 bottom fish trawl, bottom fish pot, and scallop trawl fisheries likely catch few, if any, salmonids.  
7 Further, of the four listed species, Chinook salmon is the only species caught in recreational bottom  
8 fisheries or the commercial shrimp trawl fisheries. Thus, fishery closures would have little conservation  
9 benefit to listed salmonids. In addition, the relative bycatch of listed salmonids from fisheries and  
10 research activities, where they occur, is a much smaller fraction of the overall population compared to  
11 rockfish.

12  
13 **4.2.2.1. No-action Alternative**

14 | **NMFS Issues No ITP or Research Permits; WDFW Authorizes No Bottom Fish Fishery or**  
15 **Shrimp Trawl Fishery; WDFW Conducts No Research that Might Take Rockfish**

16 Under the No-action Alternative, there would be no change in life history, as described in Subsection  
17 3.0, Affected Environment, or injury to or mortality of Puget Sound Chinook salmon, Hood Canal  
18 summer chum salmon, Puget Sound steelhead, or bull trout in the set net, set line, bottom fish trawl,  
19 bottom fish pot, and scallop trawl fisheries, as these fisheries would remain closed. There would also  
20 be no change in life history, or injury to or mortality of these ESA-listed salmonids in recreational  
21 bottom fisheries or commercial shrimp trawl fisheries in Puget Sound because WDFW would not  
22 authorize these fisheries.

23 Because no research activities would occur under the No-action Alternative, no ESA-listed Puget  
24 Sound Chinook salmon, Hood Canal summer chum salmon, Puget Sound steelhead, or bull trout would  
25 be incidentally captured by WDFW Puget Sound fish research activities (Appendix A: Estimated  
26 Numbers of ESA-listed Fish Species to be Incidentally Taken under the Various Alternatives), and no  
27 ESA-listed rockfish would be directly taken by research activities. Similarly, no ESA-listed salmon,  
28 steelhead, or bull trout would be incidentally taken in the recreational bottom fish fishery or the shrimp  
29 trawl fishery because these fisheries would be closed.

30 The overall status and abundance of the 22 populations of Puget Sound Chinook salmon, 9 populations  
31 of Hood Canal summer chum salmon, and approximately 50 stocks of Puget Sound steelhead (some of  
32 which are currently at high risk of extinction) (Subsection 3.2.2, Salmonids) would slightly improve

1 under the No-action Alternative. This improvement would occur because a small number of fish  
2 (Appendix A: Estimated Numbers of ESA-listed Fish Species to be Incidentally Taken under the  
3 Various Alternatives) would not be killed during research or fisheries activities.

4 The No-action Alternative would not alter the limiting factors discussed in Subsection 3.2.2,  
5 Salmonids, which include land use activities such as urbanization, past forestry practices, agriculture,  
6 and development. Limiting factors in the marine environment of Puget Sound that include nearshore  
7 degradation and bioaccumulative contaminants would continue. This is because these limiting factors  
8 are unaffected by the closed fisheries and research activities. As a result, these limiting factors would  
9 continue to affect the viability of listed salmonids, although implementation of recovery plans for Puget  
10 Sound Chinook salmon and Hood Canal chum salmon (in draft) may reduce the magnitude of some of  
11 these limiting factors. Thus, the closure of fisheries and research activities would not change the overall  
12 viability of listed Puget Sound Chinook salmon, Hood Canal chum salmon, or Puget Sound steelhead.  
13 Similarly, bull trout habitat limiting factors that include elevated fresh water temperatures, the  
14 introduction of non-native species in fresh water, and habitat degradation (Subsection 3.2.2,  
15 Salmonids), would not be affected by the closure of research activities and fisheries.

16 As described in Subsection 3.2.2, Salmonids, critical habitat is designated along the nearshore of  
17 portions of Puget Sound for Puget Sound Chinook salmon, Hood Canal chum salmon, and bull trout.  
18 The closure of the applicable fisheries and research activities would not alter the critical habitat for  
19 each of these species because, as discussed in Subsection 3.1, Marine Ecosystem and Habitat, fisheries  
20 and research activities only result in short-term and spatially isolated effects that do not alter essential  
21 habitat features for salmonids; therefore, closures would not result in any measurable benefit to critical  
22 habitat conditions.

23 Because WDFW would not conduct some of its planned research of Puget Sound fishes, less  
24 information would be available about salmonid stock status, abundance, and distribution in Puget  
25 Sound. This would limit acquisition of new information to understand the abundance, spatial structure,  
26 and habitat associations of salmonid species.

#### 27 **4.2.2.2. Alternative 2: Proposed Action**

28 | **NMFS Issues an ITP and Research Permits; WDFW Authorizes Bottom Fishing in Waters Less**  
29 **than 120 Feet and the Shrimp Trawl Fishery with a Requirement for Observers; WDFW**  
30 **Conducts Rockfish Research**

1 Similar to the No-action Alternative, under the Proposed Action there would be no change in life  
2 history, or injury to or mortality of listed Puget Sound Chinook salmon, Hood Canal summer chum  
3 salmon, Puget Sound steelhead, or bull trout in the set net, set line, bottom fish trawl, bottom fish pot,  
4 and scallop trawl fisheries for a period of 5 years, as these fisheries would remain closed for the agreed  
5 term.

6 Under the Proposed Action, WDFW would authorize recreational bottom fish fisheries in waters  
7 shallower than 120 feet and commercial shrimp trawl fisheries. Thus, compared to the No-action  
8 Alternative, the Proposed Action would result in a small amount of bycatch and mortality to Puget  
9 Sound Chinook salmon because of WDFW authorizing these two fisheries. Most of the Puget Sound  
10 Chinook salmon that are bycatch in these two fisheries would be juveniles because, as described in  
11 Subsection 3.2.2.1, Puget Sound Chinook Salmon, they are much more abundant in Puget Sound than  
12 adults (Rice 2007). The small number of deaths of Puget Sound Chinook salmon would not result in  
13 any change of life history expression to the overall population.

14 A small number of ESA-listed Puget Sound Chinook salmon, Hood Canal summer chum salmon, and  
15 Puget Sound steelhead are captured as a result of WDFW Puget Sound fish research activities, and  
16 some of those captured die as a result (Appendix A: Estimated Numbers of ESA-listed Fish Species to  
17 be Incidentally Taken under the Various Alternatives). Thus, compared to the No-action Alternative,  
18 the Proposed Action would result in a slight increase in mortality of salmonids because of WDFW's  
19 Puget Sound fish research activities.

20 Conditions for bull trout would be the same under any alternative. Bull trout have not been captured in  
21 over 1,700 research trawls conducted by WDFW (Pacunski 2011a) or captured in observed shrimp  
22 trawls (O'Toole 2011). Bull trout are unlikely to be caught in WDFW research trawls and commercial  
23 shrimp trawl because, as described in Subsection 3.2.2.4, Bull Trout, Current Status, they occupy  
24 shallow nearshore waters (away from trawl locations) (Goetz et al. 2004). Bull trout are also unlikely to  
25 be caught from recreational fishing gear because, as discussed in Subsection 3.2.2.4, Bull Trout, they  
26 eat smaller invertebrates and fishes (Goetz et al. 2004). Consequently, bull trout are not vulnerable to  
27 recreational bottom fishing gear because the lures or bait used by bottom fish anglers are larger than  
28 natural food sources.

29 The increased mortality from the fisheries and research activities under the Proposed Action would not  
30 be enough to impact viability of the ESA-listed 22 populations of Puget Sound Chinook salmon, 9

1 populations of Hood Canal summer chum salmon, and 50 stocks of Puget Sound steelhead because of  
2 the extremely small fraction of fish that would be killed relative to the overall estimated population.

3 Similar to the No-action Alternative, the Proposed Action would not alter the limiting factors discussed  
4 in Subsection 3.2.2, Salmonids, which include land use activities such as urbanization, past forestry  
5 practices, agriculture, and development. Similarly, limiting factors in the marine environment of Puget  
6 Sound that include nearshore degradation and bioaccumulative contaminants would continue because  
7 these limiting factors are unaffected by fisheries and research activities. As a result, these limiting  
8 factors would continue to affect listed salmonids' viability, although implementation of recovery plans  
9 for Puget Sound Chinook salmon and Hood Canal chum salmon (in draft) may reduce the magnitude of  
10 some of these limiting factors. However, the combined effect of these limiting factors and the death of  
11 a few listed salmonids in fisheries and research activities would not meaningfully impact the viability  
12 of listed Puget Sound Chinook salmon, Hood Canal chum salmon, or Puget Sound steelhead. Similarly,  
13 bull trout habitat limiting factors that include elevated fresh water temperatures, the introduction of  
14 non-native species in fresh water, and habitat degradation (Subsection 3.2.2, Salmonids) would not be  
15 affected by the closure of research activities and fisheries.

16 As described in Subsection 3.2.2, Salmonids, critical habitat of Puget Sound Chinook salmon, Hood  
17 Canal chum salmon, and bull trout is designated along portions of the nearshore of Puget Sound. The  
18 recreational bottom fish fishery, commercial shrimp trawl fishery, and WDFW Puget Sound fish  
19 research activities would not alter the condition of critical habitat for each of these species because  
20 these activities, as described in Subsection 2.2.2.1, Fishing Activities under the Proposed Action, and  
21 Subsection 2.2.2.2, Research Activities under the Proposed Action, would not tangibly affect habitat  
22 conditions along the nearshore (see Subsection 4.1, Marine Ecosystem and Habitat, for additional  
23 analysis). Further, the shrimp trawl fishery is not authorized to occur in nearshore waters shallower  
24 than 90 feet (30m) deep and, therefore, does not occur in bull trout critical habitat.

25 Compared to the No-action Alternative, the Proposed Action would result in additional information  
26 about stock status, abundance, and distribution of ESA-listed Puget Sound Chinook salmon, Hood  
27 Canal chum salmon, and Puget Sound steelhead from the Puget Sound fish research program. This  
28 additional data would provide information about ESA-listed salmonid distribution, abundance, and  
29 trends.

1 **4.2.2.3. Alternative 3: Similar to Proposed Action Alternative but with Fewer Restrictions**

2 | **NMFS Issues an ITP and Research Permits; WDFW Authorizes Bottom Fishing without Depth**  
3 **Restrictions and Does Not Require Observers in the Shrimp Trawl Fishery; WDFW Conducts**  
4 **Rockfish Research**

5 Impacts to ESA-listed Puget Sound Chinook salmon, Hood Canal summer chum salmon, Puget Sound  
6 steelhead, and bull trout under Alternative 3 would be the same as those described under the Proposed  
7 Action. Puget Sound Chinook salmon are likely to be the only ESA-listed salmonid to be caught in the  
8 recreational bottom fish fishery or shrimp trawl fishery, and most of these fish would be juveniles  
9 (Subsection 3.2.2.5, Incidental Catch of Salmonids in Current Recreational Bottom Fisheries,  
10 Commercial Shrimp Fisheries, and Research Activities). Alternative 3 would not have the 120-foot  
11 depth restriction, but no additional Puget Sound Chinook salmon would be expected to be caught as a  
12 result of fishing at greater depths compared to the Proposed Action because, as described in Subsection  
13 3.2.2.1, Puget Sound Chinook Salmon, most juvenile Chinook salmon generally occupy the nearshore  
14 (Rice 2007), which is shallower than 120 feet. A small number of Puget Sound Chinook salmon would  
15 be caught as a result of Alternative 3, compared to none under the No-action Alternative (Appendix A:  
16 Estimated Numbers of ESA-listed Fish Species to be Incidentally Taken under the Various  
17 Alternatives).

18 Bycatch of listed salmonids under the Proposed Action and Alternative 3 would be identical; thus,  
19 increased mortality from the fisheries and research activities under Alternative 3 relative to the No-  
20 action Alternative would not be enough to impact viability of ESA-listed Puget Sound Chinook  
21 salmon, Puget Sound steelhead, or Hood Canal summer chum salmon because of the extremely small  
22 fraction of fish killed relative to the overall estimated population.

23 Similar to the Proposed Action, Alternative 3 would not alter the limiting factors discussed in  
24 Subsection 3.2.2, Salmonids, that include land use activities such as urbanization, past forestry  
25 practices, agriculture, and development. Similarly, limiting factors in the marine environment of Puget  
26 Sound that include nearshore degradation and bioaccumulative contaminants would continue because  
27 these limiting factors are unaffected by fisheries and research activities, although implementation of  
28 recovery plans for Puget Sound Chinook salmon and Hood Canal chum salmon (in draft) may reduce  
29 the magnitude of some of these limiting factors. As a result, these limiting factors would continue to  
30 affect the viability of listed salmonids. However, the combined effect of these limiting factors and the  
31 death of a few listed salmonids in fisheries and research activities would not meaningfully impact the  
32 viability of listed Puget Sound Chinook salmon, Hood Canal chum salmon, or Puget Sound steelhead.

1 Similarly, bull trout habitat limiting factors that include elevated fresh water temperatures, the  
2 introduction of non-native species in fresh water, and habitat degradation (Subsection 3.2.2, Salmonids)  
3 would not be affected by the closure of research activities and fisheries.

4 Similar to the Proposed Action, there would be no effects to critical habitat designated along the  
5 nearshore of Puget Sound for Puget Sound Chinook salmon, Hood Canal chum salmon, and bull trout  
6 from the authorized fisheries and research.

7 Compared to the No-action Alternative, impacts to ESA-listed salmonids for research activities under  
8 Alternative 3 would be the same as those described under the Proposed Action.

### 9 **4.2.3. Eulachon**

#### 10 **4.2.3.1. No-action Alternative**

#### 11 | **NMFS Issues No ITP or Research Permits; WDFW Authorizes No Bottom Fish Fishery or** 12 **Shrimp Trawl Fishery; WDFW Conducts No Research that Might Take Rockfish**

13 Under the No-action Alternative, there would be no change in life history, injury to or mortality of  
14 eulachon from the set net, set line, bottom fish trawl, bottom fish pot, and scallop trawl fisheries  
15 because they are closed. There would be no bycatch of ESA-listed eulachon in the shrimp trawl fishery  
16 or recreational bottom fish fishery because these fisheries would be closed by WDFW. Because the  
17 shrimp trawl fishery would be closed, no on-board observers would be necessary. Also, under the No-  
18 action Alternative, no ESA-listed eulachon would be incidentally captured by WDFW research  
19 activities (Appendix A: Estimated Numbers of ESA-listed Fish Species to be Incidentally Taken under  
20 the Various Alternatives).

21 The No-action Alternative would have no effect on freshwater habitat used by eulachon, described in  
22 Subsection 3.2.3, Eulachon, because the closed fisheries and research activities would not occur in  
23 freshwater habitats. Similarly, it would have no effect on food sources of eulachon in marine waters,  
24 described in Subsection 3.2.3, Eulachon, because these closed fisheries and research activities would  
25 not catch eulachon food sources. The No-action Alternative would not alter eulachon critical habitat, as  
26 described in Subsection 3.2.3, Eulachon, because critical habitat is not designated in marine waters.

