Revised

Biological Evaluation for the General NPDES Permit for Offshore Seafood Processing Discharge within Federal Waters Off the Coasts of Washington and Oregon

Permit No. WAG520000

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Originally submitted: August 2015
Revised by EPA: May 2017

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BACKGROUND

1.1 PROJECT HISTORY

The U.S. Environmental Protection Agency (EPA) is proposing to issue a National Pollutant Discharge Elimination System (NPDES) General Permit, subsequently referred to as the "Draft Permit," for the discharge of seafood processing wastes by offshore seafood processors in Federal Waters off the coast of Washington and Oregon.

Section 301(a) of the Clean Water Act (CWA) provides that the discharge of pollutants to surface waters of the United States is unlawful except in accordance with an NPDES permit.

The EPA is proposing that permitted offshore seafood processing facilities will be authorized to discharge seafood processing wastes in accordance with effluent limitations, monitoring requirements, and other conditions set forth in the Draft Permit under the provisions of a General Permit.

1.2 FEDERAL ACTION HISTORY

This is a new General Permit, and the EPA has not previously completed consultation with the U.S. Fish and Wildlife Service (USFWS) USFWS and the National Marine Fisheries Service (NMFS) (also referred to as "the Services") regarding this General Permit under the Endangered Species Act (ESA) or the Magnuson-Stevens Act (MSA). However, the EPA originally proposed the draft General Permit for public notice in August of 2015, and submitted a Biological Evaluation (BE) to the Services at that time. On September 29, 2015, the USFWS notified the EPA that it did not concur with the EPA's determination that the General Permit was not likely to adversely affect ESA-listed species, and recommended that EPA reinitiate consultation, specifically with regard to the marbled murrelet and the short-tailed albatross. On December 18, 2015, the NMFS concurred with the EPA's determination that the General Permit is not likely to adversely affect ESA-listed species, and provided conservation recommendations to protect Essential Fish Habitat. Since its original public notice and ESA effects determination, the EPA has performed significant research and has improved the General Permit based on feedback from the USFWS and the NMFS, as well as other partner agencies and Tribes, and the seafood processing industry.

The EPA's revisions to the General Permit include the following:

- Inclusion of a seasonal prohibition on wastewater discharges in waters shallower than 100 meters in depth;
- Inclusion of a year-round discharge prohibition over the Heceta/Stonewall Banks complex;
- Clarification on the jurisdiction of the General Permit;
- The addition of a Best Management Practice (BMP) that vessels must be moving while discharging in order to aid dispersion of the discharge;
- Clarification of terminology used in the General Permit;
- Clarification of the Sea Surface Monitoring Requirements;
- Additional provisions to mitigate impact to seabirds;
- Updates to the standard NPDES language and conditions;

- Revisions to the Notice of Intent (NOI) for permit coverage; and
- Revisions to the Annual Report.
- Other factors that the EPA considered prior to re-proposing this draft General Permit based on comments received (e.g., harmful algal blooms and scientific study sites).

SECTION 2.0

DESCRIPTION OF ACTION AND ACTION AREA

2.1 DISCUSSION OF FEDERAL ACTION AND LEGAL AUTHORITY

The federal action that is the subject of this BE is EPA's proposed issuance of the NPDES General Permit for Seafood Processors in Federal Waters offshore of the States of Washington and Oregon. NPDES permits are written for a term of five years, after which the permit conditions are reviewed and a renewed permit is issued, subject to applicable regulatory changes, changes to water quality, or changes deemed acceptable by EPA.

2.1.1 Endangered Species Act [16 U.S.C. § 1531 et al.]

Section 7(a) of the Endangered Species Act ("ESA"), 16 U.S.C. Section 1536(a), requires that each federal agency:

- in consultation with the Services insure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any listed species or to result in the destruction or adverse modification of any designated critical habitat of each such species (Section 7(a)(2)); and
- confer with the Services on any agency action that is likely to jeopardize the continued existence of any species that is proposed for listing or result in the destruction or adverse modification of any critical habitat proposed to be designated for any such species (Section 7(a)(4)).

A BE provides an analysis of the potential effects of a proposed federal agency action on any proposed and listed species or the designated critical habitat of any such species based on the best scientific or commercial information available. This BE was prepared to assist the EPA Region 10 and the Services in carrying out their activities pursuant to ESA Sections 7(a)(2) and 7(a)(4) as they pertain to EPA's proposed approval of the Draft Permit. The ESA requires federal agencies to review their actions as they apply to proposed and listed species.

2.1.2 Magnuson-Stevens Fishery Management and Conservation Act [U.S.C. § 1801 et al.]

The Magnuson-Stevens Act of 1976 (16 U.S.C. § 1801, et seq.) authorizes the U.S. to manage its fishery resources in an area extending from a State's territorial sea (usually 3 nm from shore) to 200 nm (4.8 km to 320 km) off its coast, termed the EEZ. The management of these marine resources is vested in the Secretary and in regional Fishery Management Councils. In the region affected by the Draft Permit, the Pacific Fishery Management Council (PFMC) is responsible for preparing Fisheries Management Plans (FMPs) for marine fishery resources requiring conservation and management.

The Sustainable Fisheries Act of 1996 (SFA; Public Law 104-297) reauthorized and made significant amendments to the Magnuson-Stevens Act. While the original focus of the Magnuson-Stevens Act was to Americanize the fisheries off the coasts of the U.S., the SFA included provisions aimed at the development of sustainable fishing practices in order to guarantee a continued abundance of fish and continued opportunities for the U.S. fishing industry. The SFA included provisions to prevent overfishing, ensure the rebuilding of overfished stocks, minimize bycatch, identify and conserve essential fish habitat, and address impacts on fish habitat.

The 1996 amendments to the Magnuson-Stevens Fishery Management and Conservation Act set forth a number of new mandates for the NMFS, regional fishery management councils, and other federal agencies to identify and protect important marine and anadromous fish habitat. The Councils, with assistance from NMFS, are required to delineate “essential fish habitat” (EFH) for all managed species. Federal action agencies that may adversely impact EFH are required to consult with NMFS regarding the potential effects of their actions on EFH, and respond in writing to the fisheries service’s recommendations.

The EFH regulations define an adverse effect as “any impact which reduces quality and/or quantity of EFH and may include direct (e.g. contamination or physical disruption), indirect (e.g. loss of prey, reduction in species’ fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.” NMFS or a Council may recommend measures for attachment to the federal action to protect EFH; such recommendations are advisory, not proscriptive, in nature.

2.2 PERMIT PURPOSE AND OBJECTIVES

2.2.1 Seafood Processing Procedures and Discharge Characterization

The quantity and character of the seafood processing wastes generated in the action area of the Draft Permit vary slightly due to the species of fish processed, seasonal variation in their abundance, and the openings and closings of fishing seasons that are used to manage the target and non-target stocks of fish and shellfish species. Although there are slight variations in processing wastes from different fisheries, the discharges and affects to ESA species described here for Pacific whiting processing are representative of the full array of effects that may be found from other types fisheries processing proposed to be covered by the Draft Permit.

The Pacific Whiting Fishery is the largest fishery proposed to be authorized under the Draft Permit. In 2011, the United States Pacific whiting industry was valued at USD 27 million (SeafoodSource.com, 2011). Whiting are caught off the coast of Washington, Oregon, Northern California and British Columbia. The fish are converted into headed and gutted fish, fillets, mince blocks, surimi (the basis for imitation crab), fishmeal, and fish oil. The U.S. West Coast fishery is comprised of three sectors:

- Mothership fishery, where catcher vessels deliver their fish directly to motherships that operate in Federal Waters.
- At-sea catcher–processor fleet that both harvests and processes whiting at sea (again in Federal Waters).
- Shore-based fleet that delivers its harvest to shore-based processing plants.

The Draft Permit covers the first two sectors of the whiting industry. The whiting fishery is closely managed by a combination of limits on target and bycatch species for specific management zones and fishery sectors.

The catcher-processor sector of the fishery is composed of vessels that harvest and process whiting (the fleet has typically been six to seven vessels since the formation of the Pacific Whiting Conservation Cooperative in 1997). The mothership sector is composed of a number of catcher vessels that harvest whiting for delivery to motherships. Typically, three to five motherships operate in the fishery, with one mothership also servicing the tribal fleet; each mothership is typically serviced by three to four catcher vessels. Motherships are vessels that process, but do not harvest.

Since 1998, at-sea harvests by motherships and catcher-processors have ranged from 63,000 metric tons (mt.) to 128,000 mt. In 2011, 56% of the at-sea processing volume was performed by catcher-processors, and 44% was performed by motherships (PFMC, 2011b). The amount of non-whiting groundfish harvested by this fleet is quite small, often in the range of less than half of one percent of total catch (PFMC, 2008).

The majority of the whiting harvested by the non-tribal at-sea fleet is processed into finished product and then transported by sea to foreign markets.

The catcher-processor fleet and mothership fleet in recent years have typically harvested a major portion of their allocations during May and June. After June, most of the vessels leave to fish in Federal Waters off Alaska. The vessels often return in late August or September to fish the remainder of their allocations. During the summer months, a few processors (mothership or catcher-processors) may remain to continue fishing for whiting.

Based on communications with the offshore seafood processing sector (including Annual Reports submitted by vessels covered by the EPA General Permit for Offshore Seafood Processors in Alaska (AK-G52-4000) for their operations off the coast of Washington and Oregon, and a response to an EPA information request), as well as a review of NOAA permits for the West Coast At-sea Whiting sector (NOAA Pacific Coast Fisheries 2016), the EPA expects 16 vessels (10 catcher-processors and 6 motherships) to apply for coverage under this forthcoming General Permit. More detailed information about each vessel's operations with regard to this General Permit is provided in Table 2.1.

Table 2.1. Information provided to the EPA on April 6, 2017 by the offshore seafood processing fleet in response to an EPA information request.

Seafood Company	Vessel Name	Mother-ship or catcher/ processor	% of time running fish meal	% of time running fish oil	% of time discharging ground offal without any byproduct recovery	Total pounds seafood waste discharged over the 2016 year	Max pounds seafood waste discharged during a single month (specify which)	% by-product recovery (2016 average)	Dates of operation in WA/OR offshore waters in 2016
American Seafood	Eagle	CP	100%	100%	0%	1,409,657 lbs.	400,277 lbs. Oct	3.5%	5/15-5/31, 6/1-6/2, 10/1-10/24, 10/28-10/31, 11/1-11/17
American Seafood	Triumph	CP	100%	100%	0%	1,176,091 lbs.	359,460 lbs. Oct	3.5%	5/17-5/31, 9/1-9/4, 9/14-9/25, 10/3-10/22, 10/27-10-31, 11/1-11/15

American Seafood	Jaeger	CP	100%	100%	0%	733,436 lbs.	305,964 lbs. June	3.5%	5/16-5/31, 6/1, 6/5-6/25, 9/22-9/29
American Seafood	Rover	MS	100%	100%	0%	1,106,623 lbs.	303,039 lbs. May	3.5%	5/16-5/31, 6/3-6/20, 9/13-9/30, 10/1-10-15
American Seafood	Dynasty	CP	100%	100%	0%	1,092,666 lbs.	422,222 lbs. Oct	3.5%	5/17-5/31, 6/1, 9/14-9/28,10/02-10/17, 10/23-10/31, 11/1-11/9
Artic Storm	Artic Storm	MS for West Coast whiting operations	>99%	>99%	0%	1,360,001 lbs. of solid organic waste discharged	481,843 lbs. of solid organic waste discharged September	~2% of total delivered lbs.	5/15/-6/8, 9/9-10/31
Artic Storm	Arctic Fjord	MS for West Coast whiting operations	0%	0%	100%	2,019,926 lbs. of solid organic waste discharged	1,506,328 lbs. of solid organic waste discharged May	0%	5/15-6/7
Glacier	Alaska Ocean	CP for West Coast whiting operations	100%	100%	0%	889,501 lbs. of solid organic waste discharged	471,593 lbs. of solid organic waste discharged May	5.5%	5/15-6/14, 9/16-10/6
Glacier	Pacific Glacier	CP for West Coast whiting operations	0%	0%	100%	2,700,816 lbs. of solid organic waste discharged	1,115,817 lbs. of solid organic waste discharged May	0%	5/16-6/4, 10/1-11/22
Golden Alaska	M/V Golden Alaska	MS for West Coast whiting operations	100%	100%	0%	315,522 lbs.	187,626 lbs. May	4%	5/17-6/1, 6/4-6/17

Phoenix Processor Limited Partnership	Excellence	MS for West Coast whiting operations	>99% with brief periods of non-operation during maintenance and cleaning	>99% with brief periods of non-operation during maintenance and cleaning	<1% during brief periods of non-operation of fish meal plant during maintenance and cleaning	1,967,629 lbs. of solid organic waste discharged	500,140 lbs. of solid organic waste discharged July	~4% of total raw fish delivered lbs.	5/15-6/18, 6/25-7/27, 8/5-9/6, 9/12-10/13, 10/21-11/3
Phoenix Processor Limited Partnership	Ocean Phoenix	MS for West Coast whiting operations	0%	0%	0%	0	0	0%	Did not operate in Pacific Whiting fishery in 2016
Trident	Island Enterprise	CP for West Coast whiting operations	100%	100%	0%	1,010,868 lbs. of solid organic waste discharged	291,743 lbs. of solid organic waste discharged May	~8% of total delivered lbs.	5/16-5/31, 6/5-6/19, 10/8-10/13, 10/17-10/25, 11/4-11/19
Trident	Kodiak Enterprise	CP for West Coast whiting operations	0%	24.5%	75.5%	3,378,923 lbs. of solid organic waste discharged	1,133,545 lbs. of solid organic waste discharged Oct	~0.023% of total delivered lbs. (only ran oil operations in May at 0.078%)	5/15-5/27, 6/1-6/15, 9/25-10/8, 10/17-10/27
Trident	Seattle Enterprise	CP for West Coast whiting operations	0%	23.6%	76.4%	3,364,937 lbs. of solid organic waste discharged	993,905 lbs. of solid organic waste discharged May	~0.06% % of total delivered lbs. (only ran oil operations in May at 0.21%)	5/15-5/26, 5/31-6/12, 10/17-10/30, 11/3-11/18

Note: Byproduct recovery machinery may periodically cease operations during periods of startup, shutdown, and cleaning.

The location of processing varies continually. Both the catcher-processors and the motherships are in continual motion while processing. All processing occurs in Federal Waters.

The recovered products vary between processors, and the individual processors alter their end products according to need and quality of catch. For example, a processor may alter the processing flow to produce an end product of H&G (headed and gutted) fish rather than extending the processing to a final product of fillets or surimi. If fillets are produced, the mechanical filleting or deboning processes produce relatively large amounts of solid and liquid wastes. Solid wastes remaining after other production steps may be further processed into fish meal, converting much of the solid waste to marketable products. A final option is to produce surimi as a primary product, often recovering fishmeal as a secondary product. Liquid wastes include fish oil that can be recovered and used for fuel or sold as a commodity.

2.2.1.1 Seafood Processing

Seafood processing results in the following recoverable products:

- H&G blocks (headed and gutted fish with tails removed)
- Fillet blocks
- Minced blocks
- Surimi blocks
- Fishmeal
- Fish oil

All offshore processing vessels vary in their production line(s), processing steps, capacity, finished products, etc. The following narrative provides a generalized description of how processing works aboard an offshore processor.

Sea water is used to move fish and waste via flumes to grinders and discharge chutes and secondarily for clean-up and sanitation.

Freshwater is either generated onboard or acquired from a shore-based source. It is then used in the surimi making process, or for employee housing and sanitation needs.

The production process begins when fish is hauled on board. The fish are emptied into a holding bin. From the holding bin, the fish are transferred onto a sorting belt where the catch is sorted by primary species. All the fish are weighed as they travel along the belt. The prohibited species are sent to the observer, and the rest of the bycatch, that is not processed, is returned to the sea via the discard chute. The remaining catch is sent to the starting point of one of the processing lines.

The fish are then sorted by size for processing on alternative processing lines. Each line consists of a machine that will head, gut, debone and skin the fish. If the desired product is H&G fish, only the first two processes are performed. Otherwise, the end product is boned and skinned fillets. The belly flap trim is transferred to a mince processing line, if the vessel has that capability onboard. On vessels that have a fishmeal processing line, the head, guts and skin are transferred there for further processing. On vessels where no fishmeal processing line exists, these materials are ground and discharged.

Fillets are transferred by conveyor to the candling table, where they are checked for defects and parasites. Those fillets that meet quality standards are packed in a plastic basket, check weighted and transferred into a freezer frame with a box liner. The freezer frame is transferred to the plate freezers and frozen. The frozen blocks are packed in master cartons, strapped and transferred to a storage hold. Those fillets that do not meet quality standards as fillets are transferred either to the mince operation if the quality meets mince standards, to fishmeal if they do not meet mince standards, or are ground and discharged if no further processing is available.

The backbones go to the surimi processing line to extract as much flesh from the bones as possible. This process produces a paste that is extruded into plastic bags and then is frozen in a manner that is similar to the fillets. After the flesh is extracted from the bones, they are transferred to the fishmeal processing line, if available. If the fishmeal line cannot handle all the fish bones due to the volume of the catch, the excess bones are transferred to the discharge sump, ground and discharged.

The only other processing-related waste that is discharged is a portion of the wash down operation of fish products that end up inadvertently on the vessel floor. This waste is ground and pumped overboard.

Fish processed as H&G recover approximately 50 percent of raw input. Fish processed into fillets have recovery rates ranging from 25 to 50 percent. Surimi production, a minced flesh product, recovers from 7 to 22 percent of the whole fish depending on the primary product of the processing effort. Reported estimates for recovery as fishmeal range from 3 to 7 percent, and a recovery estimate has been reported for fish oil of one percent of raw input.

2.2.1.2 Seafood Processing Discharge Characterization

Discharges from seafood processing facilities may be classified into solid (particulate) and dissolved (soluble) wastes. Two categories of solid waste discharges are generated by seafood processing: ground and unground waste materials. The ground fish waste stream consists of processed raw fish and shellfish include heads, skin, scales, viscera, tail fins, shells discarded during cleaning and butchering operations, damaged fish, and unusable fish. Unground solid waste is comprised of sea debris, prohibited species fish and bycatch species that are neither processed nor retained. Dissolved wastes include solubilized organic matter and nutrients leached from fish tissues after processing. The specific chemical composition of these wastes depends on the amount of protein, fat, bone, chitin, and connective tissue present. The character and quantity of solid and liquid seafood processing wastes is assessed below.

Solid Wastes from Seafood Processing

Seafood processing waste streams generally consist of the material that cannot be processed by the onboard processing plant and is piped or conveyed to the collecting sumps on the processing deck where it is ground and pumped overboard.

Unground solid waste is comprised of sea debris, prohibited species fish and by-catch that is neither processed nor retained. These are discharged directly from the vessel. This category of discharge material represents an extremely small fraction of the solid waste.

The quantity and chemical composition of the solid waste discharged by seafood processing facilities determines the effects that the discharges may have on the aquatic environment. As noted above, seafood processing solid waste consists of both organic and inorganic material including protein, fat (oil and grease), and ash (inorganic component of fish waste). Tables 2.2 and 2.3 present details on the measured contents and theoretical composition of whitefish wastes. Most of the solid fish waste contains at least 75 percent water. The percentages of protein were similar for most types of fish waste sampled (approximately 10-15 percent wet weight). The percentage of fat was generally less than 3 percent, although viscera from pollock (a similar fish to Pacific whiting) had a much higher fat content (40 percent of wet weight). The percentage of ash, which represents the inorganic component of fish waste, was generally less than 5 percent wet weight. The percent of carbon, nitrogen, phosphorus, and sulfur based on wet weights is estimated at 16.7, 2.9, 0.3 and 0.3 percent respectively. Less discrete composition analyses have been performed and reported for whiting (whole fish, fillet, fillet waste) (Nelson et al., 1985). The results of these analyses are consistent with the information presented in Tables 2.2 and 2.3.

Table 2.2 Approximate Composition (Percent) of Whitefish Fillet and Surimi Wastes

Type	Sample	n[1]	Moisture	Protein	Fat	Ash	Source
Pollock	Machine fillet (winter)	4	81.3	11.3	3.0	3.6	Crapo, 1988
Pollock	Machine fillet (spawning)	4	82.0	12.5	1.9	3.7	Crapo, 1988
Pollock	Hand fillet	n/a	74.8	13.8	8.9	2.7	Babbitt, 1982
Pollock	Heads	n/a	81.1	13.6	1.4	4.9	Babbitt, 1982
Pollock	Viscera	n/a	45.0	8.2	40.1	0.8	Babbitt, 1982
Pollock	Frame	n/a	80.4	15.9	0.7	3.3	Babbitt, 1982
Pollock	Skin	n/a	81.8	18.0	0.3	0.9	Babbitt, 1982
Pollock	Bloodwater	3	98.5	0.9	0.2	0.3	Crapo, 1988
Surimi	Filet waste	3	81.3	11.3	3.0	3.6	Crapo, 1988
Surimi	Bloodwater	3	97.9	1.3	0.4	0.3	Crapo, 1988
Surimi	Deboner waste	3	86.1	10.7	0.8	0.7	Crapo, 1988
Surimi	Refiner waste	3	86.4	12.1	0.7	0.4	Crapo, 1988
Surimi	Rotary screen wastewater	3	98.8	0.8	0.2	0.2	Crapo, 1988

Table 2.3 Theoretical Composition of Whiting Waste (excerpted from USEPA, 2008)

Constituent	Percent Wet Weight	Approximate [a] Density (g/cm^3)	Percent Dry Weight
Water	75	1.0	-
Protein	7	1.5	60
Fat/Carbohydrates	15	0.9	28
Bone/Chitin	3	3.0	12
Total Estimated Wet Weight Density	-	1.13	-
Carbon	16.7	-	50.0[b]
Nitrogen	2.9 [c]	-	8.8 [c]
Phosphorus	0.27 [c]	-	0.8 [c]
Sulfur	0.27 [c]	-	0.8 [c]

[a] Typical values listed in the Handbook of Chemistry and Physics (Weast, 1982).
[b] Typical dry weight carbon (C) content of organic matter used.
[c] Estimated concentration of nitrogen (N) and phosphorus (P) based on the Redfield ratio of C:N:P (106:16:1) in organic matter (Redfield, 1958; Redfield et al., 1963). Ratio of sulfur to phosphorus assumed to be 1:1.

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[1] n = number of samples analyzed

Bottom Accumulations of Solid Waste

Accumulations of waste material on the bottom of the receiving water occur when the rates of deposition at a specific location exceed the rates at which material can be assimilated by the community that feeds at that location and/or the rate at which the material is likely to be dispersed by hydrodynamic forces. The likelihood of bottom accumulations due to offshore seafood processing is very low for two reasons:

1. Dischargers are in constant motion. Permittees will be required to be underway during discharge, unless doing so would compromise the safety of the vessel.
2. Water depth is usually a minimum of 35 fathoms (fm.) (210 feet) in reported seafood processing areas. The combination of wind, tide and water depth greatly increases mixing and dispersion of discharges. This minimizes concentrated oxygen consumption, sedimentation of solids, and potential impact on sea life and water quality.
3. The EPA proposes to prohibit discharge in waters shallower than 100 meters during April 15 – October 15 (the typical upwelling season during which seasonal hypoxia is more likely to occur), and year-round over the Heceta/Stonewall Banks complex.

Dissolved Wastes from Seafood Processing

Current effluent data on discharges from offshore seafood processors in the action area are not available. Table 2.4 presents effluent characteristics of dissolved wastes from shore-based groundfish dischargers operating in Alaska in 1992 and 1993. Seafood processing waste discharge characteristics in offshore waters are expected to be similar to this shore-based data because the processing is virtually identical. Discharge characteristics are not expected to have changed significantly since these data were collected. Caution should be used when comparing the median and maximum values for each effluent type because the data points, even if equal in number, may be from different facilities or time periods.