27 The No-action Alternative would not alter the limiting factors discussed in Subsection 3.2.3, Eulachon,  
28 which include freshwater habitat degradation, changing ocean conditions, and commercial harvest. This  
29 is because these limiting factors are unaffected by the closed recreational and shrimp trawl fisheries

1 and research. As a result, these limiting factors would continue to affect listed eulachon viability.  
2 However, the No-action Alternative would result in less commercial bycatch of eulachon. As such, the  
3 overall status of eulachon could be slightly improved by the No-action Alternative, as the closure of the  
4 commercial shrimp trawl fishery would eliminate any bycatch. However, on-going limiting factors  
5 would continue to affect eulachon status throughout their range.

6 No data would be collected by WDFW on stock distribution and abundance, status, and life history of  
7 ESA-listed eulachon in the Puget Sound/Georgia Basin under the No-action Alternative. Because  
8 WDFW would not conduct their planned research that would take eulachon, the only available  
9 information about stock status, abundance, and distribution would be available from research that could  
10 be conducted without risk of take. This would limit acquisition of new information to understand the  
11 abundance, spatial structure, and habitat associations of eulachon in the Puget Sound.

#### 12 **4.2.3.2. Alternative 2: Proposed Action**

##### 13 | **NMFS Issues an ITP and Research Permits; WDFW Authorizes Bottom Fishing in Waters Less** 14 **than 120 Feet and the Shrimp Trawl Fishery with a Requirement for Observers; WDFW** 15 **Conducts Rockfish Research**

16 Similar to the No-action Alternative, there would be no change in life history, or injury to or mortality  
17 of eulachon in the set net, set line, bottom fish trawl, bottom fish pot, and scallop trawl fisheries for a  
18 period of 5 years, as these fisheries would remain closed for the agreed term under the Proposed  
19 Action. Compared to the No-action Alternative, a relatively small number of eulachon would be  
20 incidentally killed by the commercial shrimp trawl fishery in North Sound (Appendix A: Estimated  
21 Numbers of ESA-listed Fish Species to be Incidentally Taken under the Various Alternatives). Because  
22 they are small and fragile, eulachon that are incidentally caught in the shrimp trawl fishery would die  
23 (WDFW 2011d).

24 Similar to the No-action Alternative, the Proposed Action would not alter most of the limiting factors  
25 discussed in Subsection 3.2.3, Eulachon, which include freshwater habitat degradation, changing ocean  
26 conditions, and commercial harvest. This is because these limiting factors are unaffected by the  
27 fisheries and research as they collectively would not occur in freshwater habitats used by eulachon,  
28 would not alter ocean conditions, or result in targeted commercial harvest. As such, these limiting  
29 factors would continue to affect listed eulachon viability. The WDFW research trawls and the shrimp  
30 trawl fishery in the North Sound would result in bycatch of only a small number of eulachon. As such,  
31 life-history expression would not be altered, and the overall status of eulachon would be only slightly

1 impacted by this bycatch because of the extremely small fraction of fish killed relative to the overall  
2 estimated population. The fisheries and research authorized under the Proposed Action would not alter  
3 eulachon critical habitat because, as described in Subsection 3.2.3, Eulachon, critical habitat is not  
4 designated in marine waters.

5 Compared to the No-action Alternative, additional information regarding eulachon distribution, habitat  
6 use, and abundance of eulachon in Puget Sound would be gained by WDFW's research activities under  
7 the Proposed Action. Also, use of observers in the shrimp trawl fishery would provide data regarding  
8 the distribution and abundance of ESA-listed eulachon, as compared to the No-action Alternative,  
9 which would have no shrimp trawl fishery (and no on-board observers).

#### 10 **4.2.3.3. Alternative 3: Similar to Proposed Action Alternative but with Fewer Restrictions**

##### 11 | **NMFS Issues an ITP and Research Permits; WDFW Authorizes Bottom Fishing without Depth** 12 **Restrictions and Does Not Require Observers in the Shrimp Trawl Fishery; WDFW Conducts** 13 **Rockfish Research**

14 Compared to the No-action Alternative, impacts to ESA-listed eulachon under Alternative 3 would be  
15 the same as those described under the Proposed Action, with one exception. Under Alternative 3, the  
16 numbers of eulachon bycatch would be less certain because on-board observers for the shrimp trawl  
17 fishery would not be required, and the fishers would self-report all bycatch (Subsection 2.2.3,  
18 Alternative 3). As described in Subsection 3.2.3, Eulachon, eulachon look similar to several other more  
19 common forage fish within Puget Sound, including Pacific herring, surf smelt, and sand lance. Thus,  
20 reliable identification and enumeration of eulachon caught in the commercial shrimp trawl fishery in  
21 the North Sound would be questionable under this alternative. This uncertainty would in turn hinder  
22 adaptive management steps to reduce eulachon bycatch in the future as necessary.

#### 23 **4.2.4. Green Sturgeon**

##### 24 **4.2.4.1. No-action Alternative**

##### 25 | **NMFS Issues No ITP or Research Permits; WDFW Authorizes No Bottom Fish Fishery or** 26 **Shrimp Trawl Fishery; WDFW Conducts No Research that Might Take Rockfish**

27 Under the No-action Alternative, there would be no change in life history, or injury to or mortality of  
28 green sturgeon in the set net, set line, bottom fish trawl, bottom fish pot, and scallop trawl fisheries  
29 because these fisheries would be closed. Further, no ESA-listed green sturgeon would be incidentally  
30 caught in Puget Sound recreational bottom fisheries or commercial shrimp trawl fisheries because these

1 fisheries would be closed. The closure of these fisheries and research activities would not affect green  
2 sturgeon critical habitat.

3 The No-action Alternative would have no effect on habitat limiting factors (entrainment in water  
4 projects, pollution, exotic species, impassible barriers, and elevated water temperatures) for green  
5 sturgeon, described in Subsection 3.2.4, Green Sturgeon. The lack of catches from fisheries and  
6 research activities would incrementally improve the abundance of green sturgeon in the action area,  
7 though the overall improvement to the population would be negligible because green sturgeon would  
8 remain at risk from pre-existing limiting factors.

9 Because WDFW would not conduct some of its planned research in Puget Sound, the only available  
10 information about stock status, abundance, and distribution would be available from research that could  
11 be conducted without risk of take. This would limit acquisition of new information to understand the  
12 distribution of green sturgeon.

#### 13 **4.2.4.2. Alternative 2: Proposed Action**

##### 14 | **NMFS Issues an ITP and Research Permits; WDFW Authorizes Bottom Fishing in Waters Less 15 than 120 Feet and the Shrimp Trawl Fishery with a Requirement for Observers; WDFW 16 Conducts Rockfish Research**

17 As under the No-action Alternative, there would be no change in life history, injury to or mortality of  
18 green sturgeon in the set net, set line, bottom fish trawl, bottom fish pot, and scallop trawl fisheries for  
19 a period of 5 years, as these fisheries would remain closed for the agreed term under the Proposed  
20 Action.

21 Compared to the No-action Alternative, in which no green sturgeon would be incidentally caught in  
22 fisheries or research activities, the Proposed Action could result in a small number of ESA-listed green  
23 sturgeon incidentally captured in WDFW research activities (Appendix A: Estimated Numbers of ESA-  
24 listed Fish Species to be Incidentally Taken under the Various Alternatives). There is no information  
25 regarding any past catch of green sturgeon in the shrimp trawl fishery or bottom fish fishery, though  
26 given the scarcity of green sturgeon in the action area, catches in these fisheries are unlikely (WDFW  
27 2011d). Most green sturgeon captured during research activities would be released alive, but it is  
28 possible one captured specimen could die as a result of this activity annually (WDFW 2011d). The  
29 numbers of green sturgeon caught would likely be low to nonexistent because, as described in  
30 Subsection 3.2.4, Green Sturgeon, they are very rare in Puget Sound, and mortalities as a result of

1 encounters during research activities would be even lower because few if any that are caught would die  
2 (WDFW 2011c).

3 Similar to the No-action Alternative, the Proposed Action would have no effect on freshwater habitat  
4 limiting factors (entrainment in water projects, pollution, exotic species, impassible barriers, and  
5 elevated water temperatures) for green sturgeon, described in Subsection 3.2.4, Green Sturgeon,  
6 because fisheries and research only occur in marine waters.

7 Unlike the No-action Alternative, the Proposed Action would enable the shrimp trawl fishery and  
8 bottom trawl research activities in the North Puget Sound where critical habitat is designated for green  
9 sturgeon, as described in Subsection 3.2.4, Green Sturgeon. The shrimp trawl fishery and bottom trawl  
10 research activities that occur in the North Sound would alter portions of green sturgeon critical habitat  
11 by affecting sediment quality and available food resources (NMFS 2009). The effects of bottom  
12 trawling on benthic habitats are discussed in more detail in Subsection 3.1, Marine Ecosystem and  
13 Habitat, and include sediment disruption, smoothing of sand waves, and general bottom roughness.  
14 Trawling would result in a small decrease of benthic invertebrates and small fish that green sturgeon  
15 eat. However, bottom trawling may result in positive effects on food resources by digging up and  
16 making prey resources more available for green sturgeon (NMFS 2009). The overall effects of the  
17 Proposed Action on green sturgeon would be negligible; a few green sturgeon could be captured in  
18 research and shrimp trawls, but are expected to survive. If a few green sturgeon are killed, the overall  
19 effects to the species, in combination with pre-existing freshwater limiting factors, are unlikely to  
20 impact species viability beyond current conditions.

21 Compared to the No-action Alternative, the Proposed Action would result in additional information  
22 about green sturgeon distribution from the Puget Sound fish research program.

#### 23 **4.2.4.3. Alternative 3: Similar to Proposed Action Alternative but with Fewer Restrictions**

#### 24 | **NMFS Issues an ITP and Research Permits; WDFW Authorizes Bottom Fishing without Depth** 25 **Restrictions and Does Not Require Observers in the Shrimp Trawl Fishery; WDFW Conducts** 26 **Rockfish Research**

27 Impacts to ESA-listed green sturgeon under Alternative 3 would be the same as those described under  
28 the Proposed Action because the Puget Sound fish research program and commercial shrimp trawl  
29 fishery would be the same under each alternative. The lack of on-board observers in the commercial  
30 shrimp trawl fishery under Alternative 3 would result in no documentation of green sturgeon bycatch,

1 which would eliminate any possible adaptive management measures to modify the fishery as necessary  
2 to decrease green sturgeon bycatch.

### 3 **4.3. Non-listed Fish**

#### 4 **4.3.1. Groundfish Species**

##### 5 **4.3.1.1. No-action Alternative**

###### 6 | **NMFS Issues No ITP or Research Permits; WDFW Authorizes No Bottom Fish Fishery or** 7 **Shrimp Trawl Fishery; WDFW Conducts No Research that Might Take Rockfish**

8 There would be no change of life history, injury to or mortality of groundfish species in the set net, set  
9 line, bottom fish trawl, bottom fish pot, and scallop trawl fisheries because they would be closed.

10 Because WDFW would close the recreational bottom fish fishery and the shrimp trawl fishery under  
11 the No-action Alternative, there would be no direct or incidental harvest of benthic or benthopelagic  
12 groundfish associated with these fisheries. Because there would be no commercial shrimp trawl fishery,  
13 there would be no effect on potential food sources (three species of *Pandalus* shrimp, small fish, and  
14 other invertebrates) for benthic and benthopelagic groundfish in North Sound. The closure of the  
15 recreational bottom fish fishery would result in no groundfish caught and thus could improve many  
16 non-listed groundfish species' viability by allowing mature fish to continue reproduction. Similarly, the  
17 closure of the recreational bottom fish fishery would result in no targeted catch of groundfish.

18 However, limiting factors such as derelict fishing gear and water quality problems that include reduced  
19 levels of dissolved oxygen and inputs of toxins such as metals and petroleum products would continue  
20 to affect recovery of those depleted groundfish populations..

21 The fisheries and research activities would not affect EFH designated for 44 species of groundfish in  
22 the action area because each would be closed under the No-action Alternative.

23 Because WDFW would not conduct some of its planned research that would take some ESA-listed  
24 species, the only available information about stock status, abundance, and distribution of non-listed  
25 groundfish would be from research that could be conducted without risk of take. This would limit  
26 acquisition of new information to understand the abundance, spatial structure, and habitat associations  
27 of most of the groundfish species assemblages within Puget Sound, as described in Subsection 3.3.1,  
28 Groundfish Species.

1 **4.3.1.2. Alternative 2: Proposed Action**

2 | **NMFS Issues an ITP and Research Permits; WDFW Authorizes Bottom Fishing in Waters Less**  
3 **than 120 Feet and the Shrimp Trawl Fishery with a Requirement for Observers; WDFW**  
4 **Conducts Rockfish Research**

5 Similar to the No-action Alternative, there would be no change in life history, injury to or mortality of  
6 groundfish in the set net, set line, bottom fish trawl, bottom fish pot, and scallop trawl fisheries for a  
7 period of 5 years, as these fisheries would remain closed for the agreed term under the Proposed  
8 Action.

9 Under the Proposed Action, WDFW's authorization of the recreational bottom fish fishery in waters  
10 shallower than 120 feet and the commercial shrimp trawl fishery would result in increased injury and  
11 mortality of benthic and benthopelagic groundfish in Puget Sound from bycatch, compared to the No-  
12 action Alternative in which these fisheries would not occur. The shrimp trawl fishery has caught an  
13 average of 16.3 pounds of bycatch per individual tow, most of which is composed of benthic  
14 groundfish but includes small numbers of other non-groundfish species such as herring. As discussed in  
15 Subsection 2.2.2.1, Fishing Activities under the Proposed Action, from 2005 to 2010, the shrimp trawl  
16 fishery has averaged 193 individual trips, with an average of 5 tows per trip (WDFW 2011d). Thus, the  
17 commercial shrimp trawl fishery would result in an estimated 15,759 pounds of fish caught as bycatch  
18 annually, compared to the No-action Alternative where no bycatch would occur. This is a small  
19 fraction of the over 220 million pounds of groundfish estimated to occur in Puget Sound. However,  
20 limiting factors such as derelict fishing gear and water quality problems that include reduced levels of  
21 dissolved oxygen and inputs of toxins (e.g., metals and petroleum products) would continue to affect  
22 non-listed groundfish. Combined, bycatch levels (although small in comparison to the pounds of  
23 groundfish estimated to occur in Puget Sound) and limiting factors would result in continued negative  
24 effects to some groundfish species (particularly the non-listed rockfish species) under the Proposed  
25 Action.

26 Unlike the No-action Alternative, the commercial shrimp trawl fishery in North Sound would catch  
27 shrimp, small fish, and other invertebrates that would be otherwise available as the prey of groundfish.  
28 The loss of this potential prey would be proportionally small and have little effect on benthic and  
29 benthopelagic groundfish because of their diverse diets that include varied species of fish and  
30 invertebrates (Subsection 3.3.2, Non-groundfish Species).

1 As discussed in Subsection 3.3.1, Groundfish Species, catch levels for groundfish by recreational  
2 bottom fish anglers averaged 113,000 fish in Puget Sound from 2004 to 2009 (WDFW 2011a). Flatfish  
3 species were 68 percent of the bottom fish annual average harvest during this time period (WDFW  
4 2011c). The overall number of groundfish species caught by recreational bottom fish anglers would be  
5 small, as 113,000 harvested fish (non-rockfish species) would be a fraction of the estimated 220 million  
6 pounds of bottom fish in Puget Sound<sup>10</sup>. The 120-foot depth restriction for recreational bottom fishing,  
7 described in Subsection 1.2, Description of the Proposed Action, would protect deepwater benthic or  
8 benthopelagic bottom fish from catches (e.g., greenstriped rockfish (*Seb. elongates*), redstripe rockfish  
9 (*Seb. proriger*), silvergray rockfish (*Seb. brevispinis*), and shortspine thornyheads (*Seb. alascanus*)),  
10 which would likely improve the depleted status of these species. Catches of non-listed rockfish would  
11 be greater than under the No-action Alternative.

12 Unlike the No-action Alternative, a small number of non-listed benthic and benthopelagic groundfish  
13 would be captured by WDFW research activities. These fish would be caught in isolated areas within  
14 each of the basins of the Puget Sound/Georgia Basin where trawl surveys occur. These catches would  
15 be small relative to the overall estimated biomass of 220 million tons of groundfish in Puget Sound.  
16 Therefore, the research activities permitted under the Proposed Action would not have a substantial  
17 effect on groundfish in Puget Sound because the amount of fish caught would be small relative to the  
18 overall biomass of fish.

19 The research and commercial shrimp trawls would occur in areas designated as EFH for 44 species of  
20 groundfish in the action area. The effects of bottom trawling on EFH and benthic habitats are discussed  
21 in more detail in Subsection 3.1, Marine Ecosystem and Habitat, and include sediment disruption,  
22 smoothing of sand waves, and general bottom roughness. In addition, the catch of some prey species  
23 may affect EFH. These effects would likely adversely affect EFH for these groundfish species,  
24 although effects would be over small spatial and temporal scales, and habitat conditions would return to  
25 functional condition soon after trawling activities cease. The catch of prey species would not adversely  
26 affect EFH because of the small amount of bycatch relative to the overall biomass of groundfish in  
27 Puget Sound.

28 Under the Proposed Action, information regarding stock status, abundance, and distribution of non-  
29 listed benthic and benthopelagic groundfish would be available as a result of WDFW research activities

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<sup>10</sup> If the average weight of harvested groundfish is 2 pounds, 113,000 harvested fish would equal approximately 0.001 percent of the overall pounds of groundfish in Puget Sound.

1 as compared to the No-action Alternative where this information would not be collected. The additional  
2 information available from WDFW-conducted research about stock status, abundance, and distribution  
3 of groundfish under the Proposed Action would be available to inform adaptive management of bottom  
4 fish fisheries to further minimize effects on groundfish.

#### 5 **4.3.1.3. Alternative 3: Similar to Proposed Action Alternative but with Fewer Restrictions**

##### 6 | **NMFS Issues an ITP and Research Permits; WDFW Authorizes Bottom Fishing without Depth 7 Restrictions and Does Not Require Observers in the Shrimp Trawl Fishery; WDFW Conducts 8 Rockfish Research**

9 Impacts to groundfish under Alternative 3 would be the same as those described under the Proposed  
10 Action, with one exception. Under Alternative 3, catch levels of groundfish in waters deeper than 120  
11 feet would be greater than under the Proposed Action because fishing at depths greater than 120 feet  
12 would not be restricted. This would result in deeper water species, such as greenstriped rockfish,  
13 redstripe rockfish, silvergray rockfish, and shortspine thornyheads, to be caught more frequently (and  
14 die of barotraumas) than under the Proposed Action (as discussed in Subsection 3.8.1, Recreational  
15 Rockfish Fisheries, the effects of barotrauma are increased with increased depth of capture). The  
16 increased catch of these species could impact their overall status.

#### 17 **4.3.2. Non-groundfish Species**

##### 18 **4.3.2.1. No-action Alternative**

##### 19 | **NMFS Issues No ITP or Research Permits; WDFW Authorizes No Bottom Fish Fishery or 20 Shrimp Trawl Fishery; WDFW Conducts No Research that Might Take Rockfish**

21 Under the No-action Alternative, there would be no change in life history, or injury to or mortality of  
22 non-listed, non-groundfish species in the set net, set line, bottom fish trawl, bottom fish pot, and scallop  
23 trawl fisheries because these fisheries would be closed. There would also be no bycatch of non-  
24 groundfish species, such as Pacific herring and other forage fish, in the recreational bottom fish fishery  
25 and commercial shrimp trawl fishery because they would both be closed. The WDFW-led research  
26 activities catch a small number of pelagic fish, such as herring; these catches would no longer occur  
27 under the No-action Alternative. There would also be no activities occurring in the epipelagic zone and  
28 thus, no change to light sources from fishing or research activities.

29 The cessation of these fisheries and research activities would avoid the death of any forage fish, as  
30 described in Subsection 3.3.2, Non-groundfish Species, which are a key food source for other non-  
31 groundfish species including salmonids. The cessation of these fisheries and research activities would

1 not alter the abundance of smaller food sources for non-groundfish species, such as zooplankton,  
2 because these organisms are not caught on hooks or within commercial nets. The status of Pacific  
3 herring is not expected to change as a result of the No-action Alternative, as described in Subsection  
4 3.3.2, Non-groundfish Species, because there is an average annual spawning biomass of 12,000 to  
5 15,000 tons. For other non-groundfish species' status, there would be no change under the No-action  
6 Alternative as, most likely, the closed fisheries historically resulted in little catch of these species.

7 Fisheries and research activities would not result in effects to EFH designated for several species of  
8 non-groundfish in the action area because each would be closed under the No-action Alternative.

9 Under the No-action Alternative, no data would be collected by WDFW on stock distribution and  
10 abundance, status, and life history of non-groundfish species in Puget Sound under the No-action  
11 Alternative. This would limit acquisition of new information on habitat associations and status of non-  
12 groundfish species in Puget Sound.

#### 13 **4.3.2.2. Alternative 2: Proposed Action**

##### 14 | **NMFS Issues an ITP and Research Permits; WDFW Authorizes Bottom Fishing in Waters Less** 15 **than 120 Feet and the Shrimp Trawl Fishery with a Requirement for Observers; WDFW** 16 **Conducts Rockfish Research**

17 Similar to the No-action Alternative, there would be no change in life history, or injury to or mortality  
18 of non-listed, non-groundfish species in the set net, set line, bottom fish trawl, bottom fish pot, and  
19 scallop trawl fisheries for a period of 5 years, as these fisheries would remain closed for the agreed  
20 term under the Proposed Action. Under the Proposed Action, bycatch of non-groundfish species would  
21 increase, compared to the No-action Alternative, because they would be captured in several fisheries.  
22 Based on available information, bycatch of non-groundfish species in the commercial shrimp trawl  
23 fishery would be a small fraction of the 15,759 pounds of fish and invertebrates caught annually (refer  
24 to Subsection 2.2.2.1, Fishing Activities under the Proposed Action). Pacific herring have been  
25 documented to occur as bycatch in the commercial shrimp trawl fishery at a rate of approximately 107  
26 fish annually (NMFS 2011); WDFW research trawls would catch approximately 800 fish annually  
27 (Pacunski 2011a). The catch of nearly 1,000 fish would remove only a small fraction of the 12,000 to  
28 15,000 tons of annual spawning biomass of Pacific herring, and therefore not impact species viability.

29 Most non-groundfish species are not caught by recreational bottom fishing because many of these  
30 species occur suspended in the water column (and not in close proximity to the bottom) and thus, are  
31 not exposed to lures or bait. Non-groundfish species that could be caught by recreational bottom fishing

1 could include spiny dogfish, Pacific tomcod, walleye pollock, Pacific hake, Pacific cod, and sablefish  
2 (Olander 1991).

3 Similar to the No-action Alternative, the fisheries and research activities under this alternative would  
4 not alter the abundance of smaller food for non-groundfish species, such as zooplankton, because these  
5 organisms are not caught on hooks or within commercial nets. Compared to the No-action Alternative,  
6 the Proposed Action would result in the death of more non-groundfish species, such as small numbers  
7 of Pacific herring, from research and commercial shrimp trawls. The impact from these deaths and  
8 subsequent loss of food for other non-groundfish species would be small. However, limiting factors  
9 such as derelict fishing gear and water quality problems that include reduced levels of dissolved  
10 oxygen and inputs of toxins such as metals and petroleum products would continue to affect non-listed  
11 groundfish.

12 Research activities and commercial shrimp trawls would occur in areas designated as EFH for several  
13 species of non-groundfish in the action area, including coastal pelagic species (Appendix B: Species of  
14 Fishes with Designated EFH in the Action Area). The effects of bottom trawling on EFH and benthic  
15 habitats are discussed in more detail in Subsection 3.1, Marine Ecosystem and Habitat, and include  
16 sediment disruption, smoothing of sand waves, and general bottom roughness. In addition, the catch of  
17 some prey species may affect EFH. These effects would not adversely affect non-groundfish species'  
18 EFH because they would occur over small spatial and temporal scales, and habitat conditions would  
19 return to functional condition soon after trawling activities cease. The catch of prey species would not  
20 adversely affect EFH because of the small amount of bycatch relative to the overall spawning biomass  
21 of non-groundfish in the Puget Sound.

22 Under the Proposed Action, information regarding stock status, abundance, and distribution of non-  
23 groundfish would be available as a result of WDFW research activities as compared to the No-action  
24 Alternative where this information would not be collected.

#### 25 **4.3.2.3. Alternative 3: Similar to Proposed Action Alternative but with Fewer Restrictions**

#### 26 | **NMFS Issues an ITP and Research Permits; WDFW Authorizes Bottom Fishing without Depth** 27 **Restrictions and Does Not Require Observers in the Shrimp Trawl Fishery; WDFW Conducts** 28 **Rockfish Research**

29 Impacts to non-listed, non-groundfish species under Alternative 3 would be the same as those described  
30 under the Proposed Action.

1

2 **4.4. Marine Mammals and Turtles**

3 **4.4.1. No-action Alternative**

4 | **NMFS Issues No ITP or Research Permits; WDFW Authorizes No Bottom Fish Fishery or**  
5 **Shrimp Trawl Fishery; WDFW Conducts No Research that Might Take Rockfish**

6 Under the No-action Alternative, there would be no recreational bottom fish fishery and no commercial  
7 shrimp trawl, set net, set line, bottom fish trawl, bottom fish pot, and scallop trawl fisheries; thus, there  
8 would be no impact from these fisheries on southern resident killer whale critical habitat, marine  
9 mammal life history, abundance, or fish and invertebrate prey that could be eaten by marine mammals  
10 that include minke whales, grey whales, killer whales, Steller sea lions, northern fur seals, elephant  
11 seals, and harbor seals. Under the No-action Alternative, WDFW research activities would not catch  
12 fishes that could be eaten by marine mammals. Similarly, there would be no interaction between  
13 fishing gear or vessels and marine mammals from these closed fisheries. The presence of  
14 bioaccumulative contaminants within prey along with other limiting factors affecting abundance of  
15 marine mammals would continue to threaten marine mammal health under the No-action Alternative.

16 Turtles are very rare within the action area and, therefore, are not likely to be affected by any of the  
17 alternatives.

18 **4.4.2. Alternative 2: Proposed Action**

19 | **NMFS Issues an ITP and Research Permits; WDFW Authorizes Bottom Fishing in Waters Less**  
20 **than 120 Feet and the Shrimp Trawl Fishery with a Requirement for Observers; WDFW**  
21 **Conducts Rockfish Research**

22 Similar to the No-action Alternative, there would be no set net, set line, bottom fish trawl, bottom fish  
23 pot, and scallop trawl fisheries; thus, there would be no impact from these fisheries on southern  
24 resident killer whale critical habitat, marine mammal life history, abundance, or fish and invertebrate  
25 prey that could be eaten by marine mammals that include minke whales, grey whales, killer whales,  
26 Steller sea lions, northern fur seals, elephant seals, and harbor seals. There would also be no interaction  
27 between fishing gear or vessels and marine mammals from these closed fisheries for a period of 5  
28 years, as these fisheries would remain closed for the agreed term under the Proposed Action.

29 Under the Proposed Action, the authorized recreational bottom fish fishery, authorized commercial  
30 shrimp trawl fishery, and WDFW research activities would occur in portions of southern resident killer

1 whale critical habitat and result in a small decrease in the amount of some prey available for marine  
2 mammals, compared to the No-action Alternative. As described in Subsection 3.3.1, Groundfish  
3 Species, the decrease of groundfish available to marine mammals because of the shrimp trawl fishery  
4 (approximately 15,759 pounds annually) and the recreational bottom fish fishery (approximately  
5 113,000 fish annually) would be very small relative to the estimated amount of groundfish available to  
6 marine mammals in Puget Sound (220 million pounds). Similarly, fisheries and research activities  
7 associated with the Proposed Action would kill a small number of ESA-listed salmonids (Appendix A:  
8 Estimated Numbers of ESA-listed Fish Species to be Incidentally Taken under the Various  
9 Alternatives) that would otherwise be available as prey. As described in Subsection 3.4, Marine  
10 Mammals and Turtles, southern resident killer whales rely upon Puget Sound Chinook salmon as prey,  
11 and to a lesser extent chum salmon, as primary prey within Puget Sound. As described in Subsection  
12 4.2.2, Salmonids, the number of Puget Sound Chinook salmon (Appendix A: Estimated Numbers of  
13 ESA-listed Fish Species to be Incidentally Taken under the Various Alternatives) and chum salmon  
14 killed under the Proposed Action would be an extremely small fraction of the overall populations and,  
15 therefore, would not appreciably reduce prey for southern resident killer whales or alter their critical  
16 habitat.

17 Because the decrease of prey represents an unmeasurable, small fraction of that available in the action  
18 area, the prey decrease would be unlikely to meaningfully affect any marine mammal species.  
19 Similarly, the fisheries and research activities would not catch appreciable numbers of small fish,  
20 benthic invertebrates, or crustaceans that some marine mammals eat (Subsection 3.4, Marine Mammals  
21 and Turtles).

22 Commercial and recreational fishermen would be required to comply with the Marine Mammal  
23 Protection Act (MMPA, 16 U.S.C. 1361 *et seq.*) and the recently issued Protective Regulations for  
24 Killer Whales in the Northwest Region (76 Fed. Reg. 20870, April 14, 2011). As compared to the No-  
25 action Alternative, slightly more vessels would be present in the action area under the Proposed Action.  
26 Additionally, there would be a few more WDFW research vessels than under the No-action Alternative.  
27 The few additional vessels from fisheries and research activities would not tangibly increase the risk to  
28 marine mammals from harassment, vessel strikes, or noise, and would be in compliance with all laws  
29 and regulations.

1 **4.4.3. Alternative 3: Similar to Proposed Action Alternative but with Fewer Restrictions**

2 | **NMFS Issues an ITP and Research Permits; WDFW Authorizes Bottom Fishing without Depth**  
3 **Restrictions and Does Not Require Observers in the Shrimp Trawl Fishery; WDFW Conducts**  
4 **Rockfish Research**

5 Impacts to marine mammals under Alternative 3 would be similar to those described under the  
6 Proposed Action. However, under Alternative 3, the 120-foot depth restriction would not be in effect  
7 and the numbers of deepwater rockfish and lingcod (as described in Subsections 4.2.1, Rockfish  
8 Species, and Subsection 4.3.1, Groundfish Species) caught by anglers would increase. The rockfish  
9 would be released per state law, and thus would remain available as marine mammal prey (even if they  
10 die because of barotraumas). The number of lingcod that would be caught, and therefore unavailable as  
11 marine mammal prey, could be slightly greater than under the Proposed Action, but lingcod make up a  
12 small component of marine mammal diets (e.g., for harbor seals, less than 1 percent) (Lance and  
13 Jeffries 2006) and their retention by anglers would not appreciably affect the overall prey abundance  
14 for marine mammals.