Table 2.4 Effluent data for Alaskan shore-based seafood processors discharging under individual permits in 1992 and 1993[1]

Product[2]		TSS mg/L		Oil & Grease (mg/L)		BOD (mg/L)	
		Monthly Avg.	Daily Max.	Monthly Avg.	Daily Max.	Monthly Avg.	Daily Max.
Bottomfish	Median	105	150	73	91	n/a	n/a
	n	120	124	101	106	n/a	n/a
	Minimum	10	6.0	2.8	4.5	n/a	n/a
	Maximum	4,553	3,324	1,621	1,486	n/a	n/a
Meal	Median	88	142	28	44	80	120
	n	18	18	18	18	15	15
	Minimum	16	24	1.4	1.4	36	36
	Maximum	1,330	1,949	153	284	13,356	39,750
Stickwater	Median	4,900	9,540	2.1	5.6	7,600	7,600
	n	53	53	25	25	47	47
	Minimum	9	23	0.2	0.2	1.5	2
	Maximum	84,000	110,000	91,139	203,800	148,950	432,000
Surimi	Median	1,079	1,366	208	257	2,323	1,845
	n	25	25	25	25	6	6
	Minimum	24	33	8	17	286	286
	Maximum	6,209	7,808	282,400	295,200	7,328	7,750

Product[2]	TSS mg/L		Oil & Grease (mg/L)		BOD (mg/L)	
	Monthly Avg.	Daily Max.	Monthly Avg.	Daily Max.	Monthly Avg.	Daily Max.

n/a = not available

[1] Obtained from Discharge Monitoring Reports (DMRs) submitted to EPA's Permit Compliance System (PCS)

[2] Product Classifications are as follows:

Bottomfish = Bottomfish (pollock, cod, sablefish, etc.) sections
Meal = Fishmeal
Stickwater = Stickwater from fish meal operations
Surimi = Surimi production from pollock

In addition to oil and grease, Biochemical Oxygen Demand (BOD), and Total Suspended Solids (TSS), other contaminants can be present in effluent from seafood processing facilities. The dissolved wastes may include disinfectants used to maintain sanitary conditions in compliance with requirements for the production of food for human consumption. The following sections provide greater detail on stickwater, surimi wastewater, wash-down water, sanitary wastewater and other wastewaters.

Stickwater

Stickwater is the mixture of water, oil, proteins, fats and ash separated from the press liquor generated during the production of fish meal. After decanting to remove oil, this stream is a dilute solution of insoluble fines, very fine denatured solubles, and water soluble connective tissue. A small amount of fish oil is present as an emulsion with the protein. The impact of this stream is low due to dilute concentration, fine particle size and inability of the oil fraction to coalesce. Note that the effluent data, summarized above in Table 2.4 shows that stickwater has one of the highest median concentrations for TSS and BOD compared to other wastewaters.

Surimi Wastewater

Surimi production is a washed minced fish product. The manufacturing process includes gutting, heading, deboning and filleting followed by mincing and washing. Surimi wastewater is relatively high in TSS and BOD and had the highest median and maximum values for oil and grease compared to other liquid wastes as shown in Table 2.4.

Wash-down Water

Wash-down water is used to remove wastes and maintain sanitary standards during processing operations. In addition to the organic materials, these discharges may include disinfectants that could contain chlorine, iodine, or ammonium chloride-based solutions. These wastes are generally low in volume.

Sanitary Wastewater

Sanitary waste is human body waste discharged from toilets and urinals. The pollutants associated with this discharge include TSS, BOD, bacteria, and residual chlorine. All vessels must employ properly functioning Type I or Type II Marine Sanitation Devices (MSDs).

Other Wastewaters

Other wastewaters include other liquid wastes generated during seafood processing operations. These low-volume wastes include catch transfer water, live tank water, refrigerated seawater, cooking water, boiler water, cooling water, refrigerator condensate, pressure relief water, clean-up water and scrubber water. Wastewaters not having contact with seafood are not required to be discharged through the seafood process waste-handling system. These wastes would not be expected to contain concentrations of contaminants that would be detrimental to marine organisms.

2.2.2 Distribution and Discharge of Seafood Processing Facilities

This section provides a summary of available data on the character and quantity of discharge by facilities known to be currently operating in the action area of the Draft Permit.

2.2.2.1 Distribution of Pacific Whiting Facilities

The Pacific whiting fishery is the largest fishery covered by the Draft Permit. The catcher-processor sector of the fishery is composed of vessels that harvest and process whiting. The mothership sector is composed of a number of catcher vessels that harvest whiting for delivery to motherships. Typically, three to five motherships operate in the fishery, with one mothership also servicing the tribal fleet; each mothership is typically serviced by three to four catcher vessels.

The action area of the Draft Permit includes Federal Waters of the United States, seaward of the states of Washington and Oregon, greater than 3 nm from shore; including the contiguous zone, ocean waters, and the EEZ, extending from 3 to 200 nm offshore. Vessels are constantly moving and discharging throughout the action area.

2.2.2.2 Discharge Characterization of Proposed Facilities

Since 1998, at-sea harvests by motherships and catcher-processors have ranged from 63,000 mt. to 128,000 mt. In 2011, 56% of the at-sea processing volume was performed by catcher-processors, and 44% was performed by motherships (PFMC, 2011b). The amount of non-whiting groundfish harvested by this fleet is quite small, often in the range of less than half of one percent of total catch (PFMC, 2008).

The catcher-processor fleet and mothership fleet in recent years have typically harvested a major portion of their allocations during May and June. After June, most of the vessels leave to fish in Federal Waters off Alaska. The vessels then often return in late August or September to fish the remainder of their allocations. During the summer months, a few processors (mothership or catcher-processors) may remain to continue fishing for whiting.

2.3 PERMIT AND ACTION AREA DESCRIPTION

The EPA Region 10 proposes to issue a new General Permit for offshore seafood processors in Federal Waters off the coast of Washington and Oregon. Below is a summary of permit conditions relevant to this BE. For a complete description of proposed permit conditions, please refer to the re-proposed Draft General Permit.

2.3.1 Authorized Facilities

Subject to the restrictions of this Draft Permit, the following categories of dischargers are authorized to discharge the pollutants set out in Part II of this Draft Permit once a Notice of Intent has been filed with and a written authorization is received from the EPA:

Operators of offshore vessels (processors), operating and discharging “seafood processing waste” in Federal Waters greater than 3 nm from shore, engaged in the processing of fresh, frozen, canned, smoked, salted or pickled seafood or the processing of seafood mince, paste, or meal and other secondary by-products.

2.3.2 Pollutants

The Draft Permit proposes to authorize the discharge of the following pollutants subject to the limitations and conditions set forth herein:

1. Seafood processing wastewater and wastes, including the waste fluids, heads, organs, flesh, fins, bones, skin, chitinous shells, and stickwater produced by the conversion of aquatic animals from a raw form to a marketable form.

    a. Treatment of waste solids. Permittees must send all solid seafood processing wastes through a properly maintained and operating grinder system designed and operated to grind solids to 0.5 inch or smaller prior to discharge. This 0.5 inch effluent requirement does not apply to (1) the calcareous shells of scallops, clams, oysters and abalones, (2) the calcareous shells (i.e., tests) of sea urchins, or (3) incidental catches of prohibited and by-catch species which are neither retained nor processed.

    Utilization. Permittees must fully utilize to the extent practicable all treatment processes available on board their vessel, including but not limited to fishmeal and fish oil production.

    Permittees must discharge effluents into hydrodynamically energetic waters with a high capacity of dilution and dispersion.

2. Wash-down water, which include disinfectants added to wash-down water to facilitate the removal of wastes and to maintain sanitary standards during processing or to sanitize seafood processing areas.

3. Sanitary wastewater must be discharged in accordance to U.S. Coast Guard regulations.

4. Other wastewater generated in the seafood processing operation, including, seafood catch transfer water, live tank water, refrigerated seawater, cooking water, boiler water, gray water, cooling water, refrigeration condensate, freshwater pressure relief water, clean-up water, and scrubber water.

The Draft Permit proposes to exclude any pollutants which are not expressly authorized in the Draft Permit. The Draft Permit also proposes to prohibit the discharge of petroleum (e.g., diesel, kerosene, and gasoline) or hazardous substances into or upon the navigable waters of the U.S., adjoining shorelines, into or upon the waters of the contiguous zone which may affect natural resources belonging to, appertaining to, or under the exclusive management authority of the U.S., under 33 U.S.C.A. 1321(b)(3).

2.3.3 Receiving Waters

1. This General Permit authorizes discharges of pollutants into Federal Waters of the United States off the coasts of Washington and Oregon (i.e., seaward of 3 nm from the coastal shoreline of Washington and Oregon), except where noted below.

2. Generally, Federal Waters off Washington and Oregon begin 3 nm from the state's coastal shorelines. In the case of emergent offshore rocks and islands, the General Permit's jurisdiction begins 3 nm seaward from the seaward shoreline of offshore rocks and islands. The greatest distance is off Orford Reef, where the boundary between state and Federal Waters begin approximately 8 nm from the mainland shoreline. See Figure 2.3.3a.

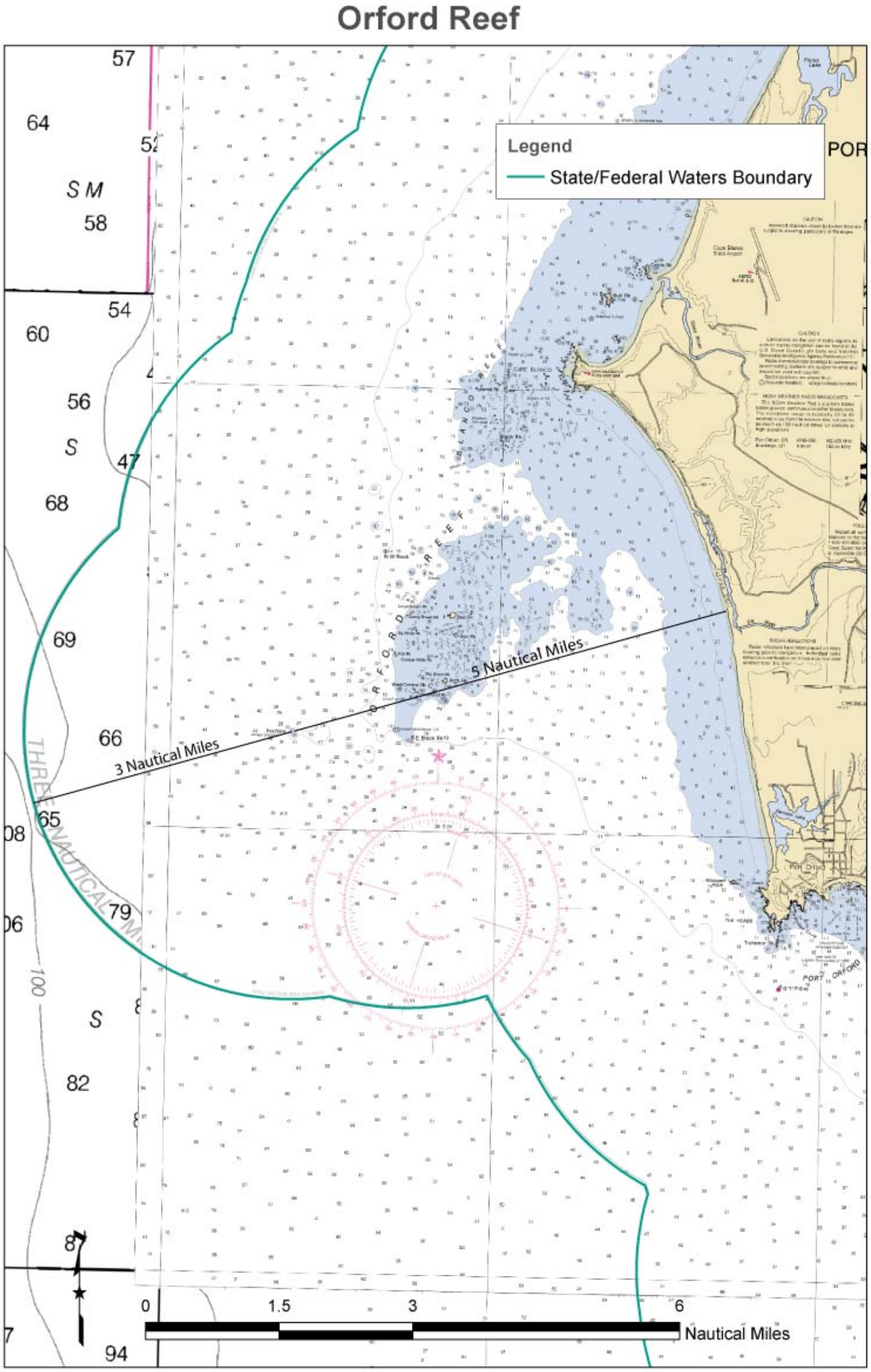


Figure 2.3.3a. Orford Reef, with the 3 nm Boundary from Fox Rock.

This Permit does not authorize the discharge of pollutants in the following areas:

1. Any state waters, including:
    a. Bays, estuaries, and rivers.
    b. Ocean waters within 3 nm of the west coasts of Washington and Oregon within 3 nm of the seaward boundary of emergent rocks and islands.
2. Any waters under the jurisdiction of Canada.
3. Any waters south of the Oregon / California border (42º00” N latitude).
4. Waters shallower than 100 meters in depth and shoreward during April 15 – October 15, unless the Permittee can demonstrate that its discharge will not contribute to hypoxic conditions, according to Section V.B.7. of this General Permit. See Figure 2.3.3b for a visual depiction of the seasonal discharge prohibition.
5. Discharge is prohibited (year-round) over the Heceta/Stonewall Bank complex. See Figure 2.3.3c.

Heceta/Stonewall Banks Complex – Coordinates:

Latitude	Longitude
44.50450	-124.61615
44.68164	-124.56497
44.67941	-124.15125
43.82156	-124.23857
43.81267	-124.83207
43.92338	-124.95911
44.26036	-124.95804
44.34816	-124.78539

Figure 2.3.3b. Seasonal Discharge Prohibition in Waters Shallower than 100 Meters.

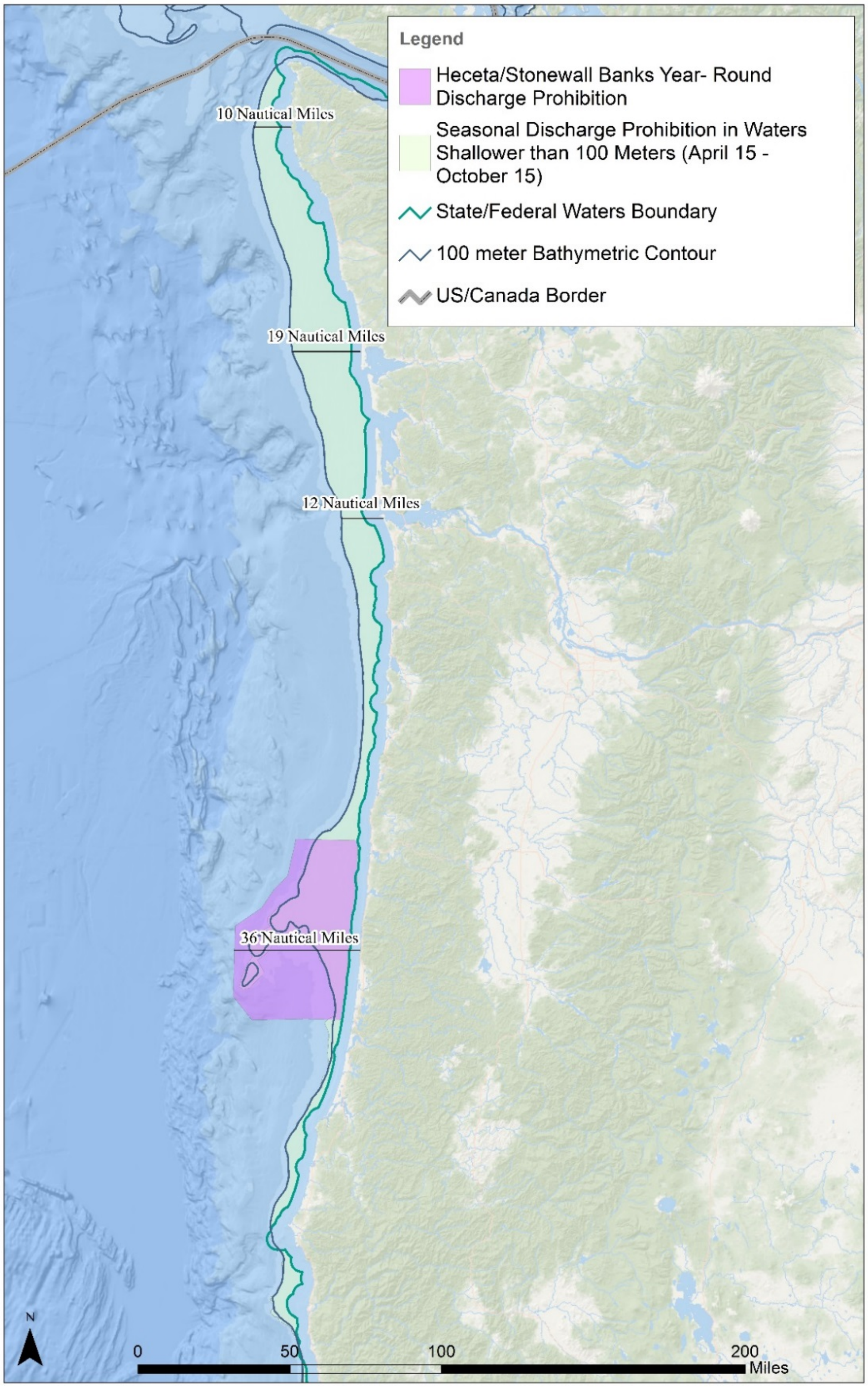


Figure 2.3.3.c. Year-round Discharge Prohibition over the Heceta/Stonewall Bank Complex.

2.3.4 Effluent Limitations

Sections 101, 301(b), 304, 308, 401, and 402 of the CWA provide the basis for the effluent limitations and conditions of the Draft Permit. The EPA first determines which technology-based limits apply to the discharges in accordance with the national effluent guidelines and standards. EPA then determines which water quality-based limits apply to the discharges.

2.3.4.1 Technology Based Limitations

The CWA requires particular categories of industrial dischargers to meet technology-based effluent limitations established by EPA. The CWA initially focused on the control of traditional pollutants (i.e., conventional pollutants and some metals) through the use of best practicable control technology currently available (BPT). For conventional pollutants (i.e., pH, BOD, TSS, oil and grease, and fecal coliform), CWA Section 301(b)(1)(E), 33 U.S.C. § 1311(b)(1)(E), requires the imposition of effluent limitations based on best conventional pollutant control technology (BCT). For nonconventional and toxic pollutants, CWA Section 301(b)(2)(A), (C), and (D), 33 U.S.C. §1311(b)(2)(A), (C), and (D), require the imposition of effluent limitations based on best available technology economically achievable (BAT). CWA Section 301(b), 33 U.S.C. § 1311(b), requires compliance with BCT and BAT no later than March 31, 1989. Where EPA has not yet developed guidelines for a particular industry, permit conditions must be established using Best Professional Judgment (BPJ) procedures (40 CFR 122.43, 122.44 and 125.3).

1. Process and process-associated wastes

   EPA has promulgated final ELGs specifying BCT, BPT, and NSPS for specific categories of seafood processing. These ELGs are codified at 40 CFR Part 408. When the ELGs were promulgated, the offshore seafood processing industry either did not exist or was in its infancy. Therefore, offshore processors were not analyzed during the development of the ELGs. As such, the ELGs do not apply to the offshore seafood processors that may be covered under this permit. Since there are no ELGs applicable to these facilities, EPA may use its BPJ in establishing technology based effluent limits in the permit.

   Grinding seafood waste to 0.5 inch has been the technology-based effluent limitation applicable to offshore seafood processing facilities in offshore waters around Alaska for over 30 years. The majority, if not all, of the vessels that would likely apply for coverage under the Draft Permit also operate in Alaskan waters and, thus, have the equipment on board to grind their waste to 0.5 inch. The 0.5 inch limitation was originally used for remote Alaska locations in consideration of the expense and logistical difficulties associated with much of Alaska. The 0.5 inch grind effluent limitation was also the BPJ effluent limit that was established in an individual NPDES permit for a seafood processing vessel that discharges to the Atlantic Ocean. Ground wastes should disperse rapidly in the waters covered by the Permit.

   In addition to grinders, most of the vessels known to discharge in the coverage area of the Draft Permit also have the capacity onboard to produce fishmeal and/or fish oil. When these by-product recovery systems are fully utilized, wastes discharged to the receiving waters are greatly reduced. Because grinding is economically and technologically feasible, the BPJ requirements for the draft permit are as follows:

   a. Treatment of waste solids. Permittees must send all solid seafood processing wastes through a properly maintained and operating grinder system designed and operated to grind solids to 0.5 inch or smaller prior to discharge. This 0.5 inch effluent requirement does not apply to (1) the calcareous shells of scallops, clams, oysters and abalones, (2) the calcareous shells (i.e., tests) of sea urchins, or (3) incidental catches of prohibited and by-catch species which are neither retained nor processed.

b. Utilization. Permittees must fully utilize to the extent practicable all treatment processes available on board their vessel to reduce wastes discharges, including but not limited to fishmeal and fish oil production.

2. Sanitary wastewaters
   Sanitary wastewater must be discharged in accordance to U.S. Coast Guard regulations

2.3.5 Best Management Practices Plan

Purpose. Through implementation of a BMP Plan, a Permittee must prevent or minimize the generation and discharge of wastes and pollutants from the facility to the waters of the United States. Pollution should be prevented or reduced at the source. By-product recovery should be maximized where available. Potential pollutants should be recycled in an environmentally safe manner whenever feasible. The discharge of pollutants into the environment should be conducted in such a way as to have a minimal environmental impact.

4. Objectives. A Permittee must develop its BMP Plan consistent with the following objectives:
   a. The number and quantity of pollutants and the toxicity of the effluents that are generated, discharged, or potentially discharged from the facility must be minimized by a Permittee to the extent feasible by controlling each discharge or potential pollutant release.
   b. Evaluations for the control of discharges and potential releases of pollutants must include the following:
      (1) Each facility component or system must be examined for its pollutant minimization opportunities and its potential for causing a release of significant amounts of pollutants to receiving waters due to the failure or improper operation of equipment. The examination must include all normal operations (including raw material and product storage areas), in-plant conveyance of product, processing and product handling areas, loading or unloading operations, wastewater treatment areas, sludge and waste disposal areas, and refueling areas.
      (2) Equipment must be examined for potential failure and any resulting release of pollutants to receiving waters. Provision must be made for emergency measures to be taken in such an event.
   c. Under the BMP plan and any Standard Operating Procedures (SOPs) included in the plan, the Permittee must ensure the proper operation and maintenance of the facility and the control of the discharge or potential release of pollutants to the receiving water.
5. Requirements. The BMP Plan must be consistent with the purpose and objectives in Parts VI.A.3 and 4 and must include the following:
   a. The BMP Plan must be consistent with the general guidance contained in the publication entitled “Guidance Manual for Developing Best Management Practices”, USEPA 1993, or its subsequent revisions and “Seafood Processing Handbook for Materials Accounting Audits and Best Management Practices Plans, EPA and Bottomline Performance, 1995 (available on EPA Region 10’s

General Permits website, or at https://yosemite.epa.gov/r10/water.nsf/NPDES+Permits/General+NPDES+Permits/$FILE/seafood_processing_handbook.pdf).

b. The BMP Plan must be documented in narrative form, must include any necessary plot plans, drawings or maps, and must be developed in accordance with good engineering practices. The BMP Plan must be organized and written with the following structure:

(1) Name and physical location(s) of the vessel;

(2) Statement of BMP policy;

The policy statement provides two major functions: (1) it demonstrates and reinforces management's support of the BMP Plan, and (2) it describes the intent and goals of the BMP Plan.

(3) Materials accounting of the inputs, processes and outputs of the facility;

Materials accounting is used to trace the inflow and outflow of components in a process stream and to establish quantities of these components.

Inflow = outflow + accumulation

Example 1: For the entire facility

- Inflow = Seafood catch, fresh water, salt water, cleaning chemicals, processing additives, boiler or cook water.
- Accumulation = Product, including by-products produced
- Outflow = Inflow minus accumulation

Example 2: Process step of head-and-gut

- Inflow = Whole seafood, cleaning water
- Accumulation = Headed and gutted seafood (to next process step)
- Outflow = Heads, guts, blood, slime, scales, trimmings, unusable seafood, water.

As can be seen from the above examples, the flows can be broken down into components. Identifying and measuring the key components for a process is the basis for doing materials accounting audits. If secondary by-products are produced, such as fish meal, the Permittee must estimate or measure the volume lost to the atmosphere through water vapor. The calculation used to measure vapor must be reported to the EPA in the Annual Report.

(4) Risk identification and assessment of pollutant discharges;

(a) Review existing materials and plans, as a source of information, to ensure consistency and to eliminate duplication.

(b) Characterize actual and potential pollutant sources that might be subject to release.

(c) Evaluate potential pollutants based on the hazards they present to human health and the environment. This includes minimizing toxic disinfection use where applicable, as disinfectants are known to be toxic to marine organisms at relatively low concentrations.