15 Impacts to marine mammals regarding harassment, vessel strikes, or noise would be substantially the  
16 same as described for the Proposed Action. Under Alternative 3, a slightly greater number of  
17 recreational vessels could be present in the action area because there would not be a restriction on  
18 fishing at depths greater than 120 feet. However, this difference is uncertain, and if it did occur, would  
19 be very slight and would not tangibly increase the risk to marine mammals. All vessels in the action  
20 area related to this alternative would comply with applicable laws and regulations.

21 **4.5. Marbled Murrelet**

22 **4.5.1. No-action Alternative**

23 | **NMFS Issues No ITP or Research Permits; WDFW Authorizes No Bottom Fish Fishery or**  
24 **Shrimp Trawl Fishery; WDFW Conducts No Research that Might Take Rockfish**

25 Under the No-action Alternative, there would be no recreational bottom fish fishery and no commercial  
26 shrimp trawl, set net, set line, bottom fish trawl, bottom fish pot, and scallop trawl fisheries; thus, there  
27 would be no impact from these fisheries on marbled murrelet critical habitat; life history that includes  
28 foraging and nesting, and overall abundance; or fish and invertebrate prey. Under the No-action  
29 Alternative, WDFW research activities would not catch fish that could be eaten by marbled murrelets.  
30 Similarly, there would be no interaction between fishing gear or vessels from these closed fisheries and  
31 marbled murrelets.

1 Under the No-action Alternative, marbled murrelets would still be subjected to terrestrial threats that  
2 include the historic and ongoing loss and modification of nesting habitat through commercial timber  
3 harvests, human-induced fires, land conversions, and natural disturbance events (Subsection 3.5,  
4 Marbled Murrelet). Marbled murrelets would still be subjected to marine threats that include changes in  
5 the food web and prey quantity and quality, declining prey populations, commercial and recreational  
6 fisheries for some prey stocks, some continued (but not quantified) gill-net mortality, high body loads  
7 of PCBs in their prey base, and marine areas of low dissolved oxygen (Subsection 3.5, Marbled  
8 Murrelet). However, these threats have been reduced by a declining rate of annual habitat loss,  
9 particularly on Federal lands; improved regulatory mechanisms because of Federal and state listings  
10 and other state and Federal regulations (especially the Northwest Forest Plan); and new gill-netting  
11 regulations in northern California and Washington. Regardless, the listing status of the marbled  
12 murrelet would not be affected by the No-action Alternative.

13 **4.5.2. Alternative 2: Proposed Action**

14 | **NMFS Issues an ITP and Research Permits; WDFW Authorizes Bottom Fishing in Waters Less**  
15 **than 120 Feet and the Shrimp Trawl Fishery with a Requirement for Observers; WDFW**  
16 **Conducts Rockfish Research**

17 Similar to the No-action Alternative, there would be no set net, set line, bottom fish trawl, bottom fish  
18 pot, and scallop trawl fisheries; thus, there would be no impact from these fisheries on marbled  
19 murrelet critical habitat, life history that includes foraging and nesting, abundance, or reduction of fish  
20 and invertebrate prey. There would also be no interaction between fishing gear or vessels from these  
21 closed fisheries and marbled murrelets for a period of 5 years, as these fisheries would remain closed  
22 for the agreed term under the Proposed Action.

23 Under the Proposed Action, the authorized recreational bottom fish fishery and commercial shrimp  
24 trawl fishery, and WDFW research activities would occur, but not in areas designated as critical habitat  
25 for marbled murrelet and, therefore, would not affect these areas. The commercial shrimp trawl fishery  
26 and some research activities would cause a small decrease in the amount of some prey available for  
27 marbled murrelets, which would be documented by observers or scientists, compared to the No-action  
28 Alternative. As described in Subsection 4.3.2, Non-groundfish Species, Pacific herring have been  
29 documented to occur as bycatch in the commercial shrimp trawl fishery at a rate of approximately 107  
30 fish annually (NMFS 2011), and WDFW research trawls would catch approximately 1,000 fish  
31 annually (Pacunski 2011a). Though decreased prey is a limiting factor of marbled murrelets, the catch

1 of just over 1,000 fish would remove a small fraction of the 12,000 to 15,000 tons of annual spawning  
2 biomass of Pacific herring and would not have a noticeable effect on the total amount of prey available.

3 Similarly, as described in Subsection 4.2.3, Eulachon, fisheries and research associated with the  
4 Proposed Action would kill a small number of ESA-listed eulachon that would otherwise be available  
5 as prey for the marbled murrelet. The death of some prey is unlikely to affect marbled murrelets for  
6 several reasons, as discussed in Subsection 3.5, Marbled Murrelet. Marbled murrelets generally forage  
7 in water shallower than the shrimp trawl is allowed to occur. Further, because the decrease of prey as a  
8 result of bycatch represents a small fraction of prey available in the action area, it would be unlikely to  
9 affect marbled murrelets. Similarly, the fisheries and research activities would not catch appreciable  
10 numbers of small fish, benthic invertebrates, or crustaceans that, as described in Subsection 3.5,  
11 Marbled Murrelet, are food sources for marbled murrelets.

12 Marbled murrelets have not been captured in WDFW research activities (Pacunski 2011) or shrimp  
13 fisheries (Roberts 2008) and would not be incidentally captured from fisheries and research activities  
14 under the Proposed Action. Similar to the No-action Alternative, under the Proposed Action, marbled  
15 murrelets would still be subjected to terrestrial threats that include the historic and ongoing loss and  
16 modification of nesting habitat through commercial timber harvests, human-induced fires, land  
17 conversions, and natural disturbance events. Marbled murrelets would still be subjected to marine  
18 threats that include changes in the food web, prey quantity and quality, declining prey populations,  
19 commercial and recreational fisheries for some prey stocks, some continued gill-net mortality, high  
20 body loads of PCBs in their prey base, and marine areas of low dissolved oxygen. However, these  
21 threats have been reduced by a declining rate of annual habitat loss, particularly on Federal lands;  
22 improved regulatory mechanisms because of Federal and state listings and other state and Federal  
23 regulations (especially the Northwest Forest Plan); and new gill-netting regulations in northern  
24 California and Washington. Regardless, the listing status of the marbled murrelet would not be affected  
25 by the Proposed Action.

#### 26 **4.5.3. Alternative 3: Similar to Proposed Action Alternative but with Fewer Restrictions**

#### 27 | **NMFS Issues an ITP and Research Permits; WDFW Authorizes Bottom Fishing without Depth** 28 **Restrictions and Does Not Require Observers in the Shrimp Trawl Fishery; WDFW Conducts** 29 **Rockfish Research**

30 Impacts to marbled murrelets under Alternative 3 would be the same as those described under the  
31 Proposed Action because the research bottom trawl activities and commercial shrimp trawl fishery

1 would be the same under each alternative. The lack of observers on the commercial shrimp trawl  
2 fishery under Alternative 3 would result in no documentation of bycatch of forage fish, such as  
3 eulachon and Pacific herring, that marbled murrelets eat. Consequently, documentation of bycatch of  
4 marbled murrelet prey would not occur, which would preclude an enumeration of bycatch of their prey.  
5 As a result, there would be no way to know the actual number of eulachon and Pacific herring caught,  
6 and no basis for modifying the fishing activities if the numbers are larger than expected.

#### 7 **4.6. Socioeconomics**

##### 8 **4.6.1. No-action Alternative**

##### 9 | **NMFS Issues No ITP or Research Permits; WDFW Authorizes No Bottom Fish Fishery or** 10 **Shrimp Trawl Fishery; WDFW Conducts No Research that Might Take Rockfish**

11 Under the No-action Alternative there would be no set net, set line, bottom fish trawl, bottom fish pot,  
12 or scallop trawl fisheries because these fisheries would remain closed under the regulation (Subsection  
13 1.1, Introduction and Background). Consequently, closures would result in decreased economic  
14 benefits to the Puget Sound economy and to the three representative commercial and recreational  
15 fishing communities discussed in Subsection 3.6, Socioeconomics. Each of these fisheries has  
16 experienced a decline in ex-vessel values between 2005 and 2009; closures under the No-action  
17 Alternative would result in continued economic reduction trends.

18 Additionally, under the No-action Alternative, WDFW would not authorize the recreational bottom fish  
19 fishery or the commercial shrimp trawl fishery. Thus, no economic benefit would occur to commercial  
20 fishers, fish processors, and local economies generated from these fisheries, such as the three  
21 representative fishing communities discussed in Subsection 3.6, Socioeconomics (Seattle, Anacortes,  
22 and Bellingham, Washington). The number of angler trips targeting bottom fish ranged between 68,000  
23 and 105,000 annually between 2004 and 2009, with an average economic value of approximately \$5.6  
24 million annually in recent years (Subsection 2.2.2.1, Fishing Activities under the Proposed Action;  
25 Subsection 3.6, Socioeconomics) (Table 3-1). Fishing trip opportunities targeting bottom fish would  
26 decline to zero, and on average, fishing communities in Puget Sound would lose approximately \$5.6  
27 million annually from closures under the No-action Alternative. This would include impacts to sales of  
28 fishing licenses and tackle, bottom fisheries-related tourism expenditures, and charter fishing  
29 businesses. However, as discussed in Subsection 3.6, Socioeconomics, the approximate \$5.6 million  
30 lost annually from bottom fish fishery closures represents less than 1 percent of the total economic

1 value of the recreational fishery in Washington State (WDFW 2011c and TCW Economics 2008 as  
2 reported in the Application for an Individual Take Permit for ESA-listed species).

3 Similar impacts would occur to the shrimp trawl fishery where an average annual value of  
4 approximately \$142,000 would be lost to communities that support this fishery (Subsection 3.6,  
5 Socioeconomics) (Table 3-2). However, as discussed in Subsection 3.6, Socioeconomics, because the  
6 overall commercial fishing economy regionally is an estimated \$38 million annually, the loss of the  
7 economic benefit from the shrimp trawl fishery would represent only a small percentage decrease.

8 While impacts to a major component of the local and state-wide economy would be realized under the  
9 No-action Alternative through fishery closures, no impacts would occur to other economic sectors  
10 within the Puget Sound region, such as manufacturing and technology, forestry and agriculture, and  
11 other, non-bottom fish-related tourism. Further, fishery closures would not result in measurable, or any,  
12 changes to population totals within the Puget Sound region (Subsection 3.6, Socioeconomics).

13 The most common activity among boaters—fishing—would still remain a key motivation for boating  
14 in preferred locations in Puget Sound under the No-action Alternative because other fisheries would  
15 remain open and because boating would still provide relaxation opportunities (Subsections 3.6,  
16 Socioeconomics).

17 Research activities would not occur under the No-action Alternative, and therefore, any future  
18 economic gains to fishing communities and industries in the action area related to information collected  
19 about overall abundance, species assemblages, distribution, and health would not be realized.

#### 20 **4.6.2. Alternative 2: Proposed Action**

##### 21 | **NMFS Issues an ITP and Research Permits; WDFW Authorizes Bottom Fishing in Waters Less** 22 **than 120 Feet and the Shrimp Trawl Fishery with a Requirement for Observers; WDFW** 23 **Conducts Rockfish Research**

24 Under the Proposed Action, closure by regulation of the set net, set line, bottom fish trawl, bottom fish  
25 pot, and scallop trawl fisheries would have the same socioeconomic effects as described under the No-  
26 action Alternative for the 5-year term of the FCP. As compared to the No-action Alternative, however,  
27 the Proposed Action would have a moderate, positive effect with regard to socioeconomics in the  
28 action area, mostly because of the retention of the recreational bottom fish fishery with hook-and-line  
29 gear as well as the commercial shrimp trawl fishery (Subsection 1.2, Description of the Proposed  
30 Action; Subsection 2.2.2.1, Fishing Activities under the Proposed Action).

1 Recreational bottom fishing that is open for various periods of time within portions of Puget Sound  
2 would remain open under the Proposed Action, thereby continuing to support the fisheries economic  
3 sector and communities in the action area, including the three represented communities discussed in  
4 Subsection 3.6, Socioeconomics (Seattle, Anacortes, and Bellingham, Washington). For example, the  
5 lingcod fishery, which is the most popular bottom fish fishery in Puget Sound, occurs within a 45-day  
6 season in the spring, typically at times that most salmon fisheries are closed in Puget Sound. Thus,  
7 retention of this fishery would result in more opportunities for saltwater recreation in the action area.

8 As discussed in Subsection 3.6, Socioeconomics, the average economic value of this recreational  
9 fishery (bottom fish and other fish) is approximately \$5.6 million annually, with approximately  
10 100,000 fishing trips and a catch of more than 130,000 bottom fish reported in 2008 and 2009 (Table 3-  
11 2) (WDFW 2011c and TCW Economics 2008 as reported in the Application for an Individual Take  
12 Permit for ESA-listed rockfish and eulachon). Economic benefits to fishing communities would occur  
13 through the sales of fishing licenses and tackle, bottom fisheries-related tourism expenditures, and  
14 charter fishing businesses. While economic benefits would be realized under the Proposed Action, as  
15 discussed in Subsection 3.6, Socioeconomics, the approximate \$5.6 million earned annually from  
16 bottom fish fisheries represents less than 1 percent of the total economic value of the recreational  
17 fishery in Washington State (WDFW 2011c and TCW Economics 2008 as reported in the Application  
18 for an Individual Take Permit for ESA-listed species).

19 Socioeconomic impacts in the action area with regard to the retention of the shrimp trawl fishery would  
20 be an average of \$142,000 (catch value) annually (Subsection 3.6, Socioeconomics) (Table 3-2).  
21 Although this number amounts to a very small percentage of the overall Puget Sound commercial  
22 fishing economy (Subsection 3.6, Socioeconomics), it represents an economic benefit for local fish  
23 processors as compared to the No-action Alternative.

24 Impacts to other economic sectors and population totals within the Puget Sound region (Subsection 3.6,  
25 Socioeconomics) would be the same as those described under the No-action Alternative because open  
26 fisheries under the Proposed Action would not impact these sectors or totals. Common activities and  
27 motivations for boaters would also be the same as described under the No-action Alternative.

28 However, unlike the No-action Alternative, research activities would occur under the Proposed Action.  
29 Therefore, potential future economic gains to fishing communities and industries in Puget Sound  
30 related to information collected about overall abundance, species assemblages, distribution, and health

1 would be realized under the Proposed Action Such information could result in additional or continued  
2 fishing opportunities, which would enhance current economic revenues and benefits related to fishing.