(d) Identify pathways through which pollutants identified at the site might reach environmental and human receptors.

(e) Prioritize potential releases.

(5) Specific management practices and standard operating procedures to achieve the above objectives, including, but not limited to:
  (a) The modification of equipment, facilities, technology, processes and procedures;
  (b) The improvement in management, inventory control, materials handling or general operational phases of the facility; and
  (c) To reduce or eliminate any discharge of wastes that have the potential to collect and foul set or drift nets used in subsistence or commercial fisheries in nearby traditional use areas.

(6) Good housekeeping;
Good housekeeping means the maintenance of a clean, orderly work environment. Maintaining an orderly facility means that materials and equipment are neat and well-kept to prevent releases to the environment.

(7) Preventative maintenance;
Preventative maintenance means periodically inspecting, maintaining, and testing plant equipment and systems to uncover conditions that can cause breakdowns or failures. Preventative maintenance focuses on preventing environmental releases.

(8) Inspections and records;
  (a) Inspections provide an ongoing method to detect and identify sources of actual or potential releases. Inspections are effective in evaluating the good housekeeping and preventative maintenance programs.
  (b) Recordkeeping focuses on maintaining records that are pertinent to actual or potential environmental releases. These records may include the BMP Plan itself, inspection reports, preventative maintenance records, and employee training materials.

(9) Employee training.
Employee training is a method used to instill in personnel, at all levels of responsibility, a complete understanding of the BMP Plan, including the reasons for developing the plan, the positive impacts of the plan, and employee and managerial responsibilities under the BMP Plan.

(10) Moving while discharging.
Vessels must be moving during discharge (in order to aid dispersion), unless doing so would compromise the safety of the vessel.

2.3.6 Sea Surface Visual Monitoring Requirements

Applicability. During the term of this General Permit, the Permittee must conduct a sea surface monitoring program.

1. Purpose. A Permittee must conduct a sea surface monitoring program to determine compliance with the marine water quality criteria.
2. Objectives.
   a. Sea surface. Monitoring the sea surface will provide daily assessments of the presence and amounts of residues floating on the sea surface during a facility's operation and discharge.

(1) This monitoring program will inform the Permittee of its compliance with the General Permit limit for residues/aesthetics, color, oil and grease, and solids on the sea surface and provide a timely basis for correcting violations when they occur.

(2) The daily monitoring of the sea surface must;
  - record the total number of days for which observations were made and,
  - record the daily occurrence and areal extent of contiguous films, sheens, mats of foam, or any other visual observations.

3. Species Monitoring. The sea surface monitoring must enumerate the occurrence and numbers of the following ESA-listed species attracted to the discharge identified within the survey area: Guadalupe fur seal (*Arctocephalus townsendi),* Blue whale *(Balaenoptera musculus),* Fin whale *(Balaenoptera phyusalus),* Humpback whale *(Megaptera novaeangliae),* Southern Resident killer whale (*Orcinus orca),* North Pacific right whale (*Eubalaena japonica*), Sei whale (*Balaenoptera borealis*), Sperm whale (*Physeter macrocephalus*), Green sea turtle (*Chelonia mydas*), Leatherback sea turtle (*Dermochelys coriacea*), Loggerhead sea turtle (*Caretta caretta*), Olive Ridley sea turtle (*Lepidochelys olivacea*), marbled murrelet (*Brachyramphus marmoratus*, murrelet), and the short-tailed albatross (*Phoebastria albatrus,* albatross).

   In addition, the sea surface monitoring must enumerate the occurrence and numbers of the following migratory birds: black-footed albatross (*Phoebastria nigripes),* pink-footed shearwater (*Puffinus creatopus*), sooty shearwater (*Puffinus griseus*), and flesh-footed shearwater (*Puffinus carneipes*).

4. Schedule. All Permittees must conduct a daily sea surface monitoring program during operation of each year of coverage.
5. Monitoring reporting. Logs of this daily inspection must be kept on-board the vessel until the end of the calendar year and then maintained at the business office thereafter. Logs must be submitted at the request of the EPA.
6. Signatory requirements. A Permittee must ensure that the monitoring report is signed by a principal officer or a duly appointed representative of the Permittee.

2.3.7 Other Monitoring and Reporting Requirements

See the Notice of Intent and Annual Report for details (Appendices A and B of the re-proposed Draft General Permit).

2.3.8 Proposed Permit Conditions to Avoid Impacts to Seabirds

Seabirds, including the ESA-listed short-tailed albatross (*Phoebastria albatrus,* albatross) can be attracted to seafood processing waste discharge, which can result in injury and/or mortality due to ship strike and cable interactions (Zador and Fitzgerald, 2008 and Melvin, et al., 2004, as described in a September 29, 2015 letter from USFWS to the EPA regarding this General Permit). The EPA is engaged in consultation with the USFWS under Section 7 of the Endangered Species Act.

On May 2, 2017, the USFWS finalized a Biological Opinion Regarding the Effects of the Continued Operation of the Pacific Coast Groundfish Fishery as Governed by the Pacific Coast Groundfish Fishery Management Plan and Implementing Regulations at 50 CFR Part 660 by the

NMFS on California Least Tern, Southern Sea Otter, Bull trout, Marbled Murrelet, and Short-tailed Albatross. The Biological Opinion addressed both direct and indirect effects of the Pacific whiting trawl fishery, including short-tailed albatross attraction to fish processing waste from Pacific whiting trawl vessels. The Biological Opinion included an Incidental Take Statement, and stated that the Service believes that the reasonable and prudent measures (RPMs) (and accompanying terms and conditions) provided in the Biological Opinion will minimize take of the short-tailed albatross, and that the level of anticipated take is not likely to result in jeopardy to the species.

RPM 2 is relevant to this NPDES General Permit since it aims to minimize the risk of short-tailed albatross interacting with trawl cables, and because it includes offal management techniques. The other RPMs are not directly relevant to this General Permit. The EPA has incorporated the requirements of RPM 2 into Section VII.2. of the draft General Permit in order to be consistent with the Biological Opinion:

"In order to minimize the risk of short-tailed albatross interacting with trawl cables, Permittees shall consider the following management actions:

a. The use and effectiveness of streamer lines when using trawl gear;
b. The degree to which minimizing the aerial extent of trawl cables affects the risk of bird strike; and
c. Feasible offal management techniques that decrease attraction of short-tailed albatross to the vicinity of aerial lines.
d. Implement measures that minimize the potential for short-tailed albatross interactions with trawl gear (based on NMFS research findings and investigations into trawl-associated mortality or injury, and as these albatross protection measures become available)."

To address USFWS concerns about storm petrels or other birds becoming disoriented by lights during nighttime operations, the EPA proposes to include the following requirement:

"Lights used during night operations should be minimized as much as possible, and shielded and directed downward to the extent that is feasible."

SECTION 3.0

THREATENED AND ENDANGERED SPECIES

The Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq; ESA), provides for the conservation of endangered and threatened species of animals and plants. The designation of an ESA-listed species as threatened or endangered is based on the biological health of that species. Threatened species are those likely to become endangered in the foreseeable future (16 U.S.C. § 1532[20]). Endangered species are those in danger of becoming extinct throughout all or a significant portion of their range (16 U.S.C. § 1532[20]). Species may also be designated as candidate species if there is enough information to warrant proposing them for listing, but they have not yet been proposed because of higher listing priorities (USFWS, 2006).

In addition to listing species under ESA, the critical habitat of a newly listed species must be designated, concurrent with its listing, to the "maximum extent prudent and determinable" (16 U.S.C. § 1533[b][1][A]). ESA defines critical habitat as those specific areas that are essential to the conservation of a listed species and that may be in need of special consideration. Federal agencies are prohibited from undertaking actions that destroy or adversely modify designated critical habitat. Some species, primarily the cetaceans, which were listed in 1969 under the Endangered Species Conservation Act and carried forward as endangered under ESA, have not received critical habitat designations. Figure 3.1 shows critical habitats that lie in or near the Draft Permit action area. The overlap of each listed species Critical Habitat designated area with the Action Area is noted in Table 3.1.

Federal agencies have an affirmative mandate to conserve listed species. Federal actions, activities, or authorizations must be in compliance with the provisions of ESA. Section 7 of ESA provides a mechanism for consultation by the federal action agency with the appropriate expert agency (NMFS or USFWS).

The threatened and endangered species listed in the table below and subsequently discussed in detail are included because of their potential presence within portions of the action area of the Draft Permit. The list of species was obtained from the NOAA website and was updated April 24, 2015.

Table 3.1 ESA Listed Species Occurring within the Action Area

Species or Population	Status	FR notice	Critical Habitat Designation	Critical habitat overlap with Action Area
Marine Mammals (8)				
Guadalupe fur seal	T	12/16/1985 50 FR 51252	No CH	No
Blue whale	E	6/2/1970 35 FR 8491	No CH	No
Finback whale	E	6/2/1970 35 FR 8491	No CH	No
Humpback whale	E	6/2/1970 35 FR 8491	No CH	No
Killer whale (Southern Resident DPS)	E	11/18/2005 70 FR 69903	CH Designated	No
North Pacific right whale	E	6/2/1970 35 FR 8491	CH Designated	No
Sei whale	E	6/2/1970 35 FR 8491	No CH	No
Sperm whale	E	6/2/1970 35 FR 8491	No CH	No
Fish (33)				
Bocaccio	E	4/13/2011 76 FR 20558	CH Designated	No
Canary rockfish	T	4/13/2011 76 FR 20558	CH Designated	No
Yelloweye rockfish	T	4/13/2011 76 FR 20558	CH Designated	No

Pacific eulachon	T	4/13/2011 76 FR 20558	CH Designated	No
Chinook salmon - CA coastal	T	6/28/2005 70 FR 37160	CH Designated	No
Chinook salmon - Central Valley spring-run ESU[2]	T	6/28/2005 70 FR 37160	CH Designated	No
Chinook salmon - Lower Columbia River ESU	T	6/28/2005 70 FR 37160	CH Designated	No
Chinook salmon - Puget Sound ESU	T	6/28/2005 70 FR 37160	CH Designated	No
Chinook salmon - Sacramento River winter-run ESU	E	6/28/2005 70 FR 37160	CH Designated	No
Chinook salmon - Snake River fall-run ESU	T	6/28/2005 70 FR 37160	CH Designated	No
Chinook salmon - Snake River spring/summer-run ESU	T	6/28/2005 70 FR 37160	CH Designated	No
Chinook salmon - Upper Columbia spring-run ESU	E	6/28/2005 70 FR 37160	CH Designated	No
Chinook salmon - Upper Willamette River ESU	T	6/28/2005 70 FR 37160	CH Designated	No
Chum salmon - Columbia River ESU	T	8/2/1999 64 FR 41835	CH Designated	No
Chum salmon - Hood Canal summer-run	T	8/2/1999 64 FR 41835	CH Designated	No
Coho salmon - Central California Coast ESU	E	10/31/1996 61 FR 56138	CH Designated	No
Coho salmon - Lower Columbia River ESU	T	6/28/2005 70 FR 37160	CH Designated	No
Coho salmon - Oregon Coast ESU	T	6/20/2011 76 FR 35755	CH Designated	No
Coho salmon - Southern Oregon/Northern California Coasts ESU	T	6/28/2005 70 FR 37160	CH Designated	No
Sockeye salmon - Ozette Lake ESU	T	3/25/1999 64 FR 14529	CH Designated	No
Sockeye salmon - Snake River ESU	E	1/3/1992 57 FR 212	CH Designated	No
Steelhead - Central CA coast	T	1/5/2006 71 FR 834	CH Designated	No
Steelhead - Central Valley CA	T	1/5/2006 71 FR 834	CH Designated	No
Steelhead - Lower Columbia River	T	1/5/2006 71 FR 834	CH Designated	No
Steelhead - Middle Columbia River	T	1/5/2006 71 FR 834	CH Designated	No
Steelhead - Northern California	T	1/5/2006 71 FR 834	CH Designated	No

Steelhead - Puget Sound	T	5/11/2007 72 FR 26722	CH Proposed	No
Steelhead - Snake River Basin	T	1/5/2006 71 FR 834	CH Designated	No
Steelhead - South central CA coast	T	1/5/2006 71 FR 834	CH Designated	No
Steelhead - Southern CA coast	E	1/5/2006 71 FR 834	CH Designated	No
Steelhead - Upper Columbia River Basin	T	1/5/2006 71 FR 834	CH Designated	No
Steelhead - Upper Willamette River	T	1/5/2006 71 FR 834	CH Designated	No
North American green sturgeon	T	4/7/2006 71 FR 17757	CH Designated	Yes
Birds (2)				
Marbled murrelet	T	10/1/1992 57 FR 45328	CH Designated	No
Short-tailed albatross	E	7/31/2000 65 FR 46643	No CH	No
Turtles (4)				
Green sea turtle	T	7/28/1978 43 FR 32800	CH Designated	No
Leatherback sea turtle	E	6/2/1970 35 FR 8491	CH Designated	Yes
Loggerhead sea turtle	T	7/28/1978 43 FR 32800	No CH	No
Olive ridley sea turtle	T	7/28/1978 43 FR 32800	No CH	No

[1] DPS = Distict Population Segment, which is a population or group of populations that is discrete from other populations of the species and significant in relation to the entire species. The ESA provides for listing species, subspecies, or distinct population segments of species.

[2] ESU = Evolutionarily Significant Unit, which is similar to a DPS but used mainly for fish.

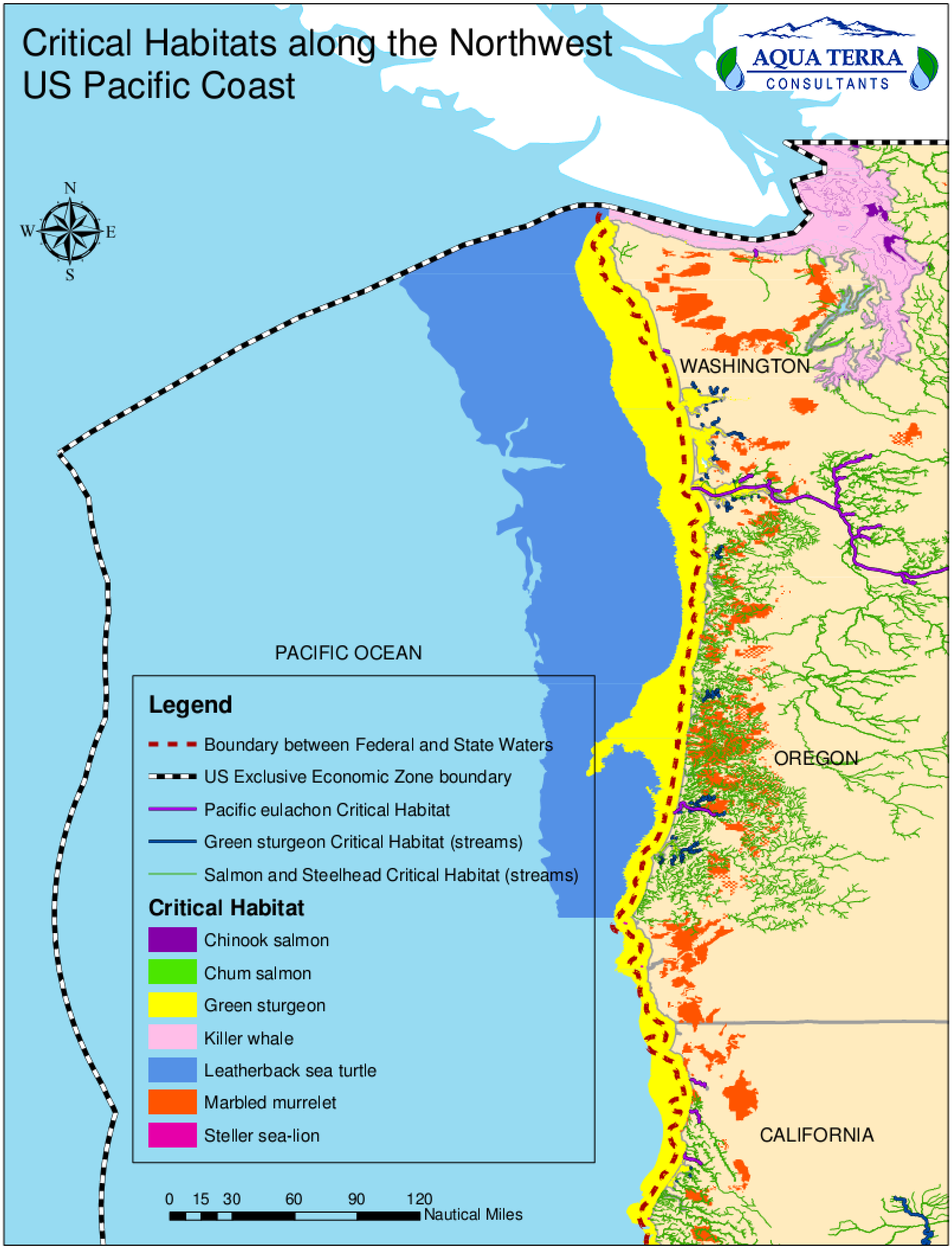


Figure 3.1 Critical Habitat for Species Occurring off the Pacific Coasts of Washington and Oregon

3.1 MARINE MAMMALS

3.1.1 Guadalupe fur seal

The Guadalupe fur seal (*Arctocephalus townsendi*) was listed as threatened throughout its range on December 16, 1985 (50 FR 51252).

3.1.1.1 Species range

Guadalupe fur seals reside in the tropical waters of the Southern California/Mexico region. During breeding season, they are found in coastal rocky habitats and caves. Little is known about their whereabouts during the non-breeding season (May to September). Guadalupe fur seals are non-migratory and their breeding grounds are almost entirely on Guadalupe Island, Mexico. There are small populations off of Baja California on San Benito Island and off of Southern California at San Miguel Island. A range map for this species is shown in Figure 3.2 (NMFS a).

Guadalupe fur seals are not common along the West Coast of the United States as they are primarily seen at Guadalupe Island, Mexico. However, their presence along the West Coast has increased and the last several years more and more pups are born on the Channel Islands off of Southern California. Historically (1500-1700 AD), these animals were seen as far North as the Northwest Washington Coast. These animals started showing up in the Pacific Northwest again around 2005, and in 2007 NOAA Fisheries had an unusual mortality event where 19 animals stranded. (NMFS. w)

3.1.1.2 Critical habitat

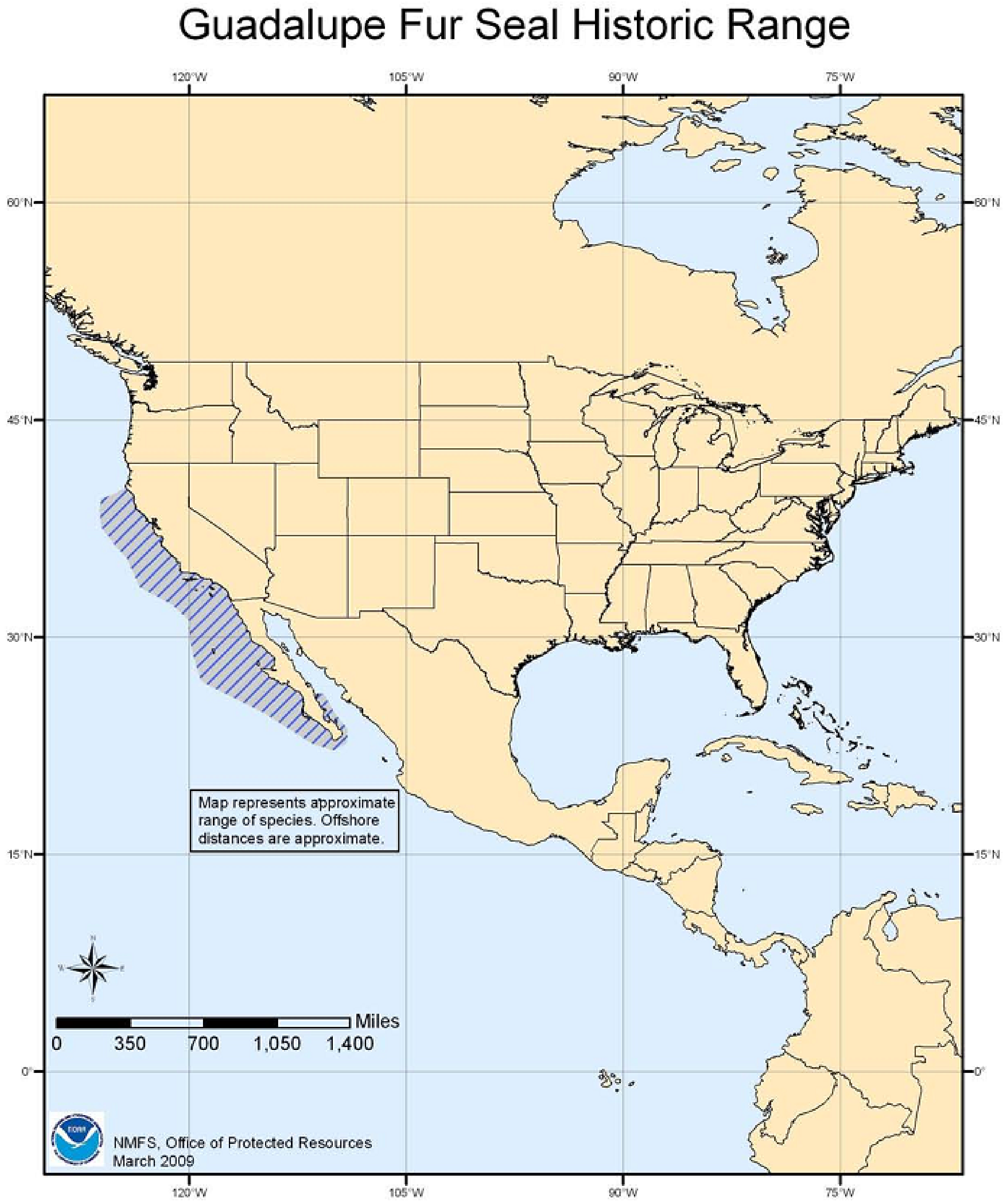
No critical habitat rules have been published for the Guadalupe Fur seal.

3.1.1.3 Life history and ecology

Guadalupe fur seals are solitary, non-social animals. Males are "polygamous" and may mate with 4 to 12 females during a single breeding season. Males form small territories that they defend by roaring or coughing. Breeding season is June through August, with females arriving in early June; pups are born a few days after their arrival. A female will mate about a week after giving birth to her pup. Weaning occurs around 9 months. Guadalupe fur seals feed mainly at night on squid, mackerel, and lantern fish by diving up to depths of 65 ft. (20 m) (NMFS a).

3.1.1.4 Population trends and risks

The Guadalupe fur seal population is slowly recovering from the brink of extinction. The current population abundance is approximately 10,000 animals. Of all the fur seal species, this one is the least studied due to their limited geographic locations. The Guadalupe fur seal population is increasing about 13.7% annually. In the 1700s and 1800s, commercial sealers heavily hunted Guadalupe fur seals to the point where the species was thought to be extinct by the early 1900s. Insufficient data exist on the incidental bycatch of Guadalupe fur seals in fishing gear, although some juvenile seals have been documented with entanglement injuries (NMFS a).



Map represents approximate range of species. Offshore distances are approximate.

NMFS, Office of Protected Resources
March 2009

Figure 3.2 Guadalupe Fur Seal Range (Source: http://nmfs.noaa.gov)

3.1.2 Blue whale

The blue whale (*Balaenoptera musculus*) was included in the first list of endangered species under the Endangered Species Conservation Act, the precursor to the ESA, on June 2, 1970 (35 FR 8491).

3.1.2.1 Species range

Blue whales are found in oceans worldwide. The blue whale's range is known to encompass much of the North Pacific Ocean, from Kamchatka to southern Japan in the west, and from the Gulf of Alaska south to at least Costa Rica in the east. The species is found primarily south of the Aleutian Islands and the Bering Sea (Reeves et al., 1998).

3.1.2.2 Critical habitat

No critical habitat rules have been published for the Blue whale.

3.1.2.3 Life history and ecology

It is assumed that blue whale distribution is governed largely by food requirements and that populations are seasonally migratory. Poleward movements in spring allow the whales to take advantage of high zooplankton production in summer. Movement toward the subtropics in the fall allows blue whales to reduce their energy expenditure while fasting, avoid ice entrapment in some areas, and engage in reproductive activities in warmer waters of lower latitudes. Overall, it is clear that this species inhabits and feeds in both coastal and pelagic environments (Reeves et al., 1998).

3.1.2.4 Population trends and risks

It is estimated that there were about 1,500 blue whales in the North Pacific when modern commercial whaling began in the early 1900s. Current estimates are in the low hundreds (Reeves et al., 1998).

Whaling has caused the largest reductions in this species population, but other factors might also contribute to its decline or may prevent the population’s recovery. These factors include collisions with ships, disturbance by commercial and recreational vessels, entanglement in fishing gear, habitat degradation, and aquatic pollution. Little evidence exists to support the conclusion that any of these factors caused a serious decline in the blue whale population, but these factors may prevent the recovery of the species (Reeves et al., 1998).

3.1.3 Finback whale

The fin whale (*Balaenoptera phyusalus*) has been listed as “endangered” since 1970 under the precursor to the Endangered Species Act (ESA) and has remained on the list of threatened and endangered species since the ESA was passed in 1973 (35 FR 8491).

3.1.3.1 Species range

Fin whales are found in deep, offshore waters of all major oceans, primarily in temperate to polar latitudes, and less commonly in the tropics.

Fin whales are migratory, moving seasonally into and out of high-latitude feeding areas, but the overall migration pattern is complex. Fin whales can occur in any one season at many different latitudes, perhaps depending on their age or reproductive state as well as their “stock” affinity. Movements can be either inshore/offshore or north/south. There may be resident groups of fin whales in some areas, including the Gulf of California (NMFS, 2010).

3.1.3.2 Critical habitat

Critical habitat has not been designated for the fin whale.

3.1.3.3 Life history and ecology

Fin whales are large, fast swimmers and the killer whale is their only non-human predator. During the summer, Pacific fin whales feed on krill, small copepods, and small schooling fish (e.g., herring, walleye pollock, and capelin). Fin whales fast in the winter while they migrate to warmer waters.

Most reproductive activity, including mating and births, takes place in the winter season (November to March; peak December/January). The gestation period is probably somewhat less than a year, and fin whale calves are nursed for 6–7 months. The average calving interval has been estimated at about two years (NMFS, 2010).

3.1.3.4 Population trends and risks

Although reliable and recent estimates of fin whale abundance are available for large portions of the North Atlantic Ocean, this is not the case for most of the North Pacific Ocean or for the Southern Oceans. The present status of populations in these ocean basins relative to their pre-whaling population size is uncertain. There are currently believed to be tens of thousands of fin whales worldwide.

NMFS recognizes three stocks in U.S. Pacific waters: Alaska (Northeast Pacific), California/Oregon/Washington, and Hawaii. The California/Oregon/Washington stock was estimated at 2,636 fin whales based on ship surveys conducted in summer/autumn of 2001 and 2005.

Historically, the greatest threat to the fin whale was commercial whaling, which ended in the North Pacific Ocean in 1976, in the Southern Ocean in 1976-77, and in the North Atlantic Ocean in 1987. They are still hunted in Greenland and subject to catch limits under the International Whaling Commission (IWC)'s "aboriginal subsistence whaling" scheme. Iceland resumed commercial whaling of fin whales in 2006 under a formal objection to the IWC's ban on commercial whaling and Japan kills fin whales as part of its scientific whaling program. Among the current potential threats are collisions with vessels, reduced prey abundance due to overfishing and/or climate change, the possibility that illegal whaling or resumed legal whaling will cause removals at biologically unsustainable rates and, possibly, the effects of increasing anthropogenic ocean noise (NMFS, 2010).

3.1.4 Humpback whale

The humpback whale (*Megaptera novaeangliae*) was designated as endangered throughout its entire range on the first list of endangered species under the Endangered Species Conservation Act on June 2, 1970 (35 FR 8491).

3.1.4.1 Species range

Humpback whales live in all major oceans from the equator to sub-polar latitudes. In the North Pacific, there are at least three separate populations, which are considered distinct stocks although there is some mixing between them. The California/Oregon/Washington stock winters in coastal Central America and Mexico and migrates to areas ranging from the coast of California to southern British Columbia in summer and fall (NMFS b).

3.1.4.2 Critical habitat

Critical habitat has not been designated for the Humpback whale.

3.1.4.3 Life history and ecology

Humpbacks generally feed for 6 months of the year on their feeding grounds in Arctic and Antarctic waters. The animals then fast and live off their fat layer for the winter period while in the tropical breeding grounds. Humpbacks eat primarily small schooling fish such as herring, capelin, pollock, and sand lance. Additionally, they commonly consume euphausiid shrimp (NMFS, 1991).

During migration, humpbacks stay near the surface of the ocean. While feeding and calving, they prefer shallow waters. During calving, humpbacks are usually found in the warmest waters available at that latitude. Calving grounds are commonly near offshore reef systems, islands, or continental shores. Humpback feeding grounds are in cold, productive coastal waters (NMFS b).

3.1.4.4 Population trends and risks

Humpbacks are increasing in abundance in much of their range. In the North Pacific, humpback abundance was estimated at fewer than 1,400 whales in 1966, after heavy commercial exploitation. The current abundance estimate for the North Pacific is about 20,000 whales. Population for the California/Oregon/Washington stock is estimated to be at least 1,250. The central North Pacific and California/Oregon/Washington stocks seem to be increasing.

Humpback whales face a series of threats including entanglement in fishing gear (bycatch), ship strikes, whale watch harassment, habitat impacts, and proposed harvest (NMFS b).

3.1.5 Killer whale, Southern Resident DPS

The killer whale (*Orcinus orca*) Southern Resident Distinct Population Segment (DPS) was listed as endangered on November 18, 2005 (70 FR 69903). A DPS is treated as a unique species under the ESA.

3.1.5.1 Species range

The Southern Resident killer whale population range during the spring, summer, and fall includes the inland waterways of Puget Sound, Strait of Juan de Fuca, and Southern Georgia Strait. Their occurrence has been documented in the coastal waters off of Oregon, Washington, Vancouver Island, central California, and Queen Charlotte Islands.

Although little is known about the wintering movements and range of the Southern Resident stock, research conducted during the winters of 2013 and 2014 indicated that they spend much of their time in the offshore waters of Washington, Oregon, and California (NMFS. 2014). Southern Residents have not been observed associating with other resident whales, and genetic data suggest that Southern Residents rarely, if ever, interbreed with other killer whale populations (NMFS c).

3.1.5.2 Critical habitat

Three specific areas in the state of Washington were designated as critical habitat for the Southern Resident killer whale on November 29, 2006 (71 FR 69054). These include (1) the Summer Core Area in Haro Strait and waters around the San Juan Islands; (2) Puget Sound; and (3) the Strait of Juan de Fuca, which comprise approximately 2,560 square miles (6,630 sq. km.) of marine habitat. These areas are shown in Figure 3.3. Critical habitat does not include areas less than 20 feet deep relative to extreme high water. Eighteen military sites were excluded due to national security concerns. As the Draft Permit proposes to exclude discharges to the Strait of Juan de Fuca and the entire Salish Sea, there is no critical habitat in the action area of the Draft Permit.

The primary constituent elements essential for conservation of the Southern Resident killer whale are: (1) Water quality to support growth and development; (2) Prey species of sufficient quantity, quality, and availability to support individual growth, reproduction, and development, as well as overall population growth; and (3) Passage conditions to allow for migration, resting, and foraging.

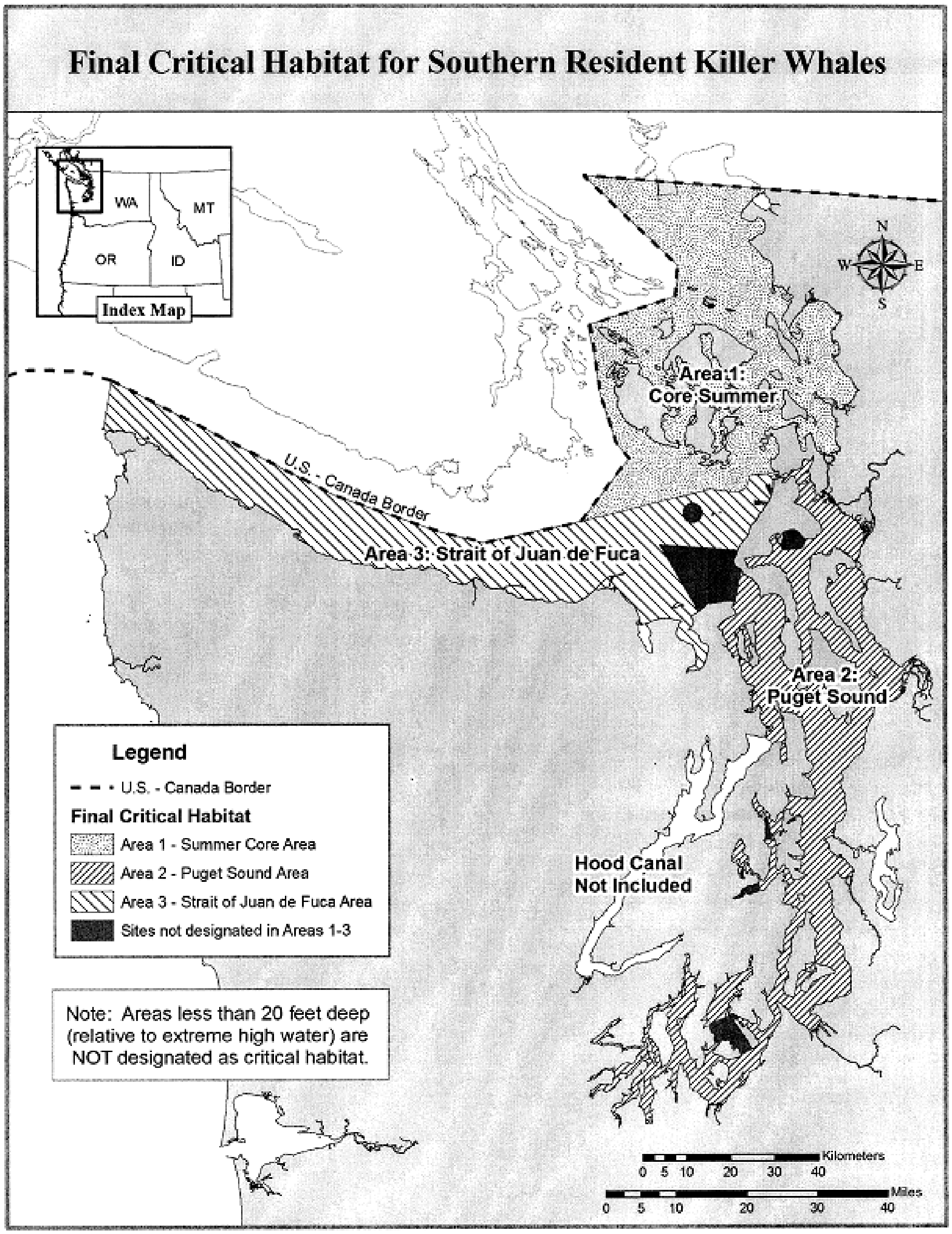


Figure 3.3 Critical Habitat for Southern Resident Killer Whales (Source: 71 FR 69069)

3.1.5.3 Life history and ecology
In the eastern North Pacific, the Resident killer whale populations mainly feed on salmonids, such as Chinook salmon and chum salmon. Like all cetaceans, killer whales depend heavily on underwater sound for orientation, feeding, and communication.

Resident type killer whales occur in large social groups termed "pods," which are defined to be groups of whales that are seen in association with one another greater than 50% of the time. The pods represent collections of matrilines (a matriarch and all her descendants), which have been found to be the stable social unit. Three pods make up the Southern resident DPS.

Sexual maturity of female killer whales is achieved when the whales reach lengths of approximately 15-18 feet (4.6 m-5.4 m), depending on geographic region. The gestation period for killer whales varies from 15-18 months, and birth may take place in any month. Calves are nursed for at least 1 year, and may be weaned between 1 and 2 years of age. The birth rate for killer whales is not well understood, but, in some populations, is estimated as every 5 years for an average period of 25 years (NMFS c).

3.1.5.4 Population trends and risks
The Southern Resident killer whale population is currently estimated at about 88 whales, a decline from its estimated historical level of about 200 during the mid- to late 1800s. Beginning in about 1967, the live-capture fishery for oceanarium display removed an estimated 47 whales and caused an immediate decline in Southern Resident numbers. The population fell an estimated 30% to about 67 whales by 1971. By 2003, the population had increased to 83 whales.

Current threats related to human activities include contaminants (e.g., PCBs), depletion of prey due to overfishing and habitat degradation, ship collisions, and oil spills. Additional threats may include disturbance from such activities as noise from industrial and military activities, entanglement in fishing gear, and whale-watching. Outside U.S. waters, directed catch of killer whales still occurs, though these levels are presumed low (NMFS c).

3.1.6 North Pacific right whale
The North Pacific right whale (*Eubalaena japonica*) has been listed as endangered under the ESA since 1973. It was originally listed as the “northern right whale” under the Endangered Species Conservation Act on June 2, 1970 (35 FR 8491).

3.1.6.1 Species range
North Pacific right whales inhabit the Pacific Ocean, particularly between 20° and 60° latitudes. Sightings have been reported as far south as central Baja California in the eastern North Pacific, as far south as Hawaii in the central North Pacific, and as far north as the sub-Arctic waters of the Bering Sea and sea of Okhotsk in the summer (NMFS d). A range map for this species is shown in Figure 3.4.

Right whales have occurred historically in all the world's oceans from temperate to subpolar latitudes. They primarily occur in coastal or shelf waters, although movements over deep waters are known. For much of the year, their distribution is strongly correlated to the distribution of their prey. During winter, right whales occur in lower latitudes and coastal waters where calving takes place. However, the whereabouts of much of the population during winter remains unknown. Right whales migrate to higher latitudes during spring and summer (NMFS d).

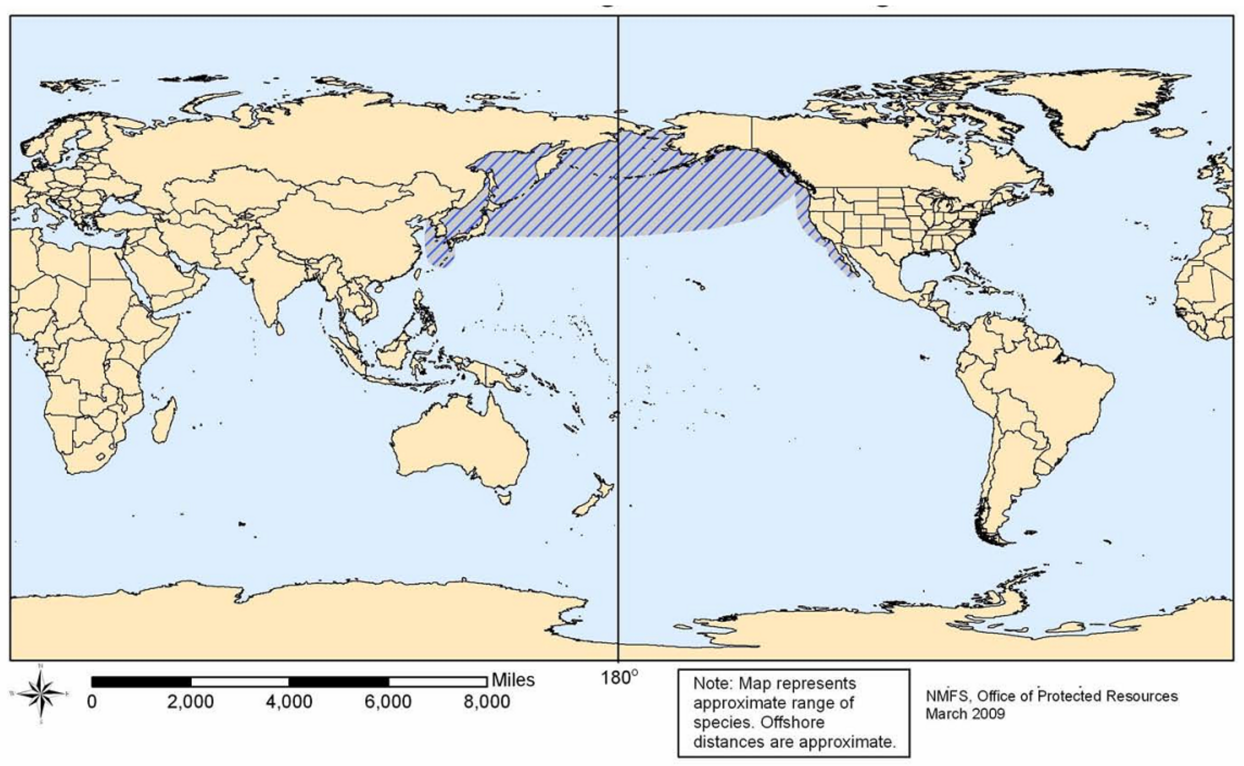


Figure 3.4 North Pacific Right Whale Range (Source: http://nmfs.noaa.gov)

3.1.6.2 Critical habitat

Two critical habitat areas, one in the Bering Sea and the other in the Gulf of Alaska, were designated for the northern right whale on July 6, 2006 (71 FR 38277). After the North Pacific right whale was listed as a separate endangered species, these same areas were designated as its critical habitat on April 8, 2008 (73 FR 19000). No critical habitat for this species lies within the action area.

The primary constituent elements of the North Pacific right whale are the copepods *Calanus marshallae*, *Neocalanus cristatus*, and *N. plumchris*, and the euphausiid *Thysanoessa raschii*, in areas of the North Pacific Ocean, in which North Pacific right whales are known or believed to feed (NMFS d).

3.1.6.3 Life history and ecology

Females give birth to their first calf at an average age of 9-10 years. Gestation lasts approximately 1 year. Calves are usually weaned toward the end of their first year. Most known right whale nursery areas are in shallow, coastal waters. The International Whaling Commission has identified four categories of right whale habitats:

1. Feeding - areas with copepod and krill densities that routinely elicit feeding behavior and are visited seasonally
2. Calving - areas routinely used for calving and neonatal nursing
3. Nursery - aggregation area(s) where nursing females feed and suckle
4. Breeding - locations where mating behavior leading to conception occurs; breeding areas are not known for any population

Migratory patterns of the North Pacific right whale are unknown, although it is thought the whales spend the summer on high-latitude feeding grounds and migrate to more temperate waters during the winter.

Right whales feed from spring to fall, and also in winter in certain areas. The primary food sources are zooplankton, including copepods, euphausiids, and cyprids. Unlike other baleen whales, right whales are skimmers: they feed by removing prey from the water using baleen while moving with their mouth open through a patch of zooplankton.

It is believed that right whales live at least 50 years, but there are few actual longevity data (NMFS d).

3.1.6.4 Population trends and risks

There are no reliable estimates of current abundance or trends for right whales in the North Pacific. The pre-exploitation size of this stock exceeded 11,000 animals. The eastern North Pacific population is known to be significantly fewer than 900. Over the past forty years, most sightings in the eastern North Pacific have been of single whales. However, during the last few years, small groups of right whales have been sighted. This is encouraging but there has been only one confirmed sighting of calves in the 20th century. Further, the North Pacific animals are known to have been subjected to large illegal Soviet catches in the early 1960s.

Because of their rare occurrence and scattered distribution, it is impossible to assess the possible threats of ship strikes and entanglement. Thus, the estimated annual rate of human-caused mortality and serious injury appears minimal. The reasons for the apparent lack of recovery for right whales in this region are unknown (NMFS d).

3.1.7 Sei whale

The sei whale (*Balaenoptera borealis*) was included in the first list of endangered species under the Endangered Species Conservation Act on June 2, 1970 (35 FR 8491).

3.1.7.1 Species range

Sei whales occur in subtropical, temperate, and subpolar waters around the world. They prefer temperate waters in the mid-latitudes on the continental shelf edge and slope worldwide, and are usually observed in deeper waters of oceanic areas far from the coastline. The entire distribution and movement pattern of this species is not well known. Sei whales may unpredictably and randomly occur in a specific area, sometimes in large numbers. These events may occur suddenly and then not occur again for long periods of time. Populations of sei whales, like other rorquals, may seasonally migrate toward the lower latitudes during the winter and higher latitudes during the summer (NMFS e).

3.1.7.2 Critical habitat

Critical habitat has not been designated for the sei whale.

3.1.7.3 Life history and ecology

Sei whales are usually observed singly or in small groups of 2-5 animals, but are occasionally found in larger (30-50) loose aggregations. They are capable of diving 5-20 minutes to opportunistically feed on plankton (e.g., copepods and krill), small schooling fish, and cephalopods (e.g., squid) by both gulping and skimming. They prefer to feed at dawn and may exhibit unpredictable behavior while foraging and feeding on prey. Sometimes seabirds are associated with the feeding frenzies of these and other large whales.

Sei whales become sexually mature at 6-12 years of age when they reach about 45 ft. (13 m) in length, and generally mate and give birth during the winter in lower latitudes. Females breed every 2-3 years, with a gestation period of 11-13 months. Females give birth to a single calf that is about 15 ft. (4.6 m) long and weighs about 1,500 lbs. (680 kg). Calves are usually nursed for 6-9 months before being weaned on the preferred feeding grounds. Sei whales have an estimated lifespan of 50-70 years (NMFS e).

3.1.7.4 Population trends and risks

For management purposes, sei whales inhabiting U.S. waters have been divided into four stocks: The Hawaiian Stock, Eastern North Pacific Stock, Nova Scotia Stock, and Western North Atlantic Stock. The estimated population in the eastern north Pacific stock is 35-55. Scientists estimate that the current worldwide population is about 80,000 individuals. After commercial whaling exhausted all known populations of this species, sei whales in the North Atlantic and North Pacific are considered to be relatively abundant, but the population in the Southern Ocean remains greatly depleted.

During the 19th and 20th centuries, sei whales were targeted and greatly depleted by commercial hunting and whaling, with an estimated 300,000 animals killed for their meat and oil. Other threats that may affect sei whale populations are ship strikes and interactions with fishing gear, such as traps and pots (NMFS e).

3.1.8 Sperm whale

The sperm whale (*Physeter macrocephalus*) was listed as endangered throughout its range on June 2, 1970 in the first list of endangered species under the Endangered Species Conservation Act of 1969 (35 FR 8495).

3.1.8.1 Species range

Sperm whales inhabit all oceans of the world. They can be seen close to the edge of pack ice in both hemispheres and are also common along the equator, especially in the Pacific. Sperm whales are found throughout the world's oceans in deep waters usually between about 60° N and 60° S latitudes. Their distribution is dependent on their food source and suitable conditions for breeding, and varies with the sex and age composition of the group. Sperm whale migrations are not as predictable or well understood as migrations of most baleen whales. In some mid-latitudes, there seems to be a general trend to migrate north and south depending on the seasons (whales move poleward in the summer). However, in tropical and temperate areas, there appears to be no obvious seasonal migration.

For management purposes, sperm whales inhabiting U.S. waters have been divided into five stocks. The California-Oregon-Washington Stock are found year-round in California waters, but they reach peak abundance from April through mid-June and from the end of August through mid-November. They are seen in every season except winter (Dec-Feb) in Washington and Oregon.

Sperm whales tend to inhabit areas with a water depth of 1968 feet (600 m) or more, and are uncommon in waters less than 984 feet (300 m) deep. Female sperm whales are generally found in deep waters (at least 3280 feet, or 1000 m) of low latitudes (less than 40°, except in the North Pacific where they are found as high as 50°). These conditions generally correspond to sea surface temperatures greater than 15°C, and while female sperm whales are sometimes seen near oceanic islands, they are typically far from land.

Immature males will stay with female sperm whales in tropical and subtropical waters until they begin to slowly migrate towards the poles, anywhere between ages 4 and 21 years old. Older, larger males are generally found near the edge of pack ice in both hemispheres. On occasion, however, these males will return to the warm water breeding area (NMFS f).

3.1.8.2 Critical habitat

Critical habitat has not been designated for the sperm whale.

3.1.8.3 Life history and ecology

Because sperm whales spend most of their time in deep waters, their diet consists of many larger organisms that also occupy deep waters of the ocean. Their principle prey are large squid weighing between 3.5 ounces and 22 pounds (0.1 kg and 10 kg), but they will also eat large demersal and mesopelagic sharks, skates, and fishes. The average dive lasts about 35 minutes and is usually down 1,312 feet (400 m), however dives may last over an hour and reach depths over 3,280 feet (1,000 m).

Female sperm whales reach sexual maturity around 9 years of age when they are roughly 29 feet (9 m) long. At this point, growth slows and they produce a calf approximately once every five years. After a 14-16-month gestation period, a single calf about 13 feet (4 m) long is born. Although calves will eat solid food before one year of age, they continue to suckle for several years. Females are physically mature around 30 years and 35 feet (10.6 m) long, at which time they stop growing. For about the first 10 years of life, males are only slightly larger than females, but males continue to exhibit substantial growth until they are well into their 30s. Males reach physical maturity around 50 years and when they are 52 feet (16 m) long. Unlike females, puberty in males is prolonged, and may last between ages 10 to 20 years old. Even though males are sexually mature at this time, they often do not actively participate in breeding until their late twenties.