3 **4.6.3. Alternative 3: Similar to Proposed Action Alternative but with Fewer Restrictions**

4 | **NMFS Issues an ITP and Research Permits; WDFW Authorizes Bottom Fishing without Depth**  
5 **Restrictions and Does Not Require Observers in the Shrimp Trawl Fishery; WDFW Conducts**  
6 **Rockfish Research**

7 Impacts to socioeconomics within in the action area under Alternative 3 would be the same as those  
8 described under the Proposed Action with one exception. The 120-foot depth restriction would not be  
9 in effect under Alternative 3, which may result in increased fishing trips for deepwater bottom fish,  
10 lingcod, or other benthic or benthopelagic bottom fish as compared to the Proposed Action or the No-  
11 action Alternative. This increased number of fishing trips would provide a very small benefit to the  
12 fisheries economic sector in Puget Sound, including the three representative commercial and  
13 recreational fishing communities discussed in Subsection 3.6, Socioeconomics (Seattle, Anacortes, and  
14 Bellingham, Washington). Compared to the No-action Alternative, this economic benefit, although  
15 likely immeasurable, would occur over the 5-year term of the FCP.

16 **4.7. Environmental Justice**

17 **4.7.1. No-action Alternative**

18 | **NMFS Issues No ITP or Research Permits; WDFW Authorizes No Bottom Fish Fishery or**  
19 **Shrimp Trawl Fishery; WDFW Conducts No Research that Might Take Rockfish**

20 The No-action Alternative would not affect tribal fishing seasons or tribal fisheries in any way. Tribal  
21 fisheries for bottom fish are regulated by the tribes themselves (Northwest Indian Fisheries  
22 Commission. 2010b).

23 Fishing opportunities for bottom fish under the No-action Alternative would be eliminated (except for  
24 the tribal fisheries). However, minority, Hispanic, and low income populations would not be  
25 disproportionately affected over other demographic groups for two reasons. First, CEQ guidelines  
26 suggest that potential environmental justice impacts could occur in an area if the percentage of  
27 minority, Hispanic, and low income populations are meaningfully greater than the percentage of these  
28 population groups in the general population. This is not the case within this action area. Second, all  
29 groups would be affected equally by fishery closures under the No-action Alternative. Opportunities for  
30 fishing in areas that are not closed under the No-action Alternative would remain available to all  
31 population groups and would not favor any one group over any other.

1 Under the No-action Alternative, the recreational bottom fish and commercial shrimp trawl fisheries  
2 would be closed, and affected groups would lose the economic and cultural benefits associated with the  
3 deep water bottom fish fishery. However, these closures would apply to all groups (except tribal  
4 fisheries) and would not disproportionately affect any one group over any other.

5 **4.7.2. Alternative 2: Proposed Action**

6 | **NMFS Issues an ITP and Research Permits; WDFW Authorizes Bottom Fishing in Waters Less  
7 than 120 Feet and the Shrimp Trawl Fishery with a Requirement for Observers; WDFW  
8 Conducts Rockfish Research**

9 The Proposed Action would not affect tribal fishing seasons or target tribal fisheries in any way. Tribal  
10 fisheries for bottom fish are regulated by the tribes themselves (Northwest Indian Fisheries  
11 Commission 2010b).

12 As compared to the No-action Alternative, recreational bottom fishing opportunities and the  
13 commercial shrimp trawl fishery under the Proposed Action would increase (Subsection 1.2,  
14 Description of Proposed Action). Closure of fishing in waters deeper than 120 feet that targets bottom  
15 fish would not preclude the option of allowing such fisheries after the 5-year term of the FCP, but  
16 affected groups would have lost the economic and cultural benefits associated with the deep water  
17 fishery for the 5-year term of the Proposed Action. As compared to the No-action Alternative, the  
18 impact to any given population group from the closure of the deep water fishery would be smaller  
19 because the bottom fish fishery would remain open in waters shallower than 120 feet.

20 There are no data to suggest that any one population group has a disproportionately greater benefit  
21 from fishing opportunities in the action area than any other group. The closure of several other  
22 commercial fisheries (Subsection 1.2, Description of the Proposed Action) would limit the types of fish  
23 available for at least the 5-year term of the FCP. However, minority, Hispanic, and low income  
24 populations would not be disproportionately affected by this reduction because they are not  
25 disproportionately represented in the fishing community.

26 **4.7.3. Alternative 3: Similar to Proposed Action Alternative but with Fewer Restrictions**

27 | **NMFS Issues an ITP and Research Permits; WDFW Authorizes Bottom Fishing without Depth  
28 Restrictions and Does Not Require Observers in the Shrimp Trawl Fishery; WDFW Conducts  
29 Rockfish Research**

30 Impacts regarding environmental justice under Alternative 3 would be the same as those described  
31 under the Proposed Action with one exception. The 120-foot depth restriction would not be in effect

1 under Alternative 3, resulting in more fishing opportunities as compared to the Proposed Action.  
2 Additionally, as compared to the No-action Alternative, there would be an increase in fishing  
3 opportunities in the deep water fishery that targets bottom fish because the fishery would remain open  
4 without restriction. However, this increase in bottom fish fishing opportunities would be equally  
5 available to all population groups, and would not represent a benefit to minority, Hispanic, or low  
6 income groups. There would be no change in impacts regarding environmental justice from the  
7 commercial shrimp trawl fishery because the fishery would be the same as described under the  
8 Proposed Action.

#### 9 **4.8. Tourism and Recreation**

##### 10 **4.8.1. Action Area Overview**

11 No effects to any historical attribute, natural beauty, or scenic quality would occur within the action  
12 area under any alternative (Subsection 3.8, Tourism and Recreation), therefore, there would be no  
13 negative or positive effects to tourism and recreation opportunities associated with these elements of  
14 the action area. Furthermore, tourism to urban centers and within Puget Sound would continue,  
15 including visits to major urban centers and day-cruise opportunities under all alternatives. Recreational  
16 fishing opportunities, primarily salmon fishing opportunities, and scuba diving opportunities would  
17 also be unaffected by any alternative (Subsection 3.8, Tourism and Recreation).

##### 18 **4.8.2. Recreational Rockfish Fisheries**

###### 19 **4.8.2.1. No-action Alternative**

###### 20 | **NMFS Issues No ITP or Research Permits; WDFW Authorizes No Bottom Fish Fishery or** 21 **Shrimp Trawl Fishery; WDFW Conducts No Research that Might Take Rockfish**

22 Under the No-action Alternative, there would be no set net, set line, bottom fish trawl, bottom fish pot,  
23 or scallop trawl fisheries because these fisheries would remain closed under the regulation (Subsection  
24 1.1, Introduction and Background). Although several recreational fisheries have targeted rockfish  
25 within the past several decades, Puget Sound is currently closed to rockfish fishing. Therefore, there  
26 would be no change in the current lack of recreational rockfish fishing opportunities under the No-  
27 action Alternative. Consequently, tourism and recreational opportunities associated with the rockfish  
28 fishery would remain unavailable.

29 No specific data for historic or recent rockfish fisheries are available; however, it is anticipated that the  
30 continued recreational fishery closure would have some negative, but small, impact on recreational

1 opportunities for anglers in Puget Sound under the No-action Alternative (refer to Subsection 4.6,  
2 Socioeconomics, for economic impact information). Most tourist-based recreational fishing in Puget  
3 Sound is associated with salmon fishing because opportunities to fish for other species such as cod and  
4 rockfish have diminished in the past few decades (Subsection 3.8, Tourism and Recreation). Salmon  
5 fishing opportunities would not be affected by the No-action Alternative, and would remain available  
6 to anglers in Puget Sound.

#### 7 **4.8.2.2. Alternative 2: Proposed Action**

##### 8 | **NMFS Issues an ITP and Research Permits; WDFW Authorizes Bottom Fishing in Waters Less 9 than 120 Feet and the Shrimp Trawl Fishery with a Requirement for Observers; WDFW 10 Conducts Rockfish Research**

11 Under the Proposed Action, recreational bottom fishing opportunities in waters less than 120 feet deep  
12 would be retained for at least the 5-year term of the FCP. Compared to the No-action Alternative, this  
13 would provide more recreational fishing opportunities (and associated tourism) for anglers in Puget  
14 Sound, but bottom fishing opportunities would not represent a large proportion of overall recreational  
15 fishing.

16 Approximately 100,000 annual boat-based angler trips targeting bottom fish have occurred per year in  
17 recent times, compared to approximately 350,000 annual trips by anglers targeting salmon (Subsection  
18 2.2.2.1, Fishing Activities under the Proposed Action). Prior to the rockfish fishing closure, an  
19 unknown but smaller subset of the 100,000 annual boat-based angler trips targeting bottom fish  
20 specifically targeted rockfish. Thus, the number of fishing trips targeting bottom fish under the  
21 Proposed Action would be less than 30 percent of the salmon fishery.

22 Currently, Puget Sound is closed to rockfish fishing; therefore, impacts to recreational fishing  
23 opportunities and tourism would be the same as under the No-action Alternative. Additionally, the  
24 Proposed Action would prohibit fishing, including rockfish fishing, at depths greater than 120 feet,  
25 which would also result in impacts similar to those anticipated under the No-action Alternative.

#### 26 **4.8.2.3. Alternative 3: Similar to Proposed Action Alternative but with Fewer Restrictions**

##### 27 | **NMFS Issues an ITP and Research Permits; WDFW Authorizes Bottom Fishing without Depth 28 Restrictions and Does Not Require Observers in the Shrimp Trawl Fishery; WDFW Conducts 29 Rockfish Research**

30 Impacts to tourism and recreation under Alternative 3 would be the same as those described under the  
31 Proposed Action. Although there would be no 120-foot depth restriction on recreational fishing under

1 Alternative 3, Puget Sound is currently closed to rockfish fishing. Therefore, even with the increased  
2 opportunity to fish at greater depths compared to the No-action Alternative or the Proposed Action,  
3 there would be no change in the current lack of recreational rockfish fishing opportunities when  
4 compared to either alternative. Consequently, tourism and recreational opportunities associated with  
5 the rockfish fishery would remain unavailable.

6

1 5. CUMULATIVE IMPACTS

2 **5.1. Context for Analysis**

3 NEPA defines cumulative effects as “the impact on the environment which results from the incremental  
4 impact of the action when added to other past, present, and reasonably foreseeable future actions,  
5 regardless of what agency (Federal or non-Federal) or person undertakes such other actions” (40 CFR  
6 1508.7). Section 3.0, Affected Environment, describes the current status of each resource, which  
7 reflects the effects of past and current actions. The preceding subsections in Section 4.0, Environmental  
8 Consequences, evaluated the effects of No-action and two action alternatives on the current status of  
9 each resource. This section now considers the cumulative effects of the alternatives, where such effects  
10 might occur, in the context of the effects of past actions, current conditions, and reasonably foreseeable  
11 future actions and conditions.

12 **5.2. Other Actions Affecting the Same Environment**

13 Past and current actions affecting the same environment as the alternative actions include:

- 14 • Puget Sound Chinook Harvest Agreement
- 15 • Halibut Management Plan
- 16 • Puget Sound Groundfish Management Plan
- 17 • Northwest Straits Marine Conservation Initiative, Derelict Gear Program
- 18 • WDFW Sportfishing Rules (2010/2011 and 2011/2012)
- 19 • WDFW Puget Sound Rockfish Conservation Plan
- 20 • Puget Sound Chinook Recovery Plan Actions <sup>11</sup>
- 21 • Southern Resident Killer Whale Recovery Plan Actions<sup>10</sup>

22

23 Subsection 1.5, Relationship to Other Plans and Policies, describes the above actions in detail. These  
24 actions collectively address habitat and fishing mortality for ESA-listed rockfish, and some improve  
25 these conditions compared to the recent past. In conjunction with the action alternatives, these actions  
26 would further serve to protect the ESA-listed rockfish species and address some habitat limiting factors  
27 over time. However, limiting factors such as contaminants, nearshore degradation, and derelict fishing  
28 gear would continue to limit recovery of ESA-listed rockfish. Cumulative effects under Alternative 2:

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<sup>11</sup> Recovery plans themselves have no effect on the environment. Implementation of recovery plan actions (such as habitat restoration, research) can affect the environment.

1 Proposed Action would be slightly less protective than under the No-action Alternative, and slightly  
 2 more protective than under Alternative 3: Similar to Proposed Action Alternative.

3  
 4 For ESA-listed rockfish, the cumulative annual mortality from the fisheries associated with the Puget  
 5 Sound Chinook Harvest Agreement and the Halibut Management Plan have been added with the  
 6 mortalities expected with each alternative (Table 5-1).

7

8 Table 5-1. Total authorized annual takes of ESA-listed rockfish.

	Yelloweye	Canary	Bocaccio*
No-action Alternative (plus Salmon and Halibut Fishery)	98	314	26
Alt 2: Proposed Action (plus Salmon and Halibut Fishery)	260	476	77
Alt 3: Similar to Proposed Action with Fewer Restrictions (plus Salmon and Halibut Fishery)	327	532	<77

9 \*No bocaccio have been documented to be caught in the halibut fishery from 2003 - 2009 (WDFW 2011c).

10 The annual mortality estimates are conservative because we consider each caught fish as a mortality  
 11 even though there would be some instances where yelloweye rockfish, canary rockfish, and bocaccio  
 12 survive after their release (WDFW 2011d). However, even if this level of mortality would occur  
 13 annually, it would not impact the viability of the species.

14 The actions described in Subsection 1.5, Relationships to Other Plans and Policies also collectively  
 15 address habitat and fishing mortality for ESA-listed Chinook salmon, Hood Canal chum salmon, Puget  
 16 Sound steelhead, and bull trout. Similar to ESA-listed rockfish, freshwater and Puget Sound limiting  
 17 habitat conditions for ESA-listed salmonids would persist through the 5-year term of the Fishery  
 18 Conservation Plan. Cumulative effects under the Proposed Action would be slightly less protective than  
 19 under the No-action Alternative, and slightly more protective than under Alternative 3.

20 Similarly, the small numbers of ESA-listed Puget Sound Chinook salmon, Hood Canal summer chum  
 21 salmon, and Puget Sound steelhead killed as a result of the Proposed Action would be a small fraction  
 22 of their total numbers and would not affect the species' viability.

23 The actions described in Subsection 1.5, Relationships to Other Plans and Policies also influence  
 24 cumulative effects to marine mammals and turtles, described in Subsection 3.4, Marine Mammals and  
 25 Turtles. These plans and policies influence the number and types of prey available to various marine  
 26 mammals. Cumulative effects under the Proposed Action would be slightly less protective than under

1 the No-action Alternative, and slightly more protective than under Alternative 3. Alternative 3 would  
2 result in more ESA-listed rockfish killed, though these fish would remain available as prey to marine  
3 mammals.