Most females will form lasting bonds with other females of their family, and on average 12 females and their young will form a family unit. While females generally stay with the same unit all their lives in and around tropical waters, young males will leave when they are between 4 and 21 years old and can be found in "bachelor schools", comprising of other males that are about the same age and size. As males get older and larger, they begin to migrate to higher latitudes (toward the poles) and slowly bachelor schools become smaller, until the largest males end up alone. Large, sexually mature males that are in their late 20s or older, will occasionally return to the tropical breeding areas to mate (NMFS f).

3.1.8.4 Population trends and risks

During the past 2 centuries, commercial whalers took about 1,000,000 sperm whales. Despite this high level of "take", the sperm whale remains the most abundant of the large whale species. Currently, there is no good estimate for the total number of sperm whales worldwide. The best estimate, that there are between 200,000 and 1,500,000 sperm whales, is based on extrapolations from only a few areas that have useful estimates. The most recent abundance estimate for the California-Oregon-Washington stock for the period between 1996 and 2001 is 1,233 sperm whales. Sperm whale abundance appears to have been rather variable off California between 1979/1980 and 1996, but does not show any obvious trends.

Current human threats to sperm whales include ship strikes, entanglements in fishing gear (although these are not as great of a threat to sperm whales as they are to more coastal cetaceans), disturbance by anthropogenic noise (notably in areas of oil and gas activities or where shipping activity is high), accumulation of stable pollutants (e.g. polycholorobiphenyls

(PCBs), chlorinated pesticides (DDT, DDE, etc.), polycyclic aromatic hydrocarbons (PAHs), and heavy metals). The potential impact of coastal pollution may be an issue for this species in portions of its habitat. Historically, whaling was a threat to this species, but has virtually ceased with the implementation of a moratorium against whaling by the IWC in 1988.

Natural threats to sperm whales include killer whales, which have been documented killing at least one sperm whale in California. Typically, however, it is believed that most killer whale attacks are unsuccessful. Pilot whales have been observed harassing sperm whales, but it is unclear if they pose any real threat. Large sharks may also be a threat, especially for young sperm whales (NMFS f).

3.2 FISH

The threatened and endangered fish discussed below fall into two categories: marine and anadromous. Marine fish spend their entire life in salt water. Anadromous fish are born in fresh water, migrate to the ocean to grow into adults, and then return to fresh water to spawn. The three marine fish discussed are all rockfish. The following three paragraphs include life history and newly designated critical habitat which is common to all three rockfish species.

Rockfish

The three marine fish discussed (bocaccio, canary rockfish and yelloweye rockfish) are all rockfish, which are unusual among the bony fishes in that fertilization and embryo development is internal, and females give birth to live larval young. Larval rockfish feed on diatoms, dinoflagellates, tintinnids, and cladocerans. Juveniles consume copepods and euphausiids of all life stages. Adults eat demersal invertebrates and small fishes, including other species of rockfish, associated with kelp beds, rocky reefs, pinnacles, and sharp drop-offs (NMFS k,l,m). Larvae are found in surface waters and may be distributed over a wide area extending several hundred miles offshore. Larvae and small juvenile rockfish may remain in open waters for several months, being passively dispersed by ocean currents. Juveniles and sub-adults tend to be more common than adults in shallow water and are associated with rocky reefs, kelp canopies, and artificial structures, such as piers and oil platforms. Adults generally move into deeper water as they increase in size and age but usually exhibit strong site fidelity to rocky bottoms and outcrops where they hover in loose groups just above the bottom (NMFS k,l,m).

Critical Habitat was designated for all three rockfish on November 13, 2014 (79 FR 68041). All critical habitat is found scattered throughout the Puget Sound (See Figure 3.5) (NMFS x). The specific areas in the final designation include 590.4 square miles of nearshore habitat for canary rockfish and bocaccio, and 414.1 square miles of deepwater habitat for yelloweye rockfish, canary rockfish, and bocaccio. There is no critical habitat in the action area of the Draft Permit.

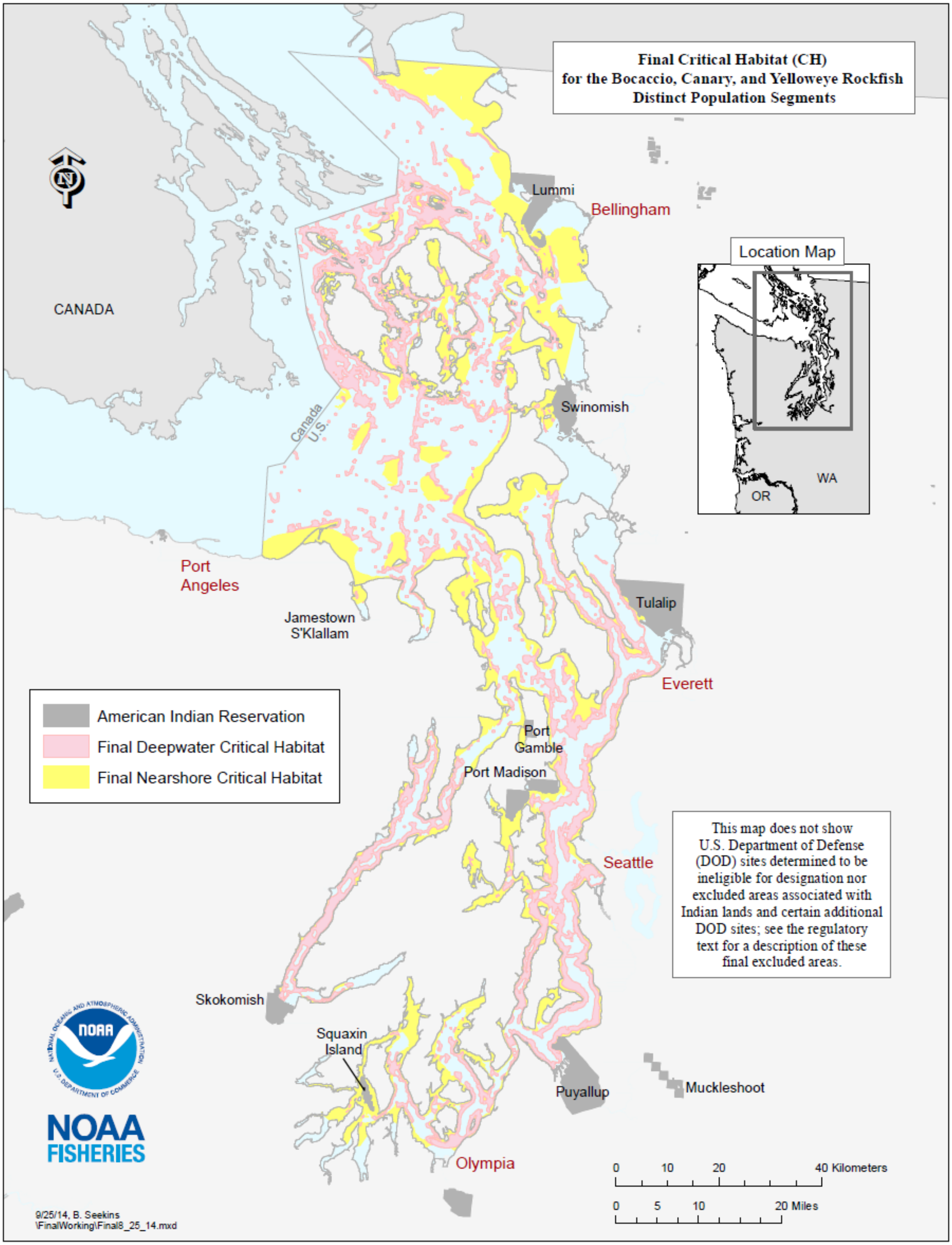


Figure 3.5 Rockfish Critical Habitat (Source http://www.westcoast.fisheries.noaa.gov/)

3.2.1 Bocaccio

The bocaccio (*Sebastes paucispinis*) is a large Pacific coast rockfish. The Puget Sound/Georgia Basin DPS of the species was listed as endangered on April 13, 2011 (76 FR 20558).

3.2.1.1 Species range

Bocaccio range from Punta Blanca, Baja California, to the Gulf of Alaska off Krozoff and Kodiak Islands. They are most common between Oregon and northern Baja California. In Puget Sound, most bocaccio are found south of Tacoma Narrows. Bocaccio are most common between 160 and 820 feet (50-250 m) depth, but may be found as deep as 1,560 feet (475m) (NMFS k).

3.2.1.2 Critical habitat

Critical Habitat was designated for Bocaccio on November 13, 2014 (79 FR 68041). Critical habitat is found throughout Puget Sound. The specific areas in the final designation include 590.4 square miles of nearshore habitat and 414.1 square miles of deepwater habitat. A critical habitat map for the species is shown in Figure 3.5 (NMFS x). There is no critical habitat in the action area of the Draft Permit.

3.2.1.3 Life history and ecology

Approximately 50 percent of adult bocaccio mature in 4 to 6 years. Bocaccio are difficult to age but are suspected to live as long as 50 years. Fecundity in female bocaccio ranges from 20,000 to over 2 million eggs, considerably more than many other rockfish species (NMFS k).

3.2.1.4 Population trends and risks

Recreational catch and effort data spanning 12 years from the mid-1970s to mid-1990s suggest declines in the population over time. Currently there are no survey data being taken for this species, but few of these fish are caught by fishermen and none have been caught by Washington state biological surveys in 20 years, suggesting very low population abundance. They are thought to be at an abundance that is less than 10% of their unfished abundance. A 2005 stock assessment by NOAA Fisheries suggests bocaccio have higher populations than was thought to be the case (NMFS k).

Bocaccio are fished directly and are often caught as bycatch by other fisheries, including those for salmon. Adverse environmental factors led to recruitment failures in the early- to mid-1990s (NMFS k).

3.2.2 Canary rockfish

The canary rockfish (*Sebastes pinniger*) was listed as threatened on April 13, 2011 (76 FR 20558).

3.2.2.1 Species range

Canary rockfish range between Punta Colnett, Baja California, and the Western Gulf of Alaska. Within this range, canary rockfish are most common off the coast of central Oregon. They primarily inhabit waters 160 to 820 feet (50 to 250 m) deep but may be found to 1400 feet (425 m) (NMFS l).

3.2.2.2 Critical habitat

Critical Habitat was designated for canary rockfish on November 13, 2014 (79 FR 68041). Critical habitat is found throughout Puget Sound. The specific areas in the final designation include 590.4 square miles of nearshore habitat and 414.1 square miles of deepwater habitat. A critical habitat map for the species is shown in Figure 3.5 (NMFS x). There is no critical habitat in the action area of the Draft Permit.

3.2.2.3 Life history and ecology

Approximately 50 percent of adult canary rockfish are mature at 14 inches (36 cm) total length (about 5 to 6 years of age). Canary rockfish can live to be 75 years old. Fecundity in female canary rockfish ranges from 260,000 to 1.9 million eggs, considerably more than many other rockfish species (NMFS l).

3.2.2.4 Population trends and risks

Recreational catch and effort data spanning 12 years from the mid-1970s to mid-1990s suggest declines in the population over time. Currently there are no survey data being taken for this species, but few of these fish are currently caught by fishermen, suggesting low population abundance. Canary rockfish were one of the three principal species caught in Puget Sound in the 1960s.

Canary rockfish are fished directly and are often caught as bycatch in other fisheries, including those for salmon. Adverse environmental factors led to recruitment failures in the early- to mid-1990s (NMFS l).

3.2.3 Yelloweye rockfish

The yelloweye rockfish (*Sebastes ruberrimus*) was listed as threatened on April 13, 2011 (76 FR 20558).

3.2.3.1 Species range

Yelloweye rockfish range from northern Baja California to the Aleutian Islands, Alaska, but are most common from central California northward to the Gulf of Alaska. They occur in waters 80 to 1560 feet (25 to 475 m) deep, but are most commonly found between 300 to 590 feet (91 to 180 m) (NMFS m).

3.2.3.2 Critical habitat

Critical Habitat was designated for yelloweye rockfish on November 13, 2014 (79 FR 68041). Critical habitat is found throughout Puget Sound. The specific areas in the final designation include 414.1 square miles of deepwater habitat. A critical habitat map for the species is shown in Figure 3.5 (NMFS x). There is no critical habitat in the action area of the Draft Permit.

3.2.3.3 Life history and ecology

Approximately 50 percent of adult yelloweye rockfish are mature by 16 inches (41 cm) total length (about 6 years of age). Yelloweye rockfish are among the longest lived of rockfishes, living up to 118 years old. Fecundity in female yelloweye rockfish ranges from 1.2 to 2.7 million eggs, considerably more than many other rockfish species (NMFS m).

3.2.3.4 Population trends and risks

Recreational catch and effort data spanning 12 years from the mid-1970s to mid-1990s suggest declines in the population over time. Currently there are no survey data being taken for this species, but few of these fish are caught by fishermen, suggesting low population abundance.

Yelloweye rockfish are fished directly and are often caught as bycatch in other fisheries, including those for salmon. Adverse environmental factors led to recruitment failures in the early- to mid-1990s (NMFS m).

Anadromous Fish

The remainder of the fish species discussed in this section are anadromous, meaning they are born in fresh water, migrate to the ocean to grow into adults, and then return to fresh water to spawn. Most of the species discussed are salmonids (of the genus *Oncorhynchus*), which includes all of the salmon and steelhead species. The other two species discussed are the Pacific eulachon and the North American green sturgeon.

3.2.4 Pacific eulachon

Eulachon (*Thaleichthys pacificus*), commonly called smelt, candlefish, or hooligan, are a small, anadromous fish from the eastern Pacific Ocean. The Southern DPS of the species was listed as threatened on April 13, 2011 (76 FR 20558).

3.2.4.1 Species range

Eulachon are endemic to the eastern Pacific Ocean, ranging from northern California to southwest Alaska and into the southeastern Bering Sea. In the continental United States, most eulachon originate in the Columbia River Basin. Other areas in the United States where eulachon have been documented include the Sacramento River, Russian River, Humboldt Bay and several nearby smaller coastal rivers (e.g., Mad River), and the Klamath River in California; the Rogue River and Umpqua Rivers in Oregon; and infrequently in coastal rivers and tributaries to Puget Sound, Washington. A range map for this species is shown in Figure 3.6. Eulachon occur in nearshore ocean waters and to 1000 feet (300 m) in depth, except for the brief spawning runs into their natal (birth) streams (NMFS n).

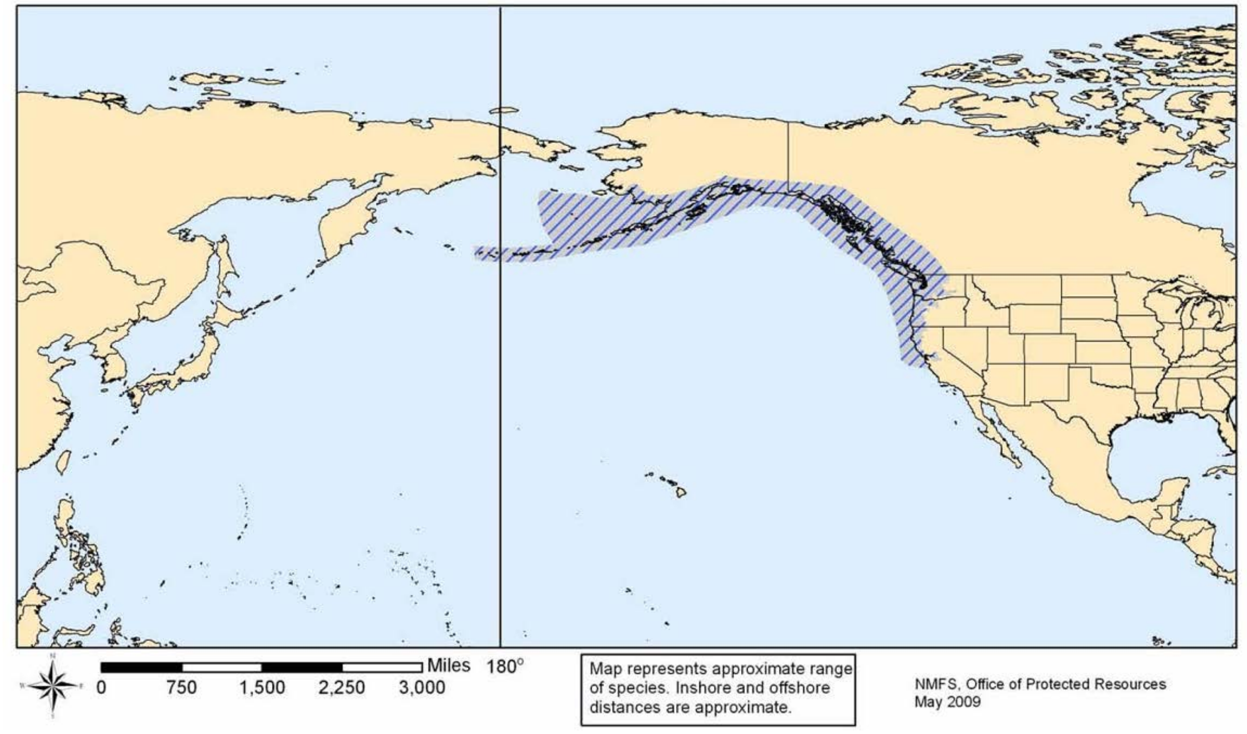


Figure 3.6 Pacific Eulachon Range Map (Source: http://www.nmfs.noaa.gov)

3.2.4.2 Critical habitat

Sixteen specific areas within the states of California, Oregon, and Washington, of which thirteen are in Washington and Oregon, were designated as critical habitat for the southern Distinct Population Segment (DPS) of Pacific eulachon on October 20, 2011 (76 FR 65324). The designated areas are a combination of freshwater creeks and rivers and their associated estuaries, comprising approximately 539 km (335 mi) of habitat.

Critical habitat for this DPS includes portions of the Umpqua River, Tenmile Creek, and Sandy River in Oregon; Grays River, Skamokawa Creek, Elochoman River, Cowlitz River, Toutle River, Kalama River, Lewis River, Quinault River, and Elwha River in Washington; and Columbia River in both states. Tribal lands of four Indian tribes are excluded from designation. Critical habitat areas in Washington and northern Oregon are shown in Figure 3.7 and areas in southern Oregon and northern California are shown in Figure 3.8. There is no critical habitat in the action area of the Draft Permit.

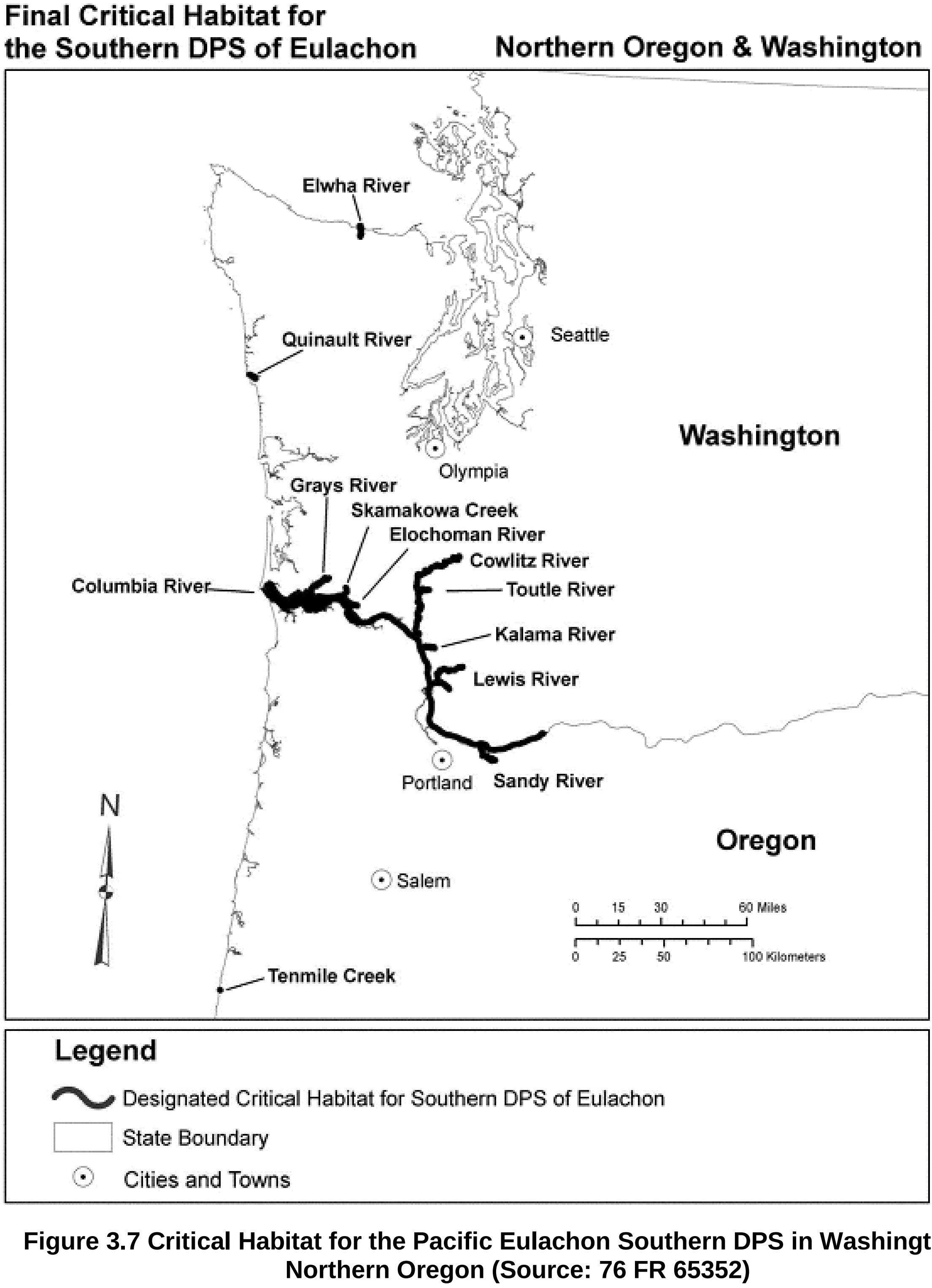


Figure 3.7 Critical Habitat for the Pacific Eulachon Southern DPS in Washington and Northern Oregon (Source: 76 FR 65352)

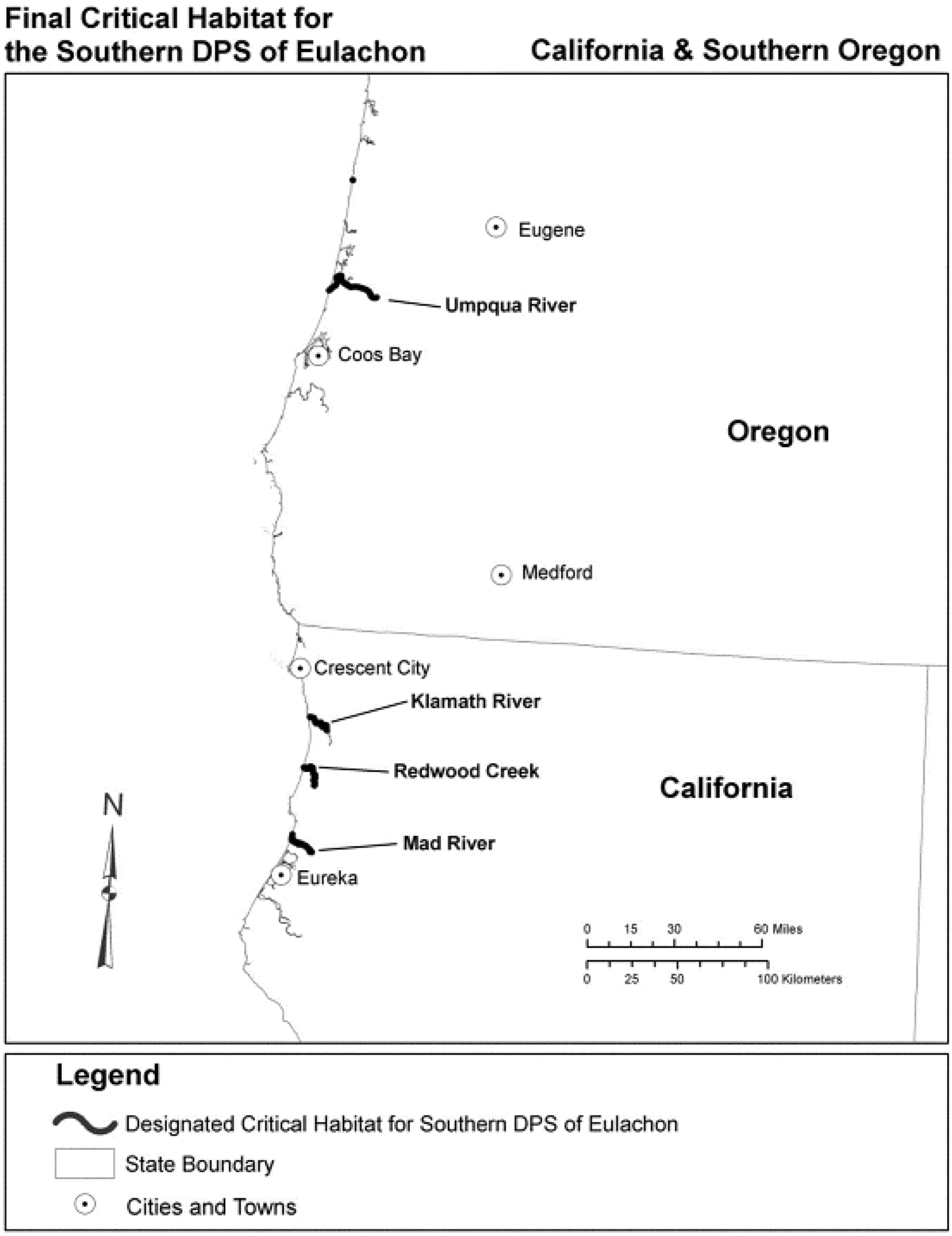


Figure 3.8 Critical Habitat for the Pacific Eulachon Southern DPS in Southern Oregon and Northern California (Source: 76 FR 65351)

3.2.4.3 Life history and ecology

Eulachon typically spend 3 to 5 years in saltwater before returning to freshwater to spawn from late winter through mid-spring. Spawning grounds are typically in the lower reaches of larger snowmelt-fed rivers with water temperatures ranging from 39 to 50° F (4-10° C). Spawning occurs over sand or coarse gravel substrates. Eggs are fertilized in the water column. After fertilization, the eggs sink and adhere to the river bottom. Most eulachon adults die after spawning. Eulachon eggs hatch in 20 to 40 days. The larvae are then carried downstream and are dispersed by estuarine and ocean currents shortly after hatching. Juvenile eulachon move from shallow nearshore areas to mid-depth areas. Within the Columbia River Basin, the major and most consistent spawning runs occur in the mainstem of the Columbia River as far upstream as the Bonneville Dam, and in the Cowlitz River (NMFS n).

3.2.4.4 Population trends and risks

Eulachon abundance exhibits considerable year-to-year variability. However, nearly all spawning runs from California to southeastern Alaska have declined in the past 20 years, especially since the mid-1990s. From 1938 to 1992, the median commercial catch of eulachon in the Columbia River was approximately 2 million pounds (900,000 kg) but from 1993 to 2006, the median catch had declined to approximately 43,000 pounds (19,500 kg), representing a nearly 98 percent reduction in catch from the prior period. Eulachon returns to British Columbia rivers similarly suffered severe declines in the mid-1990s and, despite increased returns during 2001 to 2003, presently remain at very low levels. The populations in the Klamath River, Mad River, Redwood Creek, and Sacramento River are likely extirpated or nearly so.

Habitat loss and degradation threaten eulachon, particularly in the Columbia River basin. Hydroelectric dams block access to historical spawning grounds and affect the quality of spawning substrates through flow management, altered delivery of coarse sediments, and siltation. The release of fine sediments from behind a U.S. Army Corps of Engineers sediment retention structure on the Toutle River has been negatively correlated with Cowlitz River eulachon returns 3 to 4 years later and is thus implicated in harming eulachon in this river system, though the exact cause of the effect is undetermined. Dredging activities in the Cowlitz and Columbia rivers during spawning runs may entrain and kill fish or otherwise result in decreased spawning success.

Eulachon have been shown to carry high levels of chemical pollutants, and although it has not been demonstrated that high contaminant loads in eulachon result in increased mortality or reduced reproductive success, such effects have been shown in other fish species. Eulachon harvest has been curtailed significantly in response to population declines. However, existing regulatory mechanisms may be inadequate to recover eulachon stocks.

Global climate change may threaten eulachon, particularly in the southern portion of its range where ocean warming trends may be the most pronounced and may alter prey, spawning, and rearing success (NMFS n).

Salmonids

The twenty-eight ESA listed salmonid populations which are known to occur in the Draft Permit action area are listed with their ESA status in Table 3.2. These five species are divided into Evolutionarily Significant Units (ESUs), which are distinct population groups that are reproductively isolated and contribute to the ecological or genetic diversity of the species (Waples, 1991). An ESU is considered to be a “species” under the ESA. A salmonid ESU generally includes all naturally spawned populations in the named waterway (including tributaries) and time period, as well as related hatchery-bred fish.

Table 3.2 ESA-Listed Salmonids Occurring within the Draft Permit Action Area

Species	**ESU**	**Status**
Chinook salmon (*Oncorhynchus tshawytscha*) – 9 ESUs	CA coastal	T
	Central Valley spring-run	T
	Lower Columbia River	T
	Puget Sound	T
	Sacramento River winter-run	E
	Snake River fall-run	T
	Snake River spring/summer-run	T
	Upper Columbia spring-run	E
	Upper Willamette River	T
Coho salmon (*Oncorhynchus kisutch*) – 4 ESUs	Central California Coast	E
	Lower Columbia River	T
	Oregon Coast	T
	Southern Oregon/Northern California Coasts	T
Chum salmon (*Oncorhynchus keta*) – 2 ESUs	Columbia River	T
	Hood Canal summer-run	T
Sockeye salmon (*Oncorhynchus nerka*) – 2 ESUs	Ozette Lake, WA	T
	Snake River	E
Steelhead (*Oncorhynchus mykiss*) – 11 ESUs	Central CA coast	T
	Central Valley CA	T
	Lower Columbia River	T
	Middle Columbia River	T
	Northern California	T
	Puget Sound	T
	Snake River Basin	T
	South central CA coast	T
	Southern CA coast	E
	Upper Columbia River Basin	T
	Upper Willamette River	T

Salmonid species on the west coast of the United States have experienced dramatic declines in abundance during the past several decades as a result of various human-induced and natural factors. There is no single factor solely responsible for this decline, given the complexity of the salmon species life history and the ecosystem in which they reside. Broad categories of factors which have significantly affected the status of these species include water storage, withdrawal, conveyance, and diversion systems; natural resource use and extraction; loss of the spatial and temporal connectivity between and the complexity of watersheds; commercial and recreational fishing; introduction of non-native species; habitat modifications; and natural environmental conditions (NMFS q).

3.2.5 Chinook salmon

Nine of the seventeen Chinook salmon (*Oncorhynchus tshawytscha*) ESUs are listed under the ESA as endangered or threatened. All were listed on June 28, 2005 (70 FR 37160), all have designated critical habitat. The Upper Columbia River Spring-run ESU is listed as endangered, and all others are listed as threatened. The central valley fall/late fall run ESU is considered a species of concern. Six of the ESUs have spawning grounds in Washington or Oregon, including the Upper Columbia River Spring-run, Snake River Spring/Summer-run, Snake River Fall-run, Puget Sound, Lower Columbia River, and Upper Willamette River ESUs.

3.2.5.1 Species range

In the ocean off the U.S. coast, Chinook salmon are found from the Bering Strait area off Alaska south to Southern California (NMFS t).

3.2.5.2 Critical habitat

There are nine ESUs of Chinook salmon that are listed under the ESA, all of which have designated critical habitat. In general, critical habitat for Chinook salmon encompasses presently or historically accessible reaches of all rivers (including estuarine areas and tributaries) within the range of each listed ESU, which includes all waterways, substrate, and adjacent riparian zones below longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). A composite of all critical habitat areas for Chinook salmon is shown in Figure 3.9.

Critical habitat was recently designated on September 2, 2005 (70 FR 52630) for four of the Washington/Oregon ESUs (Puget Sound, Lower Columbia River, Upper Willamette River, and Upper Columbia River spring-run). Indian lands are excluded from critical habitat for these ESUs. Specific river basins for each chinook ESU with critical habitat found in Oregon and/or Washington are listed below.

Puget Sound ESU

Critical habitat is designated to include certain areas within the Nooksack, Upper Skagit, Sauk, Lower Skagit, Stillaguamish, Skykomish, Snoqualmie, Snohomish, Lake Washington, Duwamish, Puyallup, Nisqually, Skokomish, Hood Canal, Dungeness/Elwha subbasins. It also includes all nearshore marine areas (including areas adjacent to islands) of the Strait of Georgia (south of the international border), Puget Sound, Hood Canal, and the Strait of Juan de Fuca (to the western end of the Elwha River delta) from the line of extreme high tide out to a depth of 30 meters, except any areas subject to an approved Integrated Natural Resource Management Plan or associated with Department of Defense easements or right-of-ways.

Lower Columbia River ESU

Critical habitat is designated to include certain areas within the Middle Columbia/Hood, Lower Columbia/Sandy, Lewis, Lower Columbia/Clatskanie, Upper Cowlitz, Cowlitz, Lower Columbia, Clackamas, and Lower Willamette subbasins. It also includes the Columbia River from the mouth at the Pacific Ocean upstream to a line connecting the confluences of the Sandy River in Oregon and the Washougal River in Washington.

Upper Willamette River ESU

Critical habitat is designated to include certain areas within the Middle Fork Willamette, Upper Willamette, McKenzie, North Santiam, South Santiam, Middle Willamette, Molalla/Pudding, and Clackamas subbasins. It also includes the Columbia River from the mouth at the Pacific Ocean upstream to the confluence of the Clackamas and Willamette rivers, including the Multnomah Channel portion of the lower Willamette River.

Upper Columbia River spring-run ESU

Critical habitat is designated to include certain areas within the Chief Joseph, Methow, Upper Columbia/Entiat, and Wenatchee, subbasins as well as the Columbia River from the mouth at the Pacific Ocean upstream to Rock Island Dam.

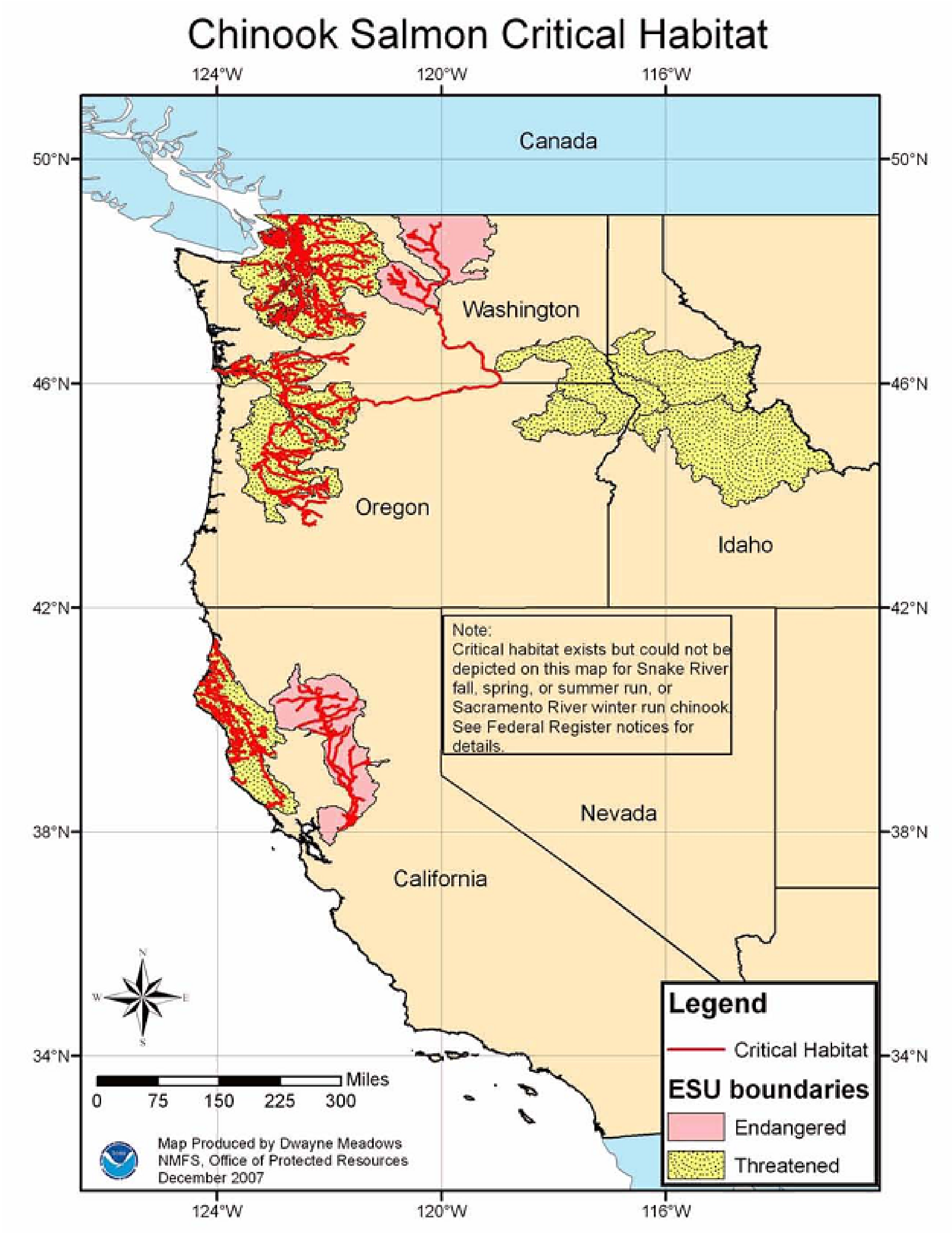


Figure 3.9 Critical Habitat for Chinook Salmon (Source: http://www.nmfs.noaa.gov/pr/species/criticalhabitat.htm)

Snake River fall run ESU

Critical habitat for the Snake River spring/summer and fall run chinook salmon ESUs was designated on December 28, 1993 (58 FR 68543). The fall run critical habitat consists of river reaches of the Columbia, Snake, and Salmon Rivers, and all tributaries of the Snake and

Salmon Rivers presently or historically accessible to this ESU, except reaches above impassable natural falls and Dworshak and Hells Canyon Dams.

Snake River spring/summer-run ESU

A revision to the Snake River spring/summer-run ESU was published on October 25, 1999. The current critical habitat is designated to include the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) and including all Columbia River estuarine areas and river reaches proceeding upstream to the confluence of the Columbia and Snake Rivers; all Snake River reaches from the confluence of the Columbia River upstream to Hells Canyon Dam.

3.2.5.3 Life history and ecology

Chinook feed on terrestrial and aquatic insects, amphipods, and other crustaceans while young, and primarily on other fishes when older.

Juvenile Chinook may spend from 3 months to 2 years in freshwater before migrating to estuarine areas as smolts and then into the ocean to feed and mature. They remain at sea for 1 to 6 years (more commonly 2 to 4 years), with the exception of a small proportion of yearling males (called jack salmon) which mature in freshwater or return after 2 or 3 months in salt water. Adults migrate from a marine environment into the freshwater streams and rivers of their birth in order to mate. They spawn only once and then die.

There are different seasonal (i.e., spring, summer, fall, or winter) "runs" in the migration of Chinook salmon from the ocean to freshwater, even within a single river system. These runs have been identified on the basis of when adult Chinook salmon enter freshwater to begin their spawning migration. However, distinct runs also differ in the degree of maturation at the time of river entry, the temperature and flow characteristics of their spawning site, and their actual time of spawning. Freshwater entry and spawning timing are believed to be related to local temperature and water flow regimes.

Adult female Chinook may deposit eggs in 4 to 5 "nesting pockets" within a single redd (nest). They will guard the redd from just a few days to nearly a month before dying. The eggs will hatch, depending upon water temperatures, 3 to 5 months after deposition. Eggs are deposited at a time to ensure that young salmon fry emerge during the following spring when the river or estuary productivity is sufficient for juvenile survival and growth.

Two distinct types or races among Chinook salmon have evolved.

One race, described as a "stream-type" Chinook, is found most commonly in headwater streams of large river systems. Stream-type Chinook salmon have a longer freshwater residency, and perform extensive offshore migrations in the central North Pacific before returning to their birth, or natal, streams in the spring or summer months. Stream-type juveniles are much more dependent on freshwater stream ecosystems because of their extended residence in these areas. A stream-type life history may be adapted to areas that are more consistently productive and less susceptible to dramatic changes in water flow. At the time of saltwater entry, stream-type (yearling) smolts are much larger, averaging 3 to 5.25 inches (73-134 mm) depending on the river system, than their ocean-type (sub-yearling) counterparts, and are therefore able to move offshore relatively quickly.

The second race, called "ocean-type" Chinook, is commonly found in coastal streams in North America. Ocean-type Chinook typically migrate to sea within the first three months of life, but they may spend up to a year in freshwater prior to emigration to the sea. They also spend their ocean life in coastal waters. Ocean-type Chinook salmon return to their natal streams or rivers as spring, winter, fall, summer, and late-fall runs, but summer and fall runs predominate. Ocean-type Chinook salmon tend to use estuaries and coastal areas more extensively than other pacific salmonids for juvenile rearing. The evolution of the ocean-type life history strategy may have been a response to the limited carrying capacity of smaller stream systems and unproductive watersheds, or a means of avoiding the impact of seasonal floods. Ocean-type Chinook salmon tend to migrate along the coast. Populations of Chinook salmon south of the Columbia River drainage appear to consist predominantly of ocean-type fish (NMFS t).

3.2.5.4 Population trends and risks

In the U.S. Pacific Northwest states, many wild stocks remain at or near record low levels. Other stocks in this area are already extinct due to a long list of contributing factors, including over-fishing; loss of spawning and rearing habitats; impediments to upstream or downstream migration due to river dams; watershed logging; water allocations for farming, mining and navigation; and generalized industrialization and urbanization throughout the region. Over time, recovery programs for some ESA-listed stock groups in the Sacramento and Columbia rivers are beginning to cause minor improvements (Heard et al., 2007).

3.2.6 Chum salmon

The Columbia River and summer-run Hood Canal ESU’s were both listed as threatened on August 2, 1999 (64 FR 41835).

3.2.6.1 Species range

Chum salmon have the widest natural geographic distribution of all Pacific salmon species, ranging in Asia from Korea to the Russian Arctic coast and west to the Lena River, and in North America from Monterey, California, to the Arctic coast and east to the Mackenzie River (Beaufort Sea).

The Hood Canal summer-run ESU includes summer-run chum salmon populations in Hood Canal in Puget Sound and in Discovery and Sequim Bays on the Strait of Juan de Fuca. It may also include summer-run fish in the Dungeness River, but the existence of that run is uncertain. Distinctive life-history and genetic traits were the most important factors in identifying this ESU. Hood Canal summer-run chum salmon are defined as fish that spawn from mid-September to mid-October in the mainstems of rivers (Johnson et al.,1997).

Chum salmon of the Columbia River ESU spawn in tributaries and in mainstem areas below Bonneville Dam. Most fish spawn on the Washington side of the Columbia River. Previously, chum salmon were reported in almost every river in the lower Columbia River basin, but most runs disappeared by the 1950s (Johnson et al., 1997). Currently, WDFW regularly monitors only a few natural populations in the basin, one in Grays River, two in small streams near Bonneville Dam, and the mainstem area next to one of the latter two streams. Recently, spawning has occurred in the mainstem Columbia River at two spots near Vancouver, Washington, and in Duncan Creek below Bonneville Dam (USEPA, 2007).

3.2.6.2 Critical habitat

Critical habitat for both of the listed chum salmon ESUs (Columbia River and Hood Canal summer-run) was most recently designated on September 2, 2005 (70 FR 52630) and includes areas in Washington and Oregon as described below. A map of critical habitat areas is shown in Figure 3.10. Indian lands are excluded from these critical habitat designations.

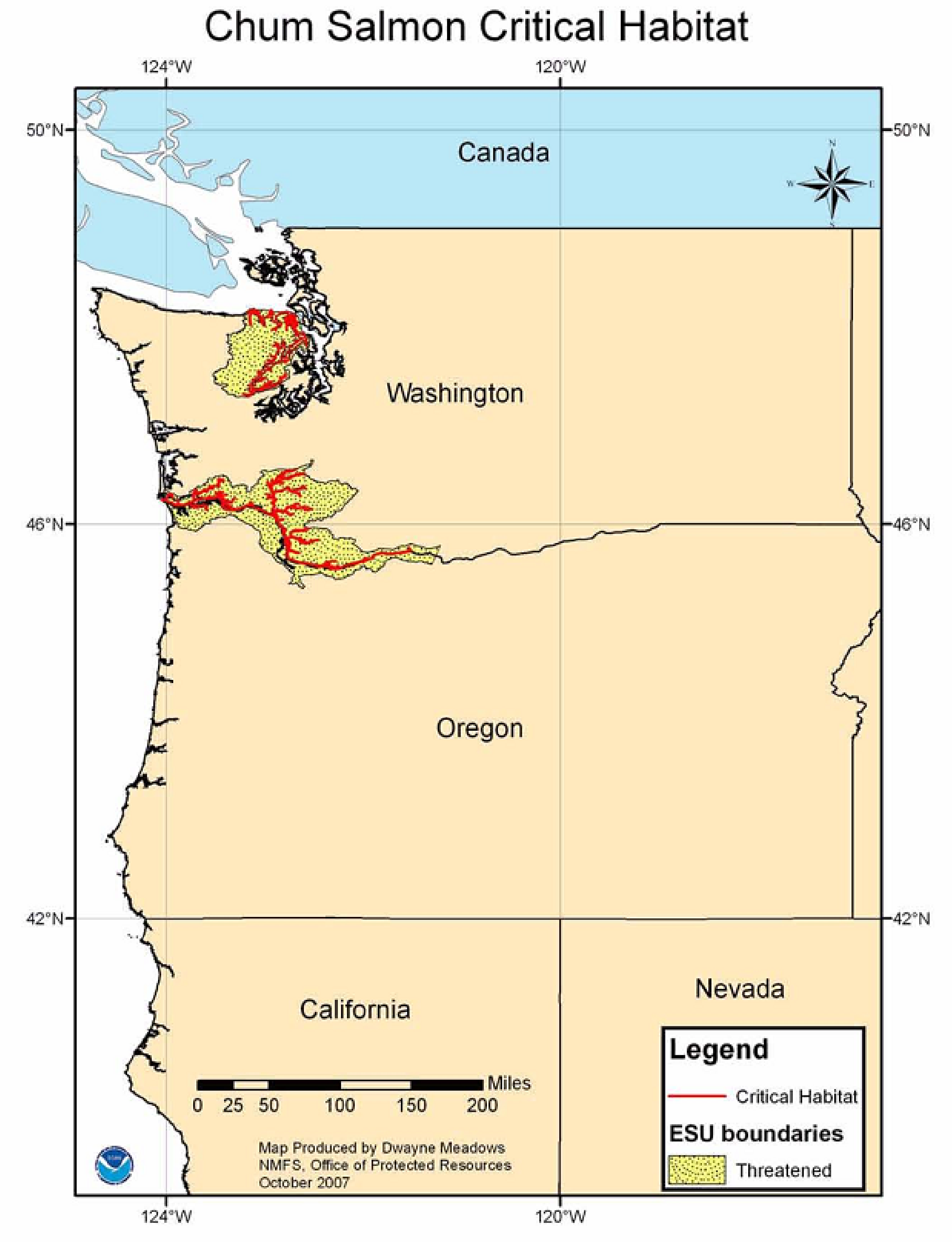


Figure 3.10 Critical Habitat for Chum Salmon (Source: http://www.nmfs.noaa.gov)

Hood Canal Summer-run ESU

Critical habitat includes parts of the Skokomish, Hood Canal, Puget Sound, and Dungeness/Elwha subbasins. It also encompasses all nearshore marine areas (including areas adjacent to islands) of Hood Canal and the Strait of Juan de Fuca (to Dungeness Bay) from the line of extreme high tide out to a depth of 30 meters, except any areas subject to an approved Integrated Natural Resource Management Plan or associated with Department of Defense easements or right-of-ways.

Columbia River ESU

Critical habitat includes parts of the Middle Columbia/Hood, Lower Columbia/Sandy, Lewis, Lower Columbia/Clatskanie, Lower Cowlitz, and Lower Columbia subbasins as well as the Lower Columbia River Corridor.