#### 4 **5.3. Climate Change and Ocean Acidification**

5 Climate change is another factor that may affect the Puget Sound/Georgia Basin and ESA-listed and  
6 non-listed rockfish, salmonids, groundfish, and marine mammals. Important climate changes have  
7 occurred in the Puget Sound region in the past century and the next several decades will likely see even  
8 greater changes (Mote et al. 2005 as reported in Drake et al. 2010). Since the late 1800s, Pacific  
9 Northwest temperatures rose faster than the global average, and Puget Sound waters have warmed  
10 substantially since the early 1970s (Ruckelshaus and McClure 2007 as reported in Drake et al. 2010).  
11 As a consequence of regional warming in the 20th century, springtime snow pack has decreased  
12 markedly at many sites in Puget Sound, and the timing of river and stream flow has shifted with  
13 significant reductions in snowmelt runoff in May-July, reduced summer stream flows, and increased  
14 runoff in late winter and early spring (Ruckelshaus and McClure 2007 as reported in Drake et al. 2010).  
15 The effects to the habitats of Puget Sound from runoff, and precipitation changes of the watersheds that  
16 drain into it, are unknown. Projections for the consequences of future global warming in the Puget  
17 Sound region include continued rise of air and marine water temperatures, altered river and stream  
18 flows, increased winter runoff with decreased water stored as snow pack, increased river flooding, and  
19 continued sea level rise (Ruckelshaus and McClure 2007 as reported in Drake et al. 2010). Related  
20 consequences to Puget Sound will likely consist of changes to water quality, circulation patterns,  
21 biological productivity, habitat distributions, populations of sensitive species, rates of harmful algal  
22 blooms, surface wind patterns, and coastal upwelling regimes (Drake et al. 2010).

23 Given the general importance of climate to rockfish recruitment, it is likely that climate strongly  
24 influences the dynamics of the ESA-listed rockfish population productivity and therefore their overall  
25 population viability (Drake et al. 2010). Drake et al. (2010) contains a detailed discussion of the  
26 various threats to the viability of ESA-listed rockfish species and the individual and cumulative effects  
27 of these threats on rockfish conservation and recovery. In summary, recent declines in marine fish  
28 populations in greater Puget Sound may reflect recent climatic shifts; however, it is not known whether  
29 these climatic shifts represent long-term changes or short-term fluctuations that may reverse in the near  
30 future (Drake et al. 2010). Potential long-term threats to ESA-listed rockfish species as a result of  
31 climate change, coupled with other threats such as bycatch by other fisheries, habitat loss, pollutants,

1 and low dissolved oxygen (Drake et al. 2010) could further affect the survival and reproductive success  
2 of rockfish and their prey sources in the Puget Sound/Georgia Basin DPSs.

3 Long-term effects to climate change as a result of either the No-action or the action alternatives  
4 evaluated in this EA are likely to be minor. Impacts to climate change resulting from the Proposed  
5 Action or Alternative 3 would be similar. Outboard motors used by recreational anglers as well as  
6 engines used by commercial fishers and WDFW research boats would initially emit carbon dioxide at  
7 current levels, and emissions could be reduced over the 5-year period of the action alternatives as new  
8 engines become more efficient in response to better technology and improved standards, which are  
9 administered by the Environmental Protection Agency (75 Fed. Reg. 179, September 16, 2010).  
10 Because Alternative 3 does not include the 120-foot depth restriction, more recreational anglers  
11 targeting rockfish could be expected, resulting in slightly more carbon dioxide emissions than under the  
12 Proposed Action. A small reduction of carbon dioxide emissions would be expected under the No-  
13 action Alternative because there would be fewer recreational and commercial fishing trips, and fewer  
14 WDFW research trips in the marine environment.

15 Ocean acidification may also affect ESA-listed rockfish and other fish species in the Puget  
16 Sound/Georgia Basin. Ocean acidification is a global phenomenon resulting from increased carbon  
17 dioxide concentrations in the Earth's atmosphere. Carbonic acid is formed when carbon dioxide  
18 dissolves in sea water, and this chemical reaction leads to acidification. Ocean acidification can disrupt  
19 the process of shell-producing organisms that are an important part of the marine food web, including  
20 krill, oysters, sea urchins, and corals. For marine animals, including some fish, accumulation of CO<sub>2</sub> in  
21 the body may result in changes in the organism's morphology, metabolic state, physical activity, and  
22 reproduction (Symposium on the Ocean in a High CO<sub>2</sub> World 2008). Ocean acidification could  
23 negatively affect the ESA-listed rockfish species, listed and unlisted salmonids, and all species  
24 discussed in this EA because of impacts to important components of the food web, including  
25 invertebrates such as krill. When combined with the potential negative effects from climate change as  
26 discussed above, these effects could hinder conservation efforts as described in Subsection 1.5,  
27 Relationship to Other Plans and Policies. Long-term effects to ocean acidification as a result of either  
28 the No-action or the action alternatives evaluated in this EA are expected to be minor and would be the  
29 same or similar to the effects described above for climate change with regard to emissions from motors  
30 and engines used by recreational anglers and commercial fishers.

1 Climate change is unlikely to have tangible impacts on ESA-listed species that are considered under the  
2 Proposed Action over the next 5 years. The research and adaptive management scheme described in  
3 WDFW's conservation plan would assist in a better understanding of the marine environment and the  
4 effect of long-term climate change upon species of the Puget Sound/Georgia Basin, and the fisheries  
5 restrictions associated with the Proposed Action would not threaten covered species' viability.

6

1 6. AGENCIES CONSULTED

2 Washington State Department of Fish and Wildlife

3 United States Fish and Wildlife Service

4 Tribal coordination is important to NMFS for all NEPA review. On June 1, 2010, NMFS sent a letter to  
5 the Northwest Indian Fisheries Commission that notified them of our preparation of a draft EA and  
6 proposed Incidental Take Permit under section 10(a)(1)(B) of the ESA to WDFW.

7

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- 8

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6

1 9. FINDING OF NO SIGNIFICANT IMPACT FOR SECTION 10 PERMIT APPLICATIONS  
2 BY THE WASHINGTON STATE DEPARTMENT OF FISH AND WILDLIFE FOR  
3 INCIDENTAL TAKE OF ESA-LISTED ROCKFISH AND OTHER LISTED FISH WITHIN  
4 THE PUGET SOUND/GEORGIA BASIN AND TAKE DUE TO SCIENTIFIC RESEARCH

5 National Marine Fisheries Service

6  
7 National Oceanic and Atmospheric Administration Administrative Order 216-6 (NAO 216-6) (May 20,  
8 1999) contains criteria for determining the significance of the impacts of a Proposed Action. In  
9 addition, the Council on Environmental Quality regulations at 40 C.F.R. 1508.27 state that the  
10 significance of an action should be analyzed both in terms of “context” and “intensity.” Each criterion  
11 listed below is relevant in making a finding of no significant impact and has been considered  
12 individually, as well as in combination with the others. The Proposed Action, which NMFS has  
13 determined is the agency’s preferred alternative, is for NMFS to issue the requested permits<sup>12</sup> and for  
14 WDFW to implement the proposed Fishery Conservation Plan and Puget Sound fish research program.  
15 The significance of this action is analyzed based on the NAO 216-6 criteria and CEQ’s context and  
16 intensity criteria. These include:

17 **1) Can the proposed action reasonably be expected to jeopardize the sustainability of any**  
18 **target species that may be affected by the action?**

19 Response: The recreational bottom fish fishery and WDFW research activities would result in the death  
20 of some non-Endangered Species Act (ESA) listed bottomfish. The recreational groundfish fishery and  
21 WDFW research activities permitted under the Proposed Action would not jeopardize the sustainability  
22 of targeted groundfish in Puget Sound because the number of fish caught as a result of each of these  
23 activities would be small relative to the overall estimated biomass of 220 million tons of ground fish in  
24 the action area (Subsection 4.3.2, Proposed Action, 4.3.1 Groundfish Species). The shrimp trawl  
25 fishery harvests several tons of shrimp within the Puget Sound. This fishery takes a small fraction of  
26 the total biomass of shrimp in the action area, and removing a small amount of shrimp would not  
27 jeopardize the sustainability of these target species.

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<sup>12</sup> An incidental take permit under section 10(a)(1)(B) of the ESA that would cover the incidental take of ESA-listed rockfish, Chinook salmon, and eulachon in two state-authorized fisheries in Puget Sound and scientific research permits under section 10(a)(1)(A) of the ESA that would cover the direct take of ESA-listed rockfish, Puget Sound Chinook salmon, Puget Sound steelhead, Hood Canal summer chum salmon, green sturgeon, and eulachon resulting from WDFW scientific research activities on fish.

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1    **2)       Can the proposed action reasonably be expected to jeopardize the sustainability of any**  
2       **non-target species?**

3    Response: The Proposed Action would not jeopardize the sustainability of non-target species for the  
4    following reasons (refer to Subsection 4.2, ESA-listed Fish; 4.3, Non-listed Fish; 4.4, Marine Mammals  
5    and Turtles; and 4.5, Marbled Murrelet for a more detailed rationale):

6    *Rockfish:* Under the Proposed Action, the combined effects to yelloweye rockfish, canary rockfish, and  
7    bocaccio from fishing, research activities, and other continued risk factors unrelated to the Proposed  
8    Action would likely result in a small reduction in abundance and productivity, spatial structure, and  
9    diversity. This small reduction is unlikely to exceed levels that would hinder population sustainability  
10   and would not jeopardize species sustainability. Further, the Proposed Action would result in additional  
11   information about stock status, abundance, and distribution of ESA-listed rockfish that would inform  
12   management and development of measures supporting recovery actions. This information would come  
13   from two sources: (1) the Puget Sound fish research program; and (2) monitoring and reporting data  
14   from the bottom fish fishery and shrimp trawl fishery.

15   *Salmonids:* The mortality from the fisheries and research activities under the Proposed Action would  
16   not impact the sustainability of 22 ESA-listed populations of Puget Sound Chinook salmon, 9  
17   populations of Hood Canal summer chum salmon, and 50 stocks of Puget Sound steelhead because of  
18   the extremely small numbers of fish that would be killed relative to the overall estimated population  
19   sizes. Additionally, there would be no change in life history, or injury to or mortality of ESA-listed  
20   Puget Sound Chinook salmon, Hood Canal summer chum salmon, Puget Sound steelhead, or bull trout  
21   because the set net, set line, bottom fish trawl, bottom fish pot, and scallop trawl fisheries would be  
22   closed for the 5-year term under the Proposed Action. Fisheries and research authorized under the  
23   Proposed Action would result in small and transitory adverse affects to nearshore critical habitat of  
24   Puget Sound Chinook salmon and Hood Canal summer chum salmon because of benthic habitat  
25   disturbance and sediment mobilization (Subsection 4.1.2, Proposed Action, Marine Ecosystem and  
26   Habitat).

27   Under the Proposed Action, additional information about stock status, abundance, and distribution of  
28   ESA-listed Puget Sound Chinook salmon, Hood Canal summer chum salmon, and Puget Sound  
29   steelhead would result from the Puget Sound fish research program. This additional data would provide  
30   information about ESA-listed salmonid distribution, abundance, and trends which would assist with

1 developing measures supporting recovery and management of sustainable populations of these non-  
2 target species.

3 *Eulachon*: The mortality from bycatch of eulachon in the WDFW research trawls and the shrimp trawl  
4 fishery in the North Sound would not impact species sustainability because of the extremely small  
5 number of fish that would be killed relative to the overall estimated population size. In addition, the  
6 life-history expression (ability to feed, avoid predation, migrate and reproduce) of those eulachon not  
7 taken in trawls would not be altered.

8 The fisheries and research authorized under the Proposed Action would not alter eulachon critical  
9 habitat because critical habitat is not designated in marine waters. Further, additional information  
10 regarding eulachon distribution, habitat use, and the abundance of eulachon in Puget Sound would be  
11 gained by WDFW's research activities under the Proposed Action. Also, use of observers in the shrimp  
12 trawl fishery would provide data regarding the distribution and abundance of ESA-listed eulachon,  
13 which would assist with development of measures supporting recovery and management of sustainable  
14 populations of this non-target species.

15 *Green sturgeon*: The overall effects of the Proposed Action on green sturgeon would be negligible; a  
16 few green sturgeon could be captured in research and shrimp trawls, but should survive. If one green  
17 sturgeon is killed, the overall effects to the species, in combination with pre-existing freshwater  
18 limiting factors, would not impact species sustainability because it would be an extremely small  
19 number compared to the overall estimated population size.

20 Additionally, the Proposed Action would result in additional information about green sturgeon  
21 distribution from the Puget Sound fish research program, which would assist with development of  
22 measures supporting recovery and management of sustainable populations. There would be no change  
23 in life history, or injury to or mortality of green sturgeon in the set net, set line, bottom fish trawl,  
24 bottom fish pot, and scallop trawl fisheries for a period of 5 years, as these fisheries would remain  
25 closed for the agreed term under the Proposed Action.

26 *Non-listed groundfish*: The research and recreational fisheries activities permitted under the Proposed  
27 Action should not have a substantial effect on groundfish in Puget Sound because the number of fish  
28 caught as a result of each of these activities would be small relative to the overall estimated biomass of  
29 220 million tons of groundfish in the action area.

1 The research and commercial shrimp trawls under the Proposed Action would occur in areas designated  
2 as EFH for 44 species of groundfish in the action area. The general effects of bottom trawling on EFH  
3 and benthic habitats include sediment disruption, smoothing of sand waves, and bottom roughness.  
4 However, these likely adverse effects to EFH for these non-target groundfish species are would occur  
5 over small spatial and temporal scales, and habitat conditions would return to functional condition soon  
6 after trawling activities cease (Subsection 4.3.1.2, Proposed Action, Non-listed Fish). In addition, the  
7 catch of some prey species may affect EFH. However, the catch of prey species of groundfish, such as  
8 Pacific herring, would not adversely affect EFH because of the small amount of bycatch relative to the  
9 overall biomass of prey species in Puget Sound. Further, under the Proposed Action, information  
10 regarding stock status, abundance, and distribution of non-listed benthic and benthopelagic groundfish  
11 would be available as a result of WDFW research activities, and the additional information would be  
12 available to inform adaptive management of bottom fish fisheries to further minimize effects on  
13 groundfish.

14 *Non-listed, non-groundfish species:* Under the Proposed Action, no change in life history, or injury to  
15 or mortality of non-listed, non-groundfish species, such as Pacific herring and other forage fish, should  
16 occur from the set net, set line, bottom fish trawl, bottom fish pot, and scallop trawl fisheries for a  
17 period of 5 years, as these fisheries would remain closed for the agreed 5-year term. The fisheries and  
18 research activities under this alternative should not alter the abundance of smaller food for non-  
19 groundfish species, such as zooplankton, because these organisms are not caught on hooks or within  
20 commercial nets. The research and commercial shrimp trawls under the Proposed Action is would  
21 result in the death of non-groundfish species, such as small numbers of Pacific herring. However, the  
22 impact from these deaths and subsequent loss of food for other species is should to be small.

23 The research and commercial shrimp trawls under the Proposed Action would occur in areas designated  
24 as EFH for several species of non-groundfish in the action area, including coastal pelagic species.  
25 Effects to EFH of coastal pelagic species are should be minimal because trawl gear does not alter the  
26 pelagic environment. Further, information regarding stock status, abundance, and distribution of non-  
27 groundfish would be available as a result of WDFW research activities.

28 *Marine mammals and turtles:* Under the Proposed Action, there would be no set net, set line, bottom  
29 fish trawl, bottom fish pot, and scallop trawl fisheries; thus, there would be no impact from these  
30 fisheries on Southern Resident killer whale critical habitat, marine mammal life history, abundance, or  
31 fish and invertebrate prey that could be eaten by marine mammals including minke whales, grey

1 whales, killer whales, Steller sea lions, northern fur seals, elephant seals, and harbor seals. There would  
2 also be no interaction between fishing gear or vessels and marine mammals from these closed fisheries  
3 for a period of 5 years.

4 The authorized recreational bottom fish fishery, authorized commercial shrimp trawl fishery, and  
5 WDFW research activities would occur in portions of Southern Resident killer whale critical habitat.  
6 These activities would result in a small decrease in the amount of some prey available for marine  
7 mammals, compared to the other alternatives evaluated. The decrease of groundfish available to marine  
8 mammals because of the shrimp trawl fishery (approximately 15,759 pounds annually) and the  
9 recreational bottom fish fishery (approximately 113,000 fish annually) would be very small relative to  
10 the estimated amount of groundfish available to marine mammals in Puget Sound (220 million  
11 pounds). Similarly, fisheries and research activities associated with the Proposed Action would kill a  
12 small number of ESA-listed salmonids that would otherwise be available as prey. The number of Puget  
13 Sound Chinook salmon and chum salmon killed under the Proposed Action would be an extremely  
14 small fraction of the overall populations and, therefore, the reduction would not appreciably reduce  
15 prey for Southern Resident killer whales or alter their critical habitat.

16 Because the decrease of prey represents a small fraction of that available in the action area, the prey  
17 decrease would be unlikely to meaningfully affect any marine mammal species. Similarly, the fisheries  
18 and research activities should not catch appreciable numbers of small fish, benthic invertebrates, or  
19 crustaceans that some marine mammals eat. Finally, the few additional vessels from fisheries and  
20 research activities under the Proposed Action should not tangibly increase the risk to marine mammals  
21 from harassment, vessel strikes, or noise because they would operate in compliance with all laws and  
22 regulations.

23 *Marbled murrelet*: Under the Proposed Action, there would be no impact on marbled murrelet critical  
24 habitat, life history (including foraging and nesting), abundance, or reduction of fish and invertebrate  
25 prey from the set net, set line, bottom fish trawl, bottom fish pot, and scallop trawl fisheries because  
26 these fisheries would be closed. There would also be no interaction between fishing gear or vessels and  
27 marbled murrelets from these closed fisheries for a period of 5 years. Fisheries and research activities  
28 authorized under the Proposed Action would not occur in areas designated as critical habitat for  
29 marbled murrelet and, therefore, would not affect these areas.

30 Decreased prey abundance is a limiting factor of marbled murrelets; however, the catch of just over  
31 1,000 Pacific herring would remove a small fraction of their 12,000 to 15,000 tons of annual spawning

1 biomass and should not have a noticeable effect on the total amount of prey available. Similarly, the  
2 decrease of prey as a result of bycatch in the authorized fisheries and research activities represents a  
3 small fraction of prey available in the action area, and would be unlikely to affect marbled murrelets.  
4 Further, the fisheries and research activities should not catch appreciable numbers of small fish, benthic  
5 invertebrates, or crustaceans that are food sources for marbled murrelets. Marbled murrelets should not  
6 be incidentally captured during fisheries and research activities under the Proposed Action, and the  
7 listing status of the marbled murrelet would not be affected by the Proposed Action.

8 **3) Can the proposed action reasonably be expected to cause substantial damage to the ocean**  
9 **and coast habitats and/or essential fish habitat as defined under the Magnuson-Stevens**  
10 **Act and identified in FMPs?**

11 Response: NMFS expects a small physical impact or damage to ocean or coastal habitats or essential  
12 fish habitats over small spatial and temporal scales from some bottom trawls associated with the  
13 Proposed Action (Subsection 4.1.2, Proposed Action, Marine Ecosystem and Habitat), for the  
14 following reasons:

15 *Closed fisheries:* There would be no change to the ocean or coastal habitats and EFH related to the set  
16 net, set line, bottom fish trawl, bottom fish pot, and scallop trawl fisheries for a period of 5 years, as  
17 these fisheries would remain closed for the agreed term under the Proposed Action.

18 *Research:* Research mid-water trawls would not come into contact with benthic habitats and, therefore,  
19 would not cause any ocean or coastal habitat and EFH alterations (Subsection 4.1.2, Proposed Action,  
20 Marine Ecosystem and Habitat). Research bottom trawls come into contact with benthic habitats and  
21 could alter ocean habitats used by green sturgeon and salmonids and EFH for several salmonids and  
22 groundfish. Research bottom trawls can alter habitat by suspending sediment and changing habitat  
23 complexity, smoothing of sand waves, and changing bottom roughness in localized areas. Some  
24 WDFW research trawls would occur in the photic zone (such as the nearshore of Puget Sound); thus,  
25 temporary sediment suspension could reduce light levels on a short-term basis, but would be unlikely to  
26 alter benthic habitats because habitat conditions and sediment levels in the nearshore are naturally  
27 dynamic. The probability of the future loss of a trawl net from research activities should be  
28 discountable.

29 *Authorized fisheries:* Effects to coastal pelagic EFH would be minimal because trawl gear does not  
30 alter the pelagic environment (Subsection 4.1.2, Proposed Action, Marine Ecosystem and Habitat).  
31 Jigs, weights, and hooks used by anglers have the potential to alter benthic ocean habitats by snagging

1 structure, and some gear can be lost; however, adverse effects to the seafloor and bottom fish EFH  
2 from lost recreational fishing gear have not been observed in WDFW habitat surveys and are thus  
3 should not occur under the Proposed Action (Subsection 4.1.2, Proposed Action, Marine Ecosystem  
4 and Habitat).

5 Under the Proposed Action, there would be increased activity in the marine ecosystem as a result of the  
6 authorized bottom fish fishery, and shrimp trawl fishery compared to the other alternatives evaluated.  
7 These activities could result in small and temporary changes to habitats, and would not cause  
8 substantial damage. Bottom trawls used in the shrimp trawl fishery come into contact with benthic  
9 habitats and could alter critical habitat for green sturgeon and salmonids, and EFH for several  
10 salmonids and groundfish. Shrimp trawl gear would be used in sandy, muddy/cobble habitats and  
11 would alter portions of the sea floor of the North Puget Sound by suspending sediment and changing  
12 habitat complexity, smoothing of sand waves, and changing bottom roughness in localized areas.  
13 Trawls in less structurally complex habitats, such as areas fished by the commercial shrimp trawlers,  
14 are less affected than areas of more complex habitat (Roberts 2008). The effect of suspended sediment  
15 would be small and temporary as sediment would re-settle to local habitats. Temporary sediment  
16 suspension would not alter light levels (and thus, would not interrupt photosynthesis or affect species  
17 such as eelgrass or kelp) because this suspended sediment is limited to waters deeper than the photic  
18 zone. The shrimp trawls use beam trawl gear (no rockhopper gear would be allowed) and thus, would  
19 not alter areas of rocky bottoms. The probability of the future loss of a trawl net from the commercial  
20 shrimp trawl fishery is discountable.

21 The overall status of the marine ecosystem under the Proposed Action would remain the same. The  
22 research activities and fisheries occurring under the Proposed Action would not degrade the overall  
23 condition of the marine ecosystem of Puget Sound and its habitats because changes to habitat structure  
24 and function would be short term and transitory. Additional information available from WDFW-  
25 conducted research about stock status, abundance, and distribution of Puget Sound fishes under the  
26 Proposed Action would be available to inform development of adaptive management measures for  
27 fisheries and other rockfish recovery efforts. These management efforts could subsequently positively  
28 influence the overall condition of the Puget Sound marine ecosystem and its habitats.

29 **4) Can the proposed action be expected to have a substantial impact on biodiversity and/or**  
30 **ecosystem function within the affected area (e.g., benthic productivity, predator-prey**  
31 **relationships, etc.)?**

32 Response: The inland waters of Washington, including Puget Sound, are heavily impacted by

1 human activities, which impact ecosystem function. The purpose of the proposed fisheries closures,  
2 restrictions, and requirements; and the proposed fish research program is to protect and enhance the  
3 recovery of the ESA-listed populations of yelloweye rockfish, canary rockfish, and bocaccio in  
4 Puget Sound (WDFW 2011d). As explained above in response to Question 3 (Can the proposed  
5 action reasonably be expected to cause substantial damage to the ocean and coast habitats and/or  
6 essential fish habitat as defined under the Magnuson-Stevens Act and identified in FMPs?), the  
7 overall status of the ocean and coastal habitats under the Proposed Action would remain the same.

8 Further, the Proposed Action would not have a substantial impact on biodiversity. The small  
9 numbers of ESA-listed and non-listed fish species killed as a result of the Proposed Action would be  
10 a small fraction of their total numbers and would not affect the species' viability, species  
11 composition, or interrelationship with other species and ecosystem elements that would affect  
12 biodiversity within the action area.

13 **5) Can the proposed action reasonably be expected to have a substantial adverse impact on**  
14 **public health or safety?**

15 Response: The Proposed Action would not have a substantial adverse impact on public health or  
16 safety because the recreational bottom fish fishery, commercial shrimp trawl fishery, and WDFW  
17 research activities would all continue to operate under current laws and regulations specific to each  
18 activity that include protections for public health and safety.

19 **6) Can the proposed action reasonably be expected to adversely affect endangered or**  
20 **threatened species, their critical habitat, marine mammals, or other non-target species?**

21 Response: The Proposed Action would not adversely affect endangered, threatened, and non-listed fish  
22 species in Puget Sound, but would be a benefit to them for the following reasons. WDFW's research  
23 activities, as well as information provided by observers in the shrimp trawl fishery, would provide data  
24 regarding the distribution, habitat use, and abundance of listed and non-listed fish species in Puget  
25 Sound. This data would be used to develop management measures that would support recovery of  
26 listed fish and marine mammals. The fisheries and research activities under the Proposed Action would  
27 not adversely affect marine mammals or other non-target species such as marbled murrelets, some of  
28 which are listed as endangered or threatened (see responses to Question 2 – Can the proposed action  
29 reasonably be expected to jeopardize the sustainability of any non-target species?).

1     **7)     Are significant social or economic impacts interrelated with natural or physical**  
2     **environmental effects?**

3     Response: The effects of the Proposed Action on the social and economic environment, interrelated  
4     with natural or physical environmental effects, are very limited. Possible employment of a few  
5     seasonal personnel needed to carry out the action (e.g., observers on shrimp trawls) is too small to  
6     have any measurable effect on the local economy, nor would environmental effects of the Proposed  
7     Action meaningfully alter natural and physical habitats of the action area. The Proposed Action would  
8     have a moderate, positive effect with regard to socioeconomics in the action area, mostly because of  
9     the retention of the recreational bottom fish fishery as well as the commercial shrimp trawl fishery  
10    (Subsection 4.6.2, Proposed Action, Socioeconomics).

11    Fishery closures under the Proposed Action would result in a small decrease of economic benefits to  
12    the Puget Sound economy for the 5-year term of the action. However, each of these fisheries has  
13    experienced a decline in ex-vessel values between 2005 and 2009, and closures under the Proposed  
14    Action would result in continued economic reduction trends (Subsection 4.6.2, Proposed Action,  
15    Socioeconomics). Potential future economic gains to fishing communities and industries in Puget  
16    Sound related to information collected about overall abundance, species assemblages, distribution, and  
17    health could be realized under the Proposed Action because such information could result in additional  
18    or continued fishing opportunities, which would enhance current economic revenues and benefits  
19    related to fishing.

20    **8)     Are the effects on the quality of the human environment likely to be highly controversial?**

21    Response: The Proposed Action would have insignificant effects on the quality of the human  
22    environment and is not likely to be highly controversial. Rockfish fishing and retention of rockfish  
23    caught as bycatch are already prohibited in most of Puget Sound, while fishing for rockfish in waters  
24    deeper than 120 feet is prohibited throughout the geographic range of the U.S. waters of the Puget  
25    Sound/Georgia Basin rockfish DPSs. Additionally, fishery closures under the Proposed Action are  
26    currently in effect and, at this time, there is no plan to lift these closures (Subsection 4.7, Proposed  
27    Action, Environmental Justice).

28    The Proposed Action continues the State-authorized recreational bottom fish fishery and commercial  
29    shrimp trawl fishery. Retaining the recreational bottom fish fishery provides another opportunity for  
30    recreational anglers, and both fisheries provide some economic benefit to fishing communities in the  
31    Puget Sound region. The Puget Sound fish research program would include continuation of a bottom

1 fish trawl census that has occurred on an annual basis since the late 1980s, a mid-water trawl survey, an  
2 acoustic trawl survey of Pacific herring, and hook-and-line and tagging studies of non-listed rockfish.  
3 Because these activities are representative of the existing research program that occurs in the action  
4 area, these research activities are not expected to be controversial.

5 **9) Can the proposed action reasonably be expected to result in substantial impacts to unique**  
6 **areas, such as historic or cultural resources, park land, prime farmlands, wetlands, wild**  
7 **and scenic rivers, or ecologically critical areas?**

8 Response: The Proposed Action would not result in substantial impacts to unique areas because there  
9 would be no activities associated with the Proposed Action in or near historic or cultural resources,  
10 park land, prime farmlands, wetlands, or wild and scenic rivers for the following reason.

11 As described above in response to Question 3 (Can the proposed action reasonably be expected to  
12 cause substantial damage to the ocean and coast habitats and/or essential fish habitat as defined under  
13 the Magnuson-Stevens Act and identified in FMPs?), small and temporary disturbances to ecologically  
14 important areas like critical habitat or EFH from commercial shrimp and research trawls is likely, but  
15 activities under the Proposed Action are not expected to result in substantial impacts to critical habitat  
16 or EFH. Other unique areas such as those in the question are not present in or near enough to the  
17 proposed action to be affected by it.

18 **10) Are the effects on the human environment likely to be highly uncertain or involve unique**  
19 **or unknown risks?**

20 Response: There are no unique or unknown risks to the human environment that would result from the  
21 Proposed Action. The small numbers of fish taken under the incidental take permit and the scientific  
22 research permit (Subsection 1.2, Description of the Proposed Action) is conservatively estimated  
23 (Appendix A). Other fishery closures, restrictions, and requirements under the Proposed Action are  
24 well-defined, and in many cases currently in effect. Thus, effects on the human environment as a result  
25 of the Proposed Action are not likely to be highly uncertain or involve unique or unknown risks.

26 **11) Is the proposed action related to other actions with individually insignificant, but**  
27 **cumulatively significant impacts?**

28 Response: The proposed action will not cause significant cumulative effects, for the following  
29 reasons. Past and current actions affecting the same environment as the Proposed Action are described  
30 in detail in Subsection 1.5, Relationship to Other Plans and Policies. These actions collectively  
31 address habitat and fishing mortality for ESA-listed rockfish, and some actions improve these

1 conditions compared to the recent past. In conjunction with the Proposed Action, these other actions  
2 would further serve to protect the ESA-listed rockfish species and address some habitat limiting  
3 factors over time. However, limiting factors such as contaminants, nearshore degradation, and derelict  
4 fishing gear would continue to limit recovery of ESA-listed rockfish (Subsection 5.2, Other Actions  
5 Affecting the Same Environment).

6 Mortalities to ESA-listed rockfish resulting from the Puget Sound Chinook Harvest Agreement  
7 (F/NWR/2010/06051) , even when combined with the expected take under the Proposed Action, would  
8 not be expected to impact the viability of the species (Subsection 5.2, Other Actions Affecting the  
9 Same Environment).