3.2.6.3 Life history and ecology

Hood Canal summer-run chum salmon are defined in SASSI (WDF et al., 1993) as fish that spawn from mid-September to mid-October. Fry emerge from February to June. In Washington, chum may reside in freshwater for as long as a month before migration to estuarine habitats where they remain for about a month before migrating to deeper water (Johnson et al.,1997). Very few summer-run chum salmon have been artificially propagated in Hood Canal, and the only releases in recent years have been from newly established restoration programs. These recent releases totaled about 241,000 chum salmon fry into Hood Canal in 1993 and 1994 and about 85,000 fry into Discovery Bay on the Strait of Juan de Fuca in 1992. There has been little artificial propagation of summer chum salmon from the Strait of Juan de Fuca east of the Elwha River. Since 1992 a restoration egg box program has produced about 85,000 fry annually in Salmon Creek, a tributary to Discovery Bay. There are no records of summer-run chum salmon fry plants into other streams that enter the Strait of Juan de Fuca, including Jimmycomelately and Snow Creeks, or the Dungeness River (Johnson et al., 1997).

Chum salmon enter the Columbia River from mid-October through early December and spawn from early November to late December. For the last 100 years hatcheries have produced chum salmon for the purpose of increasing stocks. Movement of eggs and fry from one geographical region to another has occurred. Most of the stock transfers in Washington have occurred from chum salmon hatcheries in Hood Canal to streams and hatcheries in south and north Puget Sound, and the Strait of Juan de Fuca. Although these transfers ceased in the early 1980's, hatchery strains (with the Hood Canal chum salmon gene pools) are still being used at some hatcheries and wild populations may have been mixed with hatchery strains at the hatchery and through straying. Recently, the hatching of chum salmon in small stream-side incubators has become popular with volunteer groups. When eggs are provided from hatchery sources, these projects have the potential to disrupt historic patterns of genetic diversity (Johnson et al., 1997).

3.2.6.4 Population trends and risks

Chum salmon may historically have been the most abundant of all Pacific salmonids. Seven of 16 historical spawning populations in the Hood Canal Summer-run ESU are extinct. Recently some of these populations have shown encouraging increases in numbers, but NOAA’s June 2005 status review report shows that the population trend overall is a 6% decline per year (NMFS r).

In the Columbia River, historical populations reached hundreds of thousands to a million adults each year. In the past 50 years, the average has been a few thousand a year. Currently, it is thought that 14 of the 16 spawning populations in the Columbia River ESU are extinct. About 500 spawners occur in the ESU presently, and the long-term trend is flat (NMFS r).

For threats to population recovery, see the introduction to the Salmonids section.

3.2.7 Coho salmon

Four of the seven coho salmon (*Oncorhynchus kisutch*) ESUs are listed under the ESA all of which have designated critical habitat. The central California coast ESU was designated as endangered on October 31, 1996 (61 FR 56138). The Oregon Coast ESU was designated as threatened on June 20, 2011 (76 FR 35755). The Lower Columbia River ESU and Southern Oregon/Northern California ESU were both listed as threatened on June 28, 2005 (70 FR 37160). The Puget Sound, Strait of Georgia ESU is considered a species of concern. Three of the listed Coho have spawning grounds in Oregon and Washington.

3.2.7.1 Species range

The species was historically distributed throughout the North Pacific Ocean from central California to Point Hope, Alaska, through the Aleutian Islands, and from the Anadyr River, Russia, south to Hokkaido, Japan. Coho probably inhabited most coastal streams in Washington, Oregon, and central and northern California. Some populations, now considered extinct, are believed to have migrated hundreds of miles inland to spawn in tributaries of the upper Columbia River in Washington, and the Snake River in Idaho. Coho still occur in Alaska as well (NMFS s).

3.2.7.2 Critical habitat

A composite map of coho salmon critical habitat is shown below in Figure 3.11, as well as descriptions for each listed ESU with spawning grounds in Oregon and/or Washington.

<u>Southern Oregon/Northern California Coasts ESU</u>

Critical habitat for this ESU was designated on May 5, 1999 (64 FR 24049) as all river reaches (including estuarine areas and tributaries) accessible to the ESU within its range, including all waterways, substrate, and adjacent riparian zones below longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years. The current freshwater and estuarine range of the population extends from the Mattole River in California to the Elk River in Oregon, inclusive. Indian tribal lands are excluded from critical habitat.

<u>Oregon Coast ESU</u>

Critical habitat for the Oregon Coast coho ESU was designated on February 11, 2008 (73 FR 7816). It includes parts of the Necanicum, Nehalem, Wilson/Trask/Nestucca, Siletz/Yaquina, Alsea, Siuslaw, Siltcoos, North Fork Umpqua, South Fork Umpqua, Umpqua, Coos, Coquille, and Sixes subbasins. Indian lands are excluded from the critical habitat.

<u>Lower Columbia River ESU</u>

Critical habitat for this ESU is currently in progress. Areas under consideration include watersheds in the lower Columbia River basin in southwest Washington and northwest Oregon, as well as watersheds in Puget Sound and the Strait of Juan de Fuca in Washington.

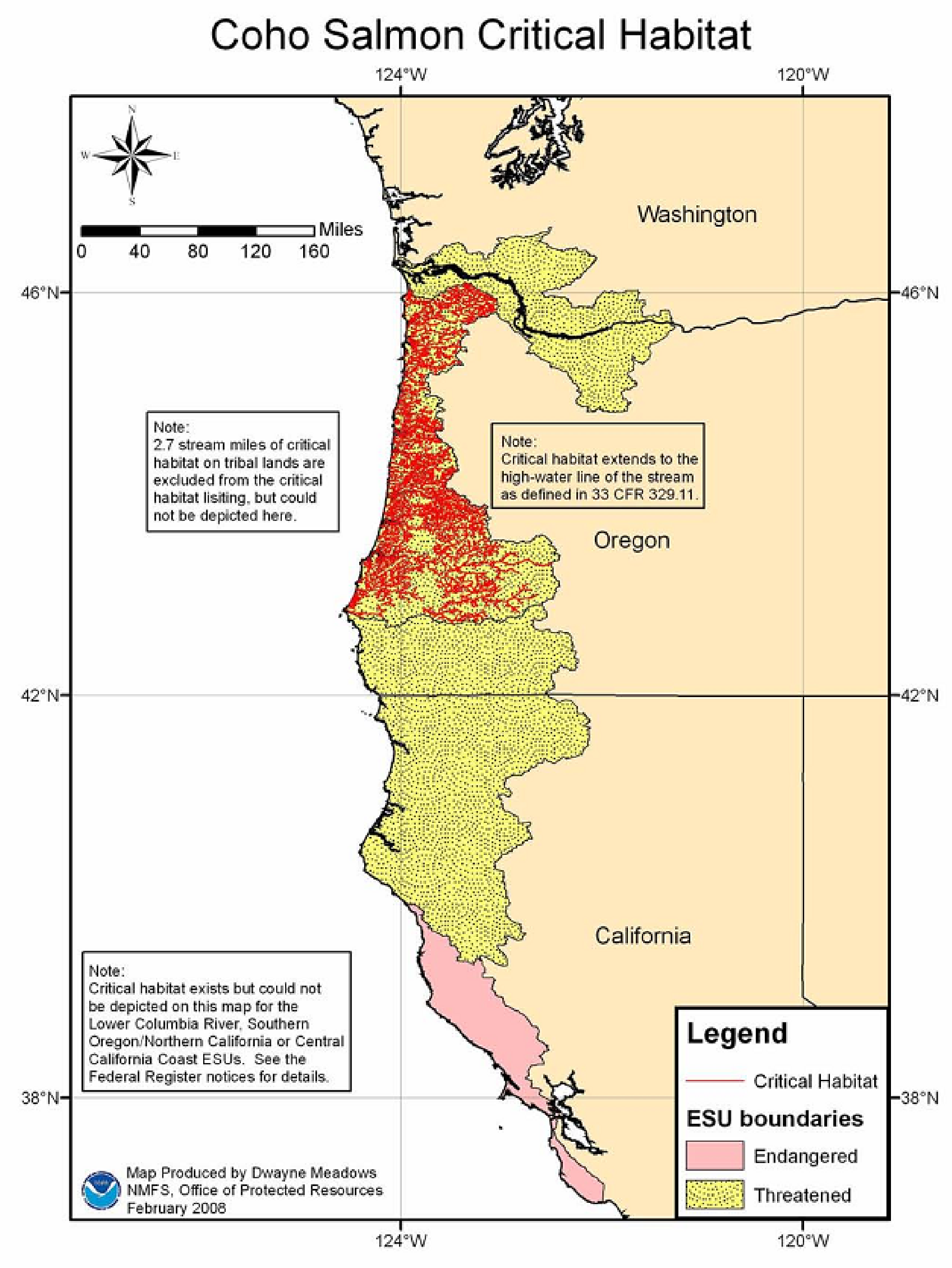


Figure 3.11 Critical Habitat for Coho Salmon (Source http://www.nmfs.noaa.gov/pr/species/criticalhabitat.htm)

3.2.7.3 Life history and ecology

Coho spend the first part of their life rearing and feeding on plankton and insects in streams and small freshwater tributaries. After about a year and a half, juveniles migrate to the sea where they forage for small fishes in estuarine and marine waters of the Pacific Ocean. Adults migrate from the marine environment back to the freshwater streams and rivers of their birth in order to mate. They spawn only once and then die, usually at around three years old. Some precocious males known as "jacks" return as two-year-old spawners. Females prepare several redds (nests) where the eggs will remain for 6-7 weeks until they hatch (NMFS s).

3.2.7.4 Population trends and risks

The long term trend for the listed populations is still downward, though there was one recent good year with an increasing trend in 2001 (NMFS s). For threats to population recovery, see the introduction to the Salmonids section.

3.2.8 Sockeye salmon

There are seven sockeye salmon (*Oncorhynchus nerka*) ESUs, two of which are listed under the ESA. The Snake River ESU was listed as endangered on January 3, 1992 (57 FR 212). The Ozette Lake ESU was listed as threatened on March 25, 1999 (64 FR 14529). These listings were reaffirmed on June 28, 2005 (70 FR 37160) and again following a five-year review on August 15, 2011 (76 FR 50448).

3.2.8.1 Species range

On the Pacific coast, sockeye salmon inhabit riverine, marine, and lake environments from the Klamath River and its tributaries north and west to the Kuskokwim River in western Alaska. As they generally require lakes for part of their life cycle, their distribution in river systems depends on the presence of usable lakes in the system, and thus can be more intermittent than for other Pacific salmon (NMFS p).

The only remaining anadromous sockeye in the Snake River system are found in Redfish Lake, on the Salmon River. The non-anadromous form (kokanee) found in Redfish Lake and elsewhere in the Snake River basin is included in the ESU. SR sockeye were historically abundant in several lake systems of Idaho and Oregon. However, all populations have been extirpated in the past century, except fish returning to Redfish Lake (USEPA, 2007).
The Ozette Lake ESU includes all naturally spawned populations of sockeye salmon in Ozette Lake, WA and streams and tributaries flowing into this lake, as well as two artificial propagation programs (NOAA).

3.2.8.2 Critical habitat

Sockeye salmon critical habitat is shown below in Figure 3.12, followed by descriptions for each ESU.

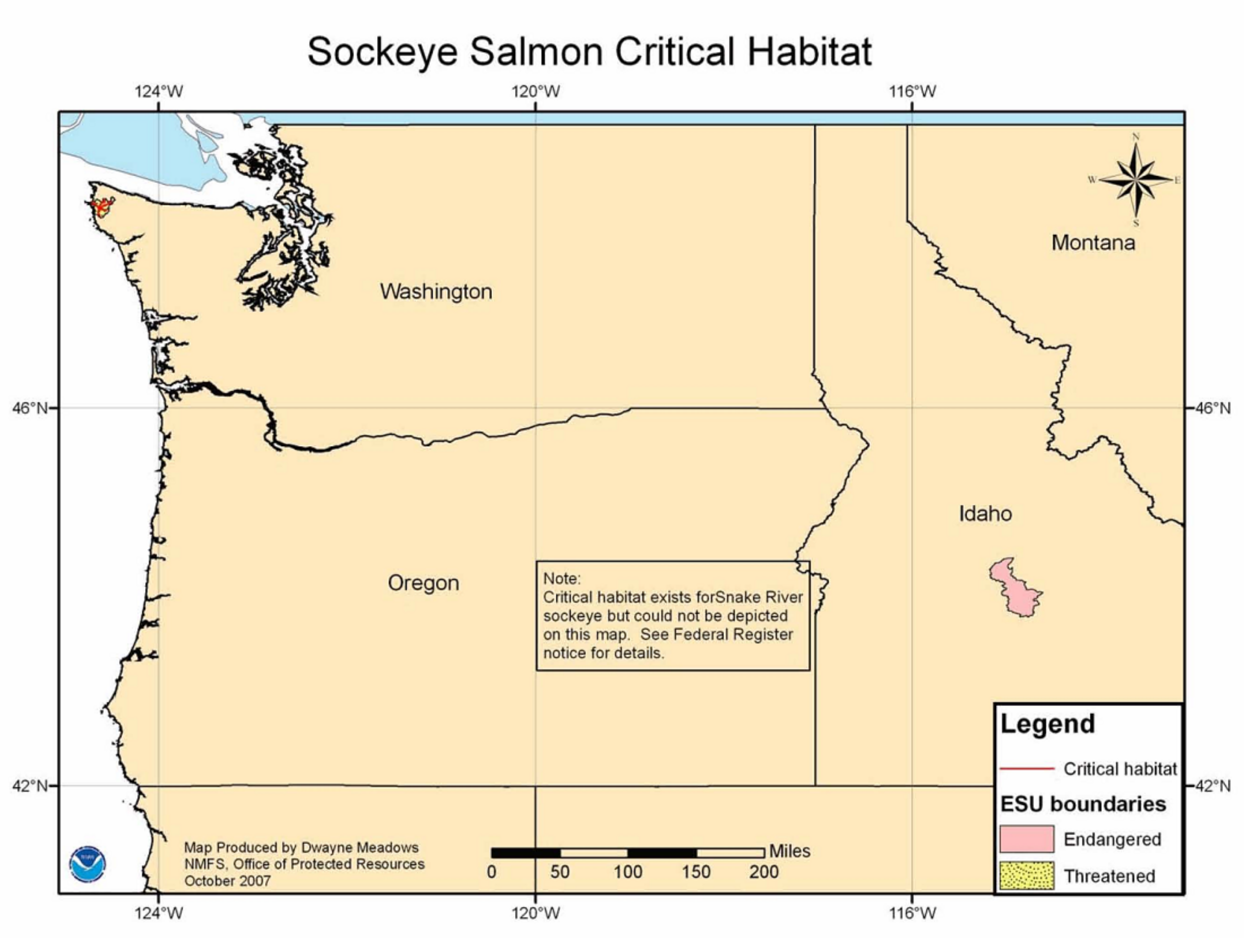


Figure 3.12 Critical Habitat for Sockeye Salmon (Source: http://www.nmfs.noaa.gov)

Ozette Lake ESU

Critical habitat for the Ozette Lake sockeye salmon ESU was designated on February 16, 2000 (65 FR 7764). It encompasses presently or historically accessible reaches of all rivers (including estuarine areas and tributaries) within the range of each ESU, which includes all waterways, substrate, and adjacent riparian zones below longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). Indian lands are excluded from this critical habitat designation.

A slight revision to this ESU's critical habitat was designated on September 2, 2005. The final area includes the Ozette Lake and river reaches within the Ozette Lake Watershed, which comprises a small portion of the Hoh/Quillayute Subbasin.

Snake River ESU

Critical habitat for the Snake River sockeye salmon ESU was designated on December 28, 1993 (58 FR 68543) in parts of Washington, Oregon and Idaho. It is comprised of the water, waterway bottom, and adjacent riparian zone of all river lakes and reaches presently or historically accessible (except reaches above impassable natural falls, and Dworshak and Hells Canyon Dams) to Snake River sockeye salmon in the following hydrologic units: Lower Salmon, Lower Snake, Lower Snake-Asotin, Lower Snake-Tucannon, Middle Salmon-Chamberlain, Middle Salmon-Panther, and Upper Salmon

Critical habitat includes the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) and including all Columbia River estuarine areas and river reaches upstream to the confluence of the Columbia and Snake Rivers; all Snake River reaches from the confluence of the Columbia River upstream to the confluence of the Salmon River; all Salmon River reaches from the confluence of the Snake River upstream to Alturas Lake Creek; Stanley, Redfish, Yellow Belly, Pettit, and Alturas Lakes (including their inlet and outlet creeks); Alturas Lake Creek, and that portion of Valley Creek between Stanley Lake Creek and the Salmon River.

3.2.8.3 Life history and ecology

Sockeye spend approximately the first half of their life cycle rearing in lakes. The remainder of the life cycle is spent foraging in estuarine and marine waters of the Pacific Ocean. They migrate from a marine environment into freshwater streams and rivers or lakes of their birth in order to mate; they spawn only once and then die; females spawn in 3 to 5 redds (nests).

In freshwater, they feed on aquatic insects and plankton; in the ocean, they eat amphipods, copepods, squid, and some fishes.

3.2.8.4 Population trends and risks

Sockeyes are the third most abundant of the seven species of Pacific salmon, after pink salmon and chum salmon. However, the Snake River ESU has remained at very low levels of only a few hundred fish, though there have been recent increases in the number of hatchery reared fish returning to spawn. Data quality for the Ozette Lake ESU makes differentiating between the number of hatchery and natural spawners difficult, but in either case the size of the population is small, though possibly growing (NMFS p). For threats to population recovery, see the introduction to the Salmonids section.

3.2.9 Steelhead

Eleven of the fifteen Distinct Population Segments (DPSs) of steelhead (*Oncorhynchus mykiss*) found along the US West Coast are listed under the ESA, of which 10 have designated critical habitat. The South California coast ESU is designated as endangered and all others are listed as threatened. The Oregon coast ESU is considered a species of concern. Six of the listed steelhead have spawning grounds in Washington and Oregon. The Lower Columbia River, Middle Columbia River, Upper Columbia River, Snake River Basin, and Upper Willamette River DPSs were designated as threatened on January 5, 2006 (71 FR 834). The Puget Sound DPS was designated as threatened on May 11, 2007 (72 FR 26722).

3.2.9.1 Species range

In the United States, steelhead trout are found along the entire Pacific Coast. Worldwide, steelhead are naturally found in the Western Pacific south through the Kamchatka peninsula. They have been introduced worldwide (NMFS u).

3.2.9.2 Critical habitat

There are ten populations of steelhead listed as Threatened or Endangered that have designated critical habitat, but only six have critical habitat in Oregon and Washington. There is also one proposed critical habitat for the Puget Sound steelhead, in Washington. Specific critical habitat areas are described below, for each population spawning in Oregon and/or Washington, followed by a composite map in Figure 3.13.

Puget Sound Steelhead

Critical habitat designation for the Puget Sound steelhead was proposed January 14, 2013. The areas under consideration include watersheds in the lower Columbia River basin in southwest Washington and northwest Oregon, as well as watersheds in Puget Sound and the Strait of Juan de Fuca in Washington.

Critical habitat was designated for the remaining five of Oregon and Washington listed steelhead on September 2, 2005 (70 FR 52630). Indian lands are excluded from critical habitat for these populations. Specific areas for each population are listed below.

Lower Columbia River steelhead

Critical habitat includes parts of the Middle Columbia/Hood, Lower Columbia/Sandy, Lewis, Lower Columbia/Clatskanie, Upper Cowlitz, Cowlitz, Clackamas, and Lower Willamette subbasins. It also includes the Columbia River from the mouth at the Pacific Ocean upstream to a line connecting the confluences of the Sandy River in Oregon and the Washougal River in Washington.

Middle Columbia River steelhead

Critical habitat includes parts of the Upper Yakima, Naches, Lower Yakima, Middle Columbia/Lake Wallula, Walla Walla, Umatilla, Middle Columbia/Hood, Klickitat, Upper John Day, North Fork John Day, Middle Fork John Day, Lower John Day, Lower Deschutes, Trout, and Upper Columbia/Priest Rapids subbasins. It also includes the Columbia River from the mouth at the Pacific Ocean upstream to the confluence of the Wind River.

Upper Columbia River steelhead

Critical habitat includes parts of the Chief Joseph, Okanogan, Similkameen, Methow, Upper Columbia/Entiat, Wenatchee, Lower Crab, and the Upper Columbia/Priest Rapids subbasins. It also includes the Columbia River from the mouth at the Pacific Ocean upstream to the confluence of the Yakima River.

Snake River Basin steelhead

Critical habitat includes parts of the Hells Canyon, Imnaha River, Lower Snake/Asotin, Upper Grande Ronde River, Wallowa River, Lower Grande Ronde, Lower Snake/Tucannon, Upper Salmon, Pahsimeroi, Middle Salmon-Panther, Lemhi, Upper Middle Fork Salmon, Lower Middle Fork Salmon, Middle Salmon-Chamberlain, South Fork Salmon, Lower Salmon, Little Salmon, Upper Selway, Lower Selway, Lochsa, Middle Fork Clearwater, South Fork Clearwater, and Clearwater subbasins. It also includes the Columbia River from the mouth at the Pacific Ocean upstream to the confluence of the Snake and Palouse rivers.

Upper Willamette River steelhead

Critical habitat includes parts of the Upper Willamette, North Santiam, South Santiam, Middle Willamette, Yamhill, Molalla/Pudding, and Tualatin subbasins. It also includes the Columbia River from the mouth at the Pacific Ocean upstream to the confluence of the Clackamas and Willamette rivers, including the Multnomah Channel portion of the lower Willamette River.

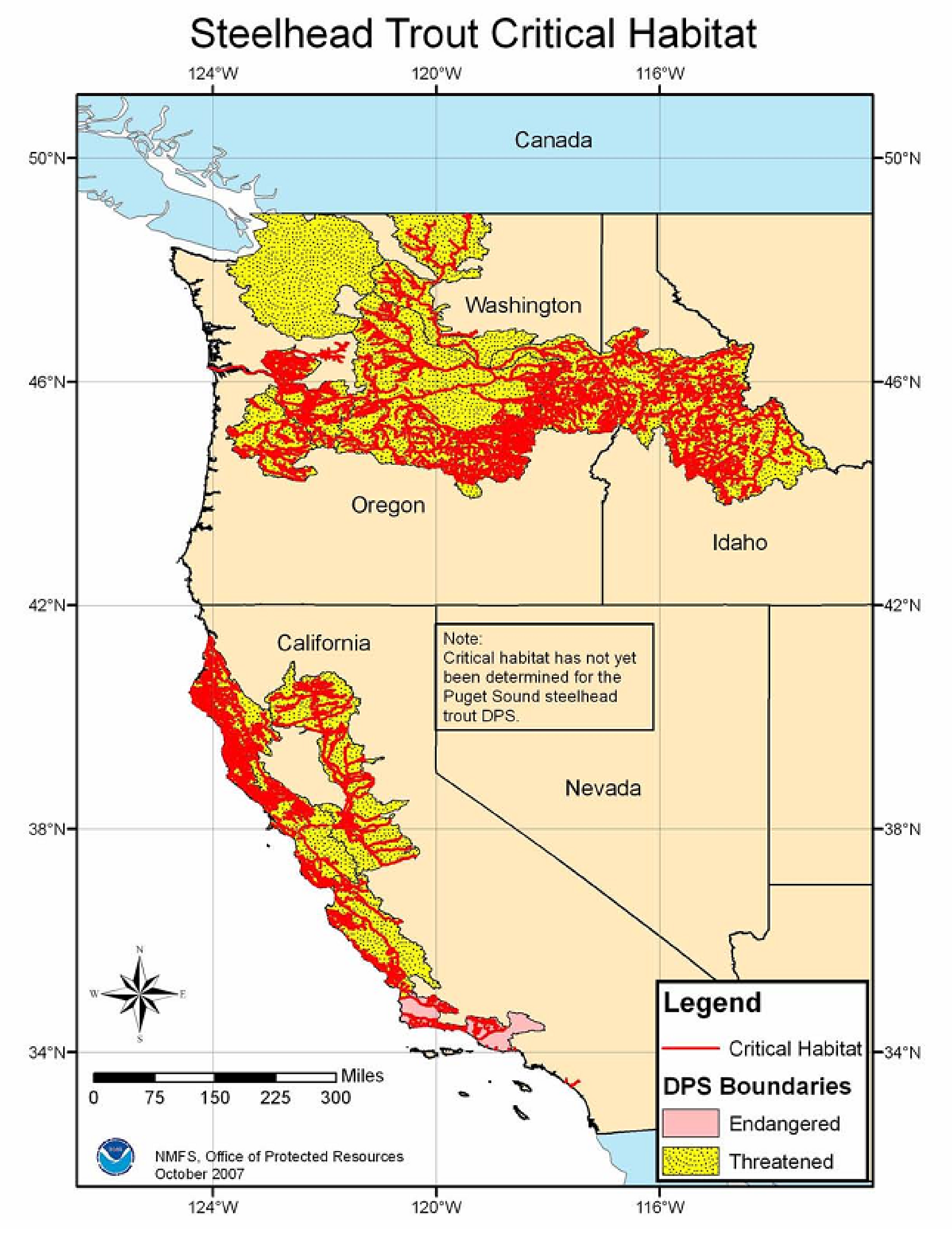


Figure 3.13 Critical Habitat for Steelhead (Source http://www.nmfs.noaa.gov/pr/species/criticalhabitat.htm)

3.2.9.3 Life history and ecology

O. mykiss are a unique species; individuals develop differently depending on their environment. While all hatch in gravel-bottomed, fast-flowing, well-oxygenated rivers and streams, some stay in fresh water all their lives. These fish are called rainbow trout. The steelhead that migrate to the ocean develop a slimmer profile, become more silver in color, and typically grow much larger than the rainbow trout that remain in fresh water.