10 The actions described in Subsection 1.5, Relationships to Other Plans and Policies, also collectively  
11 address habitat and fishing mortality for ESA-listed Chinook salmon, Hood Canal summer chum  
12 salmon, Puget Sound steelhead, and bull trout. Similar to ESA-listed rockfish, freshwater and Puget  
13 Sound limiting habitat conditions for ESA-listed salmonids would persist through the 5-year term of  
14 the Fishery Conservation Plan. The small numbers of ESA-listed Puget Sound Chinook salmon, Hood  
15 Canal summer chum salmon, eulachon, and Puget Sound steelhead killed as a result of the Proposed  
16 Action would be a small fraction of their total numbers and are not expected to affect the species'  
17 viability even in combination with other, ongoing activities in the action area or its vicinity.

18 The actions described in Subsection 1.5, Relationships to Other Plans and Policies, also influence  
19 cumulative effects to marine mammals and turtles, described in Subsection 3.4, Marine Mammals and  
20 Turtles. These plans and policies influence the number and types of prey available to various marine  
21 mammals. Because the decrease of prey, described in Subsection 4.4.2, Proposed Action, Marine  
22 Mammals and Turtles, represents a small fraction of that available in the action area, the prey decrease  
23 would be unlikely to meaningfully affect any marine mammal species, when combined with other,  
24 ongoing activities in the action area or its vicinity..

25 **12) Is the proposed action likely to adversely affect districts, sites, highways, structures, or**  
26 **objects listed or eligible for listing in the National Register of Historic Places or may**  
27 **cause loss or destruction of significant scientific, cultural, or historical resources?**

28 Response: The Proposed Action would have no adverse effects on districts, sites, highways, structures,  
29 or objects listed or eligible for listing in the National Register of Historic Places or cause loss or  
30 destruction of significant scientific, cultural, or historical resources because the majority of activities  
31 under the Proposed Action would not impact or alter the physical environment, including these

1 structures and resources. Research and commercial shrimp trawls would intermittently and temporarily  
2 affect benthic habitats by suspending sediment and changing habitat complexity, smoothing of sand  
3 waves, and changing bottom roughness in localized areas. The effect of suspended sediments would be  
4 expected to be small and temporary as sediment would re-settle to local habitats (Subsection 4.1.2,  
5 Proposed Action, Marine Ecosystem and Habitat). This very minor effect on benthic habitat and  
6 suspended sediment will not happen by, and is unrelated to historic or potentially historic places or  
7 scientific, cultural and historical resources.

8 **13) Can the proposed action reasonably be expected to result in the introduction or spread of**  
9 **non-indigenous species?**

10 Response: The Proposed Action would not import, introduce, or contribute to the spread of non-  
11 indigenous species because vessels and equipment used for the fish research program and commercial  
12 shrimp trawls are already in use locally by the WDFW or commercial fishers, respectively, or would be  
13 fabricated or purchased for the action. Vessels used by recreational fishers could potentially result in  
14 the introduction or spread of non-indigenous species. However, recreational fishing vessels are  
15 currently present in the action area already must follow WDFW guidelines for boaters to follow to  
16 prevent the transfer of non-native organisms to waters of the state. Any small increase in numbers of  
17 vessels because of the recreational rockfish fishery would not result in a meaningful change in the  
18 likelihood of introduction or spread of non-indigenous species. In addition, Washington State regulates  
19 the importation of potentially invasive species under RCW 77.12.020. Numerous aquatic species may  
20 not be possessed, imported, purchased, sold, propagated, transported, or released into state waters. The  
21 overall number of vessels operating in the action area is not likely to measurably change, and any  
22 associated risk of introduction or spread of non-indigenous species would not be affected by the  
23 Proposed Action.

24 **14) Is the proposed action likely to establish a precedent for future actions with significant**  
25 **effects or represent a decision in principle about a future consideration?**

26 Response: The Proposed Action does not establish a precedent for future actions or represent a decision  
27 in principle because the Proposed Action is similar to previous actions to protect other ESA-listed  
28 species.

29 **15) Can the proposed action reasonably be expected to threaten a violation of Federal, state,**  
30 **or local law or requirements imposed for the protection of the environment?**

31 Response: The Proposed Action would not threaten a violation of Federal, state, tribal, and local law or

1 requirements to protect the environment because it will be conducted in a manner complementary to  
2 plans that support ESA-listed rockfish and other ESA-listed species' recovery. The Proposed Action  
3 would be limited to those activities necessary to fulfill WDFW's research needs and other fisheries  
4 regulations and restrictions designed to protect the populations of ESA-listed rockfish and other listed  
5 fish species as described in Subsection 1.2, Description of the Proposed Action, and would be  
6 conducted in a manner consistent with all laws.

7 **16) Can the proposed action reasonably be expected to result in cumulative adverse effects**  
8 **that could have a substantial effect on the target species or non-target species?**

9 Response: The Proposed Action would not result in cumulative adverse effects because it will benefit  
10 the target species (ESA-listed rockfish), as well as other ESA-listed fish species and non-target fish  
11 species. As described above in response to Question 11 (Is the proposed action likely to adversely  
12 affect districts, sites, highways, structures, or objects listed or eligible for listing in the National  
13 Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or  
14 historical resources?), the closure of the set net, set line, bottom fish trawl, bottom fish pot, and scallop  
15 trawl fisheries for the 5-year term of the Proposed Action would prevent direct and incidental capture  
16 of any fish species in these fisheries. Additionally, information about stock status, abundance, and  
17 distribution of ESA-listed and non-listed fish species from the Puget Sound fish research program and  
18 on-board observers in the commercial shrimp trawl industry would provide information about ESA-  
19 listed salmonid distribution, abundance, and trends that would be used to inform fisheries management  
20 decisions.

21 Subsection 1.5, Relationship to Other Plans and Policies, describes in detail past and current actions  
22 affecting the same environment as the Proposed Action. These actions collectively address habitat and  
23 fishing mortality for ESA-listed rockfish and other listed fish, and some actions improve these  
24 conditions compared to conditions from the recent past. In conjunction with the Proposed Action, these  
25 actions would further serve to protect the ESA-listed rockfish species and other listed fish and address  
26 some habitat limiting factors over time. However, limiting factors such as contaminants, nearshore  
27 degradation, and derelict fishing gear would continue to limit recovery of ESA-listed rockfish.

28 The actions described in Subsection 1.5, Relationships to Other Plans and Policies, also collectively  
29 address habitat and fishing mortality for ESA-listed Chinook salmon, Hood Canal chum salmon, Puget  
30 Sound steelhead, and bull trout. Similar to ESA-listed rockfish, freshwater and Puget Sound limiting  
31 habitat conditions for ESA-listed salmonids would persist through the 5-year term of the Fishery

1 Conservation Plan. Similarly, the small numbers of ESA-listed Puget Sound Chinook salmon, Hood  
2 Canal summer chum salmon, Puget Sound steelhead killed and eulachon as a result of the Proposed  
3 Action would be a small fraction of their total numbers and would not affect the species' viability.

4 Climate change is another factor that may affect the Puget Sound/Georgia Basin and ESA-listed and  
5 non-listed rockfish, salmonids, groundfish, and marine mammals. Important climate changes have  
6 occurred in the Puget Sound region in the past century and the next several decades will likely see even  
7 greater changes (Mote et al. 2005 as reported in Drake et al. 2010). Given the general importance of  
8 climate to rockfish juvenile recruitment, it is likely that climate strongly influences the dynamics of the  
9 ESA-listed rockfish population productivity and therefore their overall population viability (Drake et  
10 al. 2010). Recent declines in marine fish populations in greater Puget Sound may reflect recent climatic  
11 shifts; however, it is not known whether these climatic shifts represent long-term changes or short-term  
12 fluctuations that may reverse in the near future (Drake et al. 2010). Potential long-term threats to ESA-  
13 listed rockfish species as a result of climate change, coupled with other threats such as bycatch by other  
14 fisheries, habitat loss, pollutants, and low dissolved oxygen (Drake et al. 2010) could further affect the  
15 survival and reproductive success of rockfish and their prey sources in the Puget Sound/Georgia Basin  
16 DPSs. Long-term effects to climate change as a result of the Proposed Action are likely to be  
17 negligible. Outboard motors used by recreational anglers as well as engines used by commercial fishers  
18 and WDFW research boats would initially emit carbon dioxide at current levels, and emissions could  
19 be reduced over the 5-year period of the Proposed Action as new engines become more efficient in  
20 response to better technology and improved standards, which are administered by the Environmental  
21 Protection Agency (75 Fed. Reg. 179, September 16, 2010).

22 Ocean acidification may also affect ESA-listed rockfish and other fish species in the Puget  
23 Sound/Georgia Basin. Ocean acidification can disrupt the process of shell-producing organisms that are  
24 an important part of the marine food web, including krill, oysters, sea urchins, and corals. For marine  
25 animals, including some fish, accumulation of CO<sub>2</sub> in the body may result in changes in the organism's  
26 morphology, metabolic state, physical activity, and reproduction (Symposium on the Ocean in a High  
27 CO<sub>2</sub> World 2008). Ocean acidification could negatively affect the ESA-listed rockfish species, listed  
28 and unlisted salmonids, and all species discussed in this EA because of impacts to important  
29 components of the food web, including invertebrates such as krill. When combined with the potential  
30 negative effects from climate change as discussed above, these effects could hinder conservation efforts  
31 as described in Subsection 1.5, Relationship to Other Plans and Policies. Long-term effects to ocean  
32 acidification as a result of the Proposed Action would be negligible and would be the same or similar to

1 the effects described above for climate change with regard to emissions from motors and engines used  
2 by recreational anglers and commercial fishers.

3 **9.1. List of Reviewers**

- 4  Kate Hawe, NWR NEPA Coordinator
- 5  Donna Darm, NWR Protected Resources ARA
- 6  Barry Thom, NWR Deputy Administrator
- 7  Jane Hannuksela, General Counsel Northwest
- 8  Lynne Barre, NWR Protected Resources

9 **9.2. Determination**

10 In view of the information presented in the EA and analysis (Section 4, Environmental Consequences)  
11 prepared for the action titled "Section 10 Permit Applications by the Washington State Department of  
12 Fish and Wildlife for Incidental Take of ESA-Listed Rockfish and Other Listed Fish within the Puget  
13 Sound/Georgia Basin and Take Due to Scientific Research," I have determined that issuance of permits  
14 by NMFS will not significantly impact the quality of the human environment as described above and in  
15 the EA. In addition, all beneficial and adverse impacts of the Proposed Action have been addressed to  
16 reach the conclusion of no significant impacts. Accordingly, preparation of an Environmental Impact  
17 Statement is not necessary.

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19  
20 William W. Stelle Jr., Regional Administrator  
21 NMFS Northwest Region  
22 Seattle, Washington  
23

  
Date

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**Appendix A**

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Estimated Numbers of ESA-listed Fish Species  
to be Incidentally Taken under the Various Alternatives

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	Recreational			Shrimp Trawls			Research			Annual Takes*		
	Alt 1	Alt 2	Alt 3	Alt 1	Alt 2	Alt 3	Alt 1	Alt 2	Alt 3	Alt 1	Alt 2	Alt 3
Bocaccio	0	38	<38	0	5	5	0	8	8	0	51	<51
Canary Rockfish	0	128	194	0	10	10	0	24	24	0	162	228
Yelloweye Rockfish	0	142	219	0	10	10	0	10	10	0	162	239
Eulachon, adult	0	0	0	0	3,240	3,240	0	<del>54062</del> 0	<del>54062</del> 0	0	<del>3,780</del> 860	<del>3,780</del> 860
PS Chinook Salmon	0	42	42	0	50	50	0	108	108	0	200	200
PS Steelhead	0	0	0	0	0	0	0	<del>2824</del>	<del>2824</del>	0	<del>2824</del>	<del>2824</del>
Hood Canal Summer Chum Salmon	0	0	0	0	0	0	0	<del>4311</del>	<del>4311</del>	0	<del>4311</del>	<del>4311</del>
Green Sturgeon	0	0	0	0	1	1	0	<del>32</del>	<del>32</del>	0	<del>43</del>	<del>43</del>

\*Includes lethal and non-lethal take. No bull trout are expected to be taken.

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## **Appendix B**

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### Species of Fishes with Designated EFH in the Action Area

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<b>EFH Groundfish Species</b>		
English sole	Pacific ocean perch	flathead sole
<i>Parophrys vetulus</i>	<i>S. alutus</i>	<i>Hippoglossoides elassodon</i>
soupfish shark	redbanded rockfish	Pacific sanddab
<i>Galeorhinus galeus</i>	<i>S. babcocki</i>	<i>Citharichthys sordidus</i>
spiny dogfish	rosethorn rockfish	petrale sole
<i>Squalus acanthias</i>	<i>S. helvomaculatus</i>	<i>Eopsetta jordani</i>
big skate	rougeye rockfish	rex sole
<i>Raja binoculata</i>	<i>S. aleutianus</i>	<i>Glyptocephalus zachirus</i>
California skate	sharpchin rockfish	rock sole
<i>R. inornata</i>	<i>S. zacentrus</i>	<i>Lepidopsetta bilineata</i>
Longnose Skate	shortbelly rockfish	sand sole
<i>R. rhina</i>	<i>S. jordani</i>	<i>Psettichthys melanostictus</i>
ratfish	shortraker rockfish	starry flounder
<i>Hydrolagus colliei</i>	<i>S. borealis</i>	<i>Platichthys stellatus</i>
Pacific rattail	silverygray rockfish	chilipepper
<i>Coryphaenoides acrolepis</i>	<i>S. brevispinis</i>	<i>S. goodei</i>
lingcod	splitnose rockfish	shortspine thornyhead
<i>Ophiodon elongatus</i>	<i>S. diploproa</i>	<i>Sebastobolus alascanus</i>
Pacific cod	stripetail rockfish	arrowtooth flounder
<i>Gadus macrocephalus</i>	<i>S. saxicola</i>	<i>Atheresthes stomias</i>
sablefish	vermillion rockfish	darkblotched rockfish
<i>Anoplopoma fimbria</i>	<i>S. miniatus</i>	<i>S. crameri</i>
aurora rockfish	widow rockfish	butter sole
<i>Sebastes aurora</i>	<i>S. entomelas</i>	<i>Isopsetta isolepis</i>
black rockfish	yellowtail rockfish	curlfin sole
<i>S. melanops</i>	<i>S. flavidus</i>	<i>Pleuronichthys decurrens</i>
blue rockfish	Dover sole <i>Microstomus pacificus</i>	greenspotted rockfish
<i>S. mystinus</i>		<i>S. chlorostictus</i>
bocaccio		greenstriped rockfish
<i>S. paucispinis</i>		<i>S. elongatus</i>
<b>EFH Coastal Pelagic Species</b>		
anchovy <i>Engraulis mordax</i>	Pacific sardine <i>Sardinops sagax</i>	Pacific mackerel <i>Scomber japonicus</i>
jack mackerel <i>Trachurus symmetricus</i>	market squid <i>Loligo opalescens</i>	
<b>EFH Pacific Salmon Species</b>		
Chinook salmon <i>Oncorhynchus tshawytscha</i>	coho salmon <i>O. kisutch</i>	Puget Sound pink salmon <i>O. gorbuscha</i>

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