Adult steelhead’ migrate from a marine environment into the freshwater streams and rivers of their birth in order to mate. Unlike other Pacific salmonids, they can spawn more than one time. Migrations can be hundreds of miles.

Young animals feed primarily on zooplankton. Adults feed on aquatic and terrestrial insects, mollusks, crustaceans, fish eggs, minnows, and other small fishes (including other trout).

Maximum age is about 11 years. Males mature generally at 2 years and females at 3 years. Juvenile steelhead may spend up to 7 years in freshwater before migrating to estuarine areas as smolts and then into the ocean to feed and mature. They can then remain at sea for up to 3 years before returning to freshwater to spawn. Some populations actually return to freshwater after their first season in the ocean, but do not spawn, and then return to the sea after one winter season in freshwater. Timing of return to the ocean can vary, and even within a stream system there can be different seasonal runs.

Steelhead can be divided into two basic reproductive types, based on the state of sexual maturity at the time of river entry and duration of spawning migration. The stream-maturing type (summer-run steelhead in the Pacific Northwest and northern California) enters freshwater in a sexually immature condition between May and October and requires several months to mature and spawn. The ocean-maturing type (winter-run steelhead in the Pacific Northwest and northern California) enters freshwater between November and April, with well-developed gonads, and spawns shortly thereafter. Coastal streams are dominated by winter-run steelhead, whereas inland steelhead of the Columbia River basin are almost exclusively summer-run steelhead.

Adult female steelhead will prepare a redd (or nest) in a stream area with suitable gravel type composition, water depth, and velocity. The adult female may deposit eggs in 4 to 5 "nesting pockets" within a single redd. The eggs hatch in 3 to 4 weeks (NMFS u).

3.2.9.4 Population trends and risks

In recent years, some populations have shown encouraging increases in population size while others have not (NMFS u). For threats to population recovery, see the introduction to the Salmonids section.

3.2.10 North American green sturgeon

The North American green sturgeon was officially divided into two Distinct Population Segments by the NMFS on January 29, 2003 (68 FR 4433). The Southern DPS, which includes any coastal or Central Valley, CA populations south of the Eel River in California (the only known population being in the Sacramento River), was listed as Threatened on April 7, 2006 (71 FR 17757).

3.2.10.1 Species range

Green sturgeon are the most broadly distributed, wide-ranging, and most marine-oriented species of the sturgeon family. The green sturgeon ranges from Mexico to at least Alaska in marine waters, and is observed in bays and estuaries up and down the west coast of North America (Moyle et al., 1995).

3.2.10.2 Critical habitat

Critical habitat for the Southern DPS of North American green sturgeon was designated on October 9, 2009 (74 FR 52300). Shown in Figure 3.14, it includes freshwater riverine areas, bays and estuaries, and coastal marine areas.

All of the freshwater riverine parts of the critical habitat are in California; there are none in Oregon or Washington.

Coastal bays and estuaries included in the critical habitat designation include Coos Bay, Winchester Bay, Yaquina Bay, and Nehalem Bay in Oregon; Willapa Bay and Grays Harbor in Washington; and the Lower Columbia River estuary in both states. Critical habitat in bays and estuaries includes tidally influenced areas as defined by the elevation of mean higher high water. The boundary between coastal marine areas and bays and estuaries are delineated by the COLREGS lines (33 CFR 80).

The marine portion of the critical habitat includes all U.S. coastal marine waters out to the 60 fathom (fm.) (110 m) depth bathymetry line (relative to MLLW) from Monterey Bay, California north and east to include waters in the Strait of Juan de Fuca, Washington. The Strait of Juan de Fuca includes all U.S. marine waters: in Clallam County east of a line connecting Cape Flattery, Tatoosh Island, and Bonilla Point, British Columbia; in Jefferson and Island counties north and west of a line connecting Point Wilson and Partridge Point; and in San Juan and Skagit counties south of lines connecting the U.S.-Canada border and Pile Point, Cattle Point and Davis Point, and Fidalgo Head and Lopez Island. Critical habitat in coastal marine areas is defined by the zone between the 60 (fm.) depth bathymetry line and the line on shore reached by mean lower low water (MLLW), or to the COLREGS lines.

The primary constituent elements of nearshore coastal marine critical habitat areas that are essential for the conservation of the Southern DPS of green sturgeon are:

(i) Migratory corridor: a migratory pathway for the safe and timely passage within marine and between estuarine and marine habitats.
(ii) Water quality: nearshore marine waters with adequate dissolved oxygen levels and acceptably low levels of contaminants (e.g., pesticides, organochlorines, elevated levels of heavy metals) that may disrupt the normal behavior, growth, and viability of sub-adult and adult green sturgeon.
(iii) Food resources: abundant prey items for sub-adults and adults, which may include benthic invertebrates and fishes.

Certain areas in the Strait of Juan de Fuca and Whidbey Island, Washington that are owned or controlled by the Department of Defense, or designated for its use, are excluded from critical habitat.

All Indian lands of the Confederated Tribes of the Coos, Lower Umpqua, and Siuslaw as well as the Coquille Indian Tribe in Oregon; and the Hoh, Jamestown S’Klallam, Lower Elwha, Makah, Quileute, Quinault, and Shoalwater Bay Tribes in Washington are excluded from critical habitat designation.

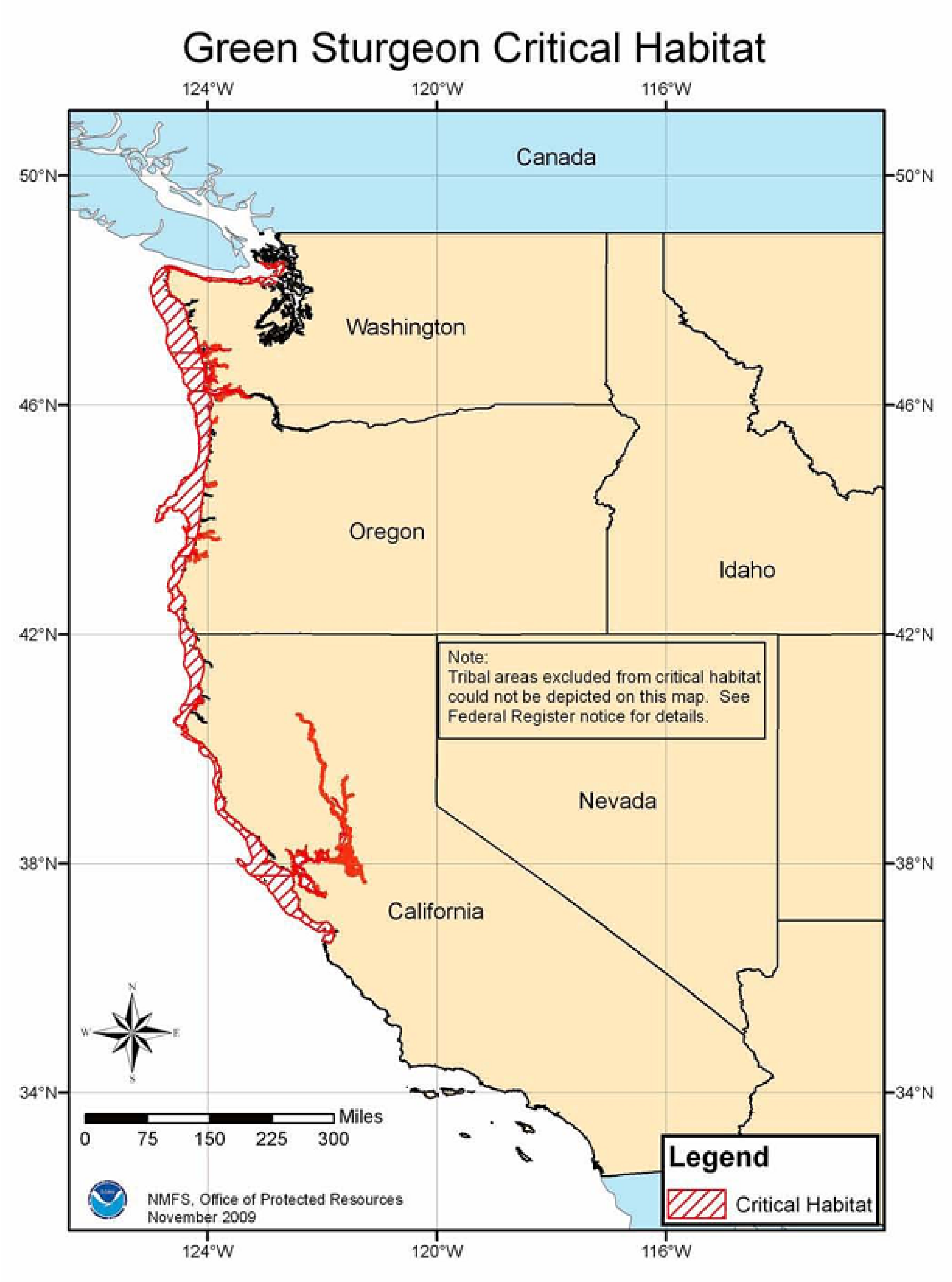


Figure 3.14 Critical Habitat for Green Sturgeon (Source: http://www.nmfs.noaa.gov)

3.2.10.3 Life history and ecology

Green sturgeon are long-lived, slow-growing fish. Mature males range from 4.5-6.5 feet (1.4-2 m) in "fork length" and do not mature until they are at least 15 years old (Van Eenennaam, 2002), while mature females range from 5-7 feet (1.6-2.2 m) fork length and do not mature until they are at least 17 years old. Maximum ages of adult green sturgeon are likely to range from 60-70 years (Moyle, 2002).

Green sturgeon are believed to spend the majority of their lives in nearshore oceanic waters, bays, and estuaries. Early life-history stages reside in fresh water, with adults returning to freshwater to spawn when they are more than 15 years of age and more than 4 feet (1.3 m) in size. Spawning is believed to occur every 2-5 years (Moyle, 2002). Adults typically migrate into fresh water beginning in late February; spawning occurs from March-July, with peak activity from April-June (Moyle et al., 1995). Females produce 60,000-140,000 eggs (Moyle et al., 1992). Juvenile green sturgeon spend 1-4 years in fresh and estuarine waters before dispersal to saltwater (Beamsesderfer and Webb, 2002). They disperse widely in the ocean after their out-migration from freshwater (Moyle et al., 1992).

The only available feeding data on adult green sturgeon shows that they eat benthic invertebrates including shrimp, mollusks, amphipods, and even small fish (Moyle et al., 1992).

3.2.10.4 Population trends and risks

Little data on current population sizes exists and data on population trends is lacking. The principal factor in the decline of the Southern DPS is reduction of the spawning area to a limited section of the Sacramento River. Other threats to the Southern DPS include insufficient freshwater flow rates in spawning areas, contaminants (e.g., pesticides), bycatch of green sturgeon in fisheries, potential poaching (e.g., for caviar), entrainment by water projects, influence of exotic species, small population size, impassable barriers (dams) to spawning grounds, and elevated water temperatures (NMFS o).

3.3 BIRDS

3.3.1 Marbled murrelet

The marbled murrelet (*Brachyramphus marmoratus*) was federally listed as Threatened under the Endangered Species Act on October 1, 1992 (57 FR 45328).

3.3.1.1 Species range

The marbled murrelet, a small sea bird that nests in the coastal old-growth forests of the Pacific Northwest, inhabits the Pacific coasts of North America from the Bearing Sea to central California. In contrast to other seabirds, murrelets do not form dense colonies, and may fly 70km or more inland to nest, generally in older coniferous forests. They are more commonly found inland during the summer breeding season, but make daily trips to the ocean to gather food, primarily fish and invertebrates, and have been detected in forests throughout the year. When not nesting, the birds live at sea, spending their days feeding and then moving several kilometers offshore at night (SEI, 1999).

3.3.1.2 Critical habitat

Critical habitat was initially designated for marbled murrelets on May 24, 1996 (61 FR 26251). The primary constituent elements essential to support successful reproduction of the species include individual trees with potential nest platforms and forest lands of at least one half site-potential tree height regardless of contiguity within 0.8 kilometers (0.5 miles) of individual trees with potential nesting platforms and that are used or potentially used by the marbled murrelet for nesting or roosting.

A downsized critical habitat was designated on October 5, 2011; portions of Oregon and California critical habitat were removed, while Washington critical habitat remained unchanged.

The current designation encompasses 3,698,100 inland and coastal acres in Washington, Oregon and California (76 FR 61599). Critical habitat in Washington is shown in Figure 3.15, and critical habitat in Oregon is shown in Figure 3.16. Since critical habitat is only designated within nesting areas on land, it will not be impacted by the proposed General Permit.

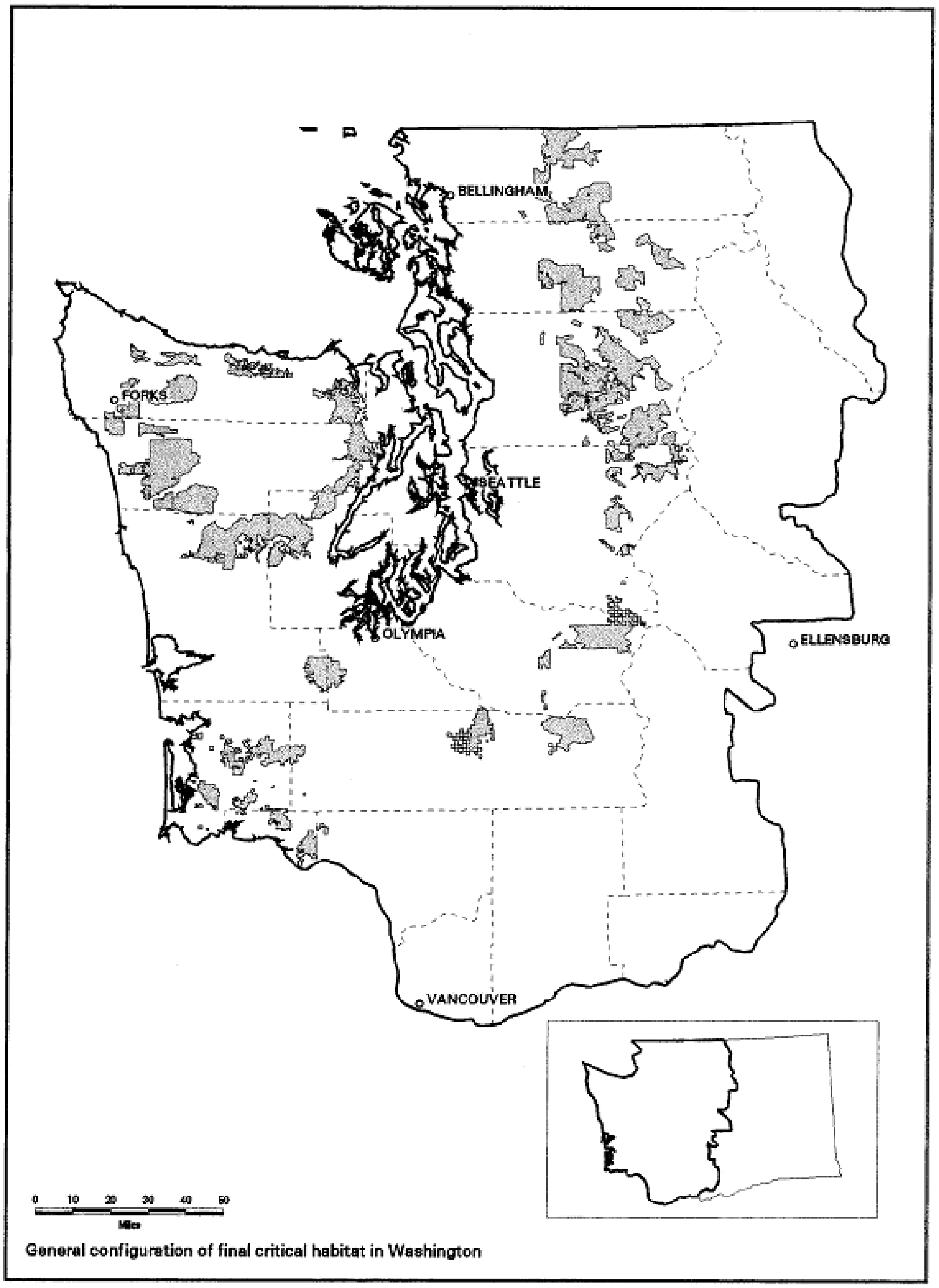


Figure 3.15 Critical Habitat for the Marbled Murrelet in Washington (Source: 61 FR 26279)

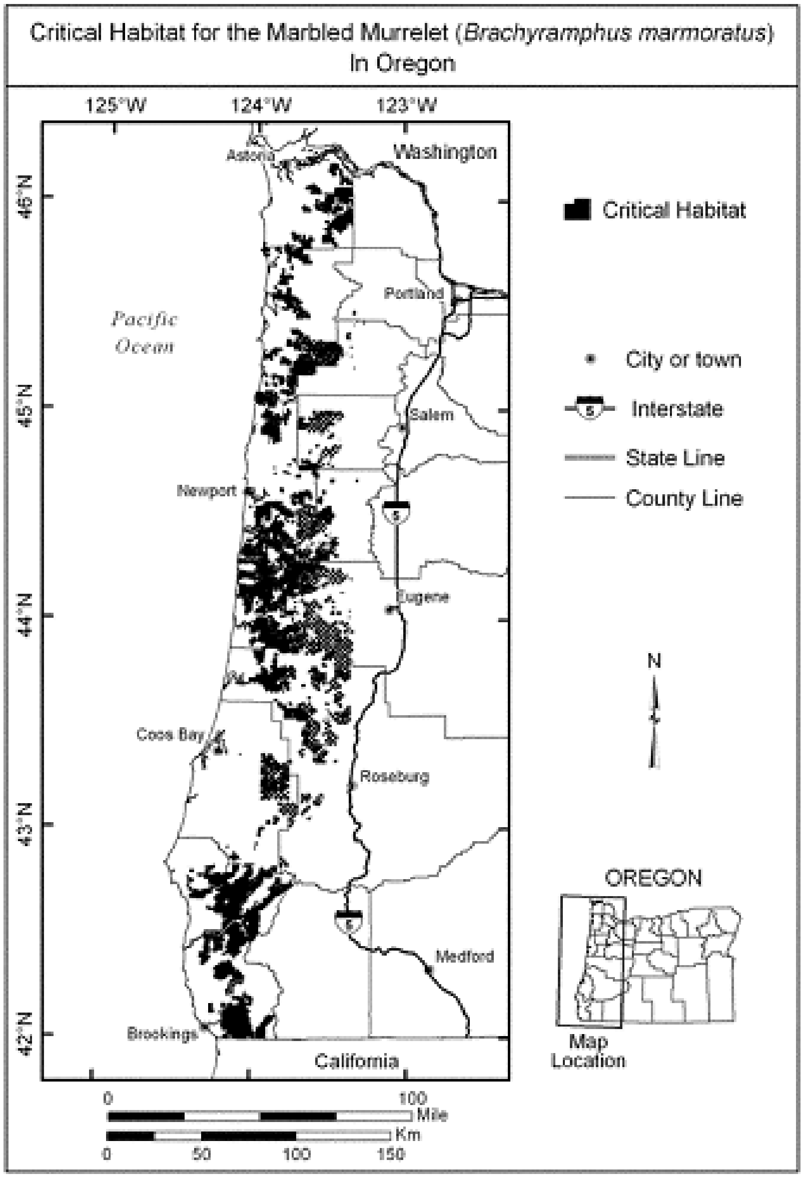


Figure 3.16 Critical Habitat for the Marbled Murrelet in Oregon (Source: 61 FR 26280)

3.3.1.3 Life history and ecology

The breeding season of the marbled murrelet generally begins in April, with most egg laying occurring in late May and early June. Peak hatching occurs in July after a 27- to 30-day incubation. Chicks remain in the nest and are fed by both parents. By the end of August, chicks have fledged and dispersed from nesting areas. The marbled murrelet differs from other seabirds in that its primary nesting habitat is old-growth coniferous forest within 50 to 75 miles of the coast. The nest typically consists of a depression on a moss-covered branch where a single egg is laid. Marbled murrelets appear to exhibit high fidelity to their nesting areas, and have been observed in forest stands for up to 20 years. Marbled murrelets have not been known to nest in other habitats including alpine forests, bog forests, scrub vegetation, or scree slopes (Marks and Bishop, 1999).

Marbled murrelets are presumably long-lived species but are characterized by low fecundity (one egg per nest) and low nesting and fledging success. Fledging success has been estimated at 45 percent. Nest predation on both eggs and chicks appears to be higher for marbled murrelets than for other alcids, and may be cause for concern. Principal predators are birds, primarily corvids (jays, ravens, and crows) (Marks and Bishop, 1999).

At sea, foraging marbled murrelets are usually found as widely spaced pairs. During the breeding season, the marbled murrelet will forage in well-defined areas along the coast in relatively shallow marine waters (Carter and Sealy 1990). Murrelets usually feed in shallow, near-shore water less than 98 feet (30 m) deep (Huff, et al., 2006). However, they are thought to be able to dive up to depths of 157 feet (47 m) (Mathews and Burger 1998). According to Strachan et al. (1995), murrelets generally forage within 2 km of the shore in shallow waters off the coasts of Washington, Oregon and California. Huff et al. (2006) determined that during the breeding season, marble murrelets are usually found within five miles from shore off of Washington, just over three miles off shore from Oregon (Huff, et al., 2006).

Limited information on winter (non-breeding) distribution suggests that following the breeding season, murrelets disperse and are less concentrated in the immediate nearshore coastal waters (Strachan et al., 1995). Murrelet prey species include small inshore fish such as the sand lance, Pacific herring, capelin, and invertebrates including the Euphausid pacifica and Thysanoessa spinifera (Sanger 1987, Sealy 1975). In some instances, marbled murrelets will aggregate in large groups in areas associated with river plumes and currents, although it is not known if these aggregations have to do with ocean conditions or prey locations (Strong et al., 1995, Ralph et al., 1995). In the southern part of the range, from Washington south, pairs or small flocks of murrelets rarely forage in mixed seabird flocks and will usually forage away from other species (Strachan et al., 1995). In California and Oregon, murrelets have been reported foraging close to pigeon guillemots and common murres but may avoid other large feeding flocks (Strachan et al., 1995).

3.3.1.4 Population trends and risks

The total North American population of marbled murrelets is estimated to be 360,000 individuals. Approximately 85 percent of this population breeds along the coast of Alaska. Estimates for Washington, Oregon, and California vary between 16,500 and 35,000 murrelets (Ralph and Miller, 1999). In British Columbia, the population was estimated at 45,000 birds in 1990 (Environment Canada, 1999). In recent decades, the murrelet population in Alaska and British Columbia has apparently suffered a marked decline, by as much as 50 percent. Between 1973 and 1989, the Prince William Sound, Alaska, murrelet population declined 67 percent. Trends in Washington, Oregon, and California are also down, but the extent of the decrease in unknown. Current data suggest an annual decline of at least 3 to 6 percent throughout the species' range (Ralph and Miller, 1999).

The most serious limiting factor for marbled murrelets is the loss of habitat through the removal of old-growth forests and fragmentation of forests. Forest fragmentation may be making nests near forest edges vulnerable to predation by other birds such as jays, crows, ravens, and great-homed owls (USFWS 1996). Entanglement in fishing nets is also a limiting factor in coastal areas due to the fact that the areas of salmon fishing and the breeding areas of marbled murrelets overlap. The marbled murrelet is especially vulnerable to oil pollution; in both Alaska and British Columbia, it is considered the seabird most at risk from oil pollution. In 1989, an estimated 8,400 marbled murrelets were killed as a result of the Exxon Valdez oil spill (Marks and Bishop, 1999). Marbled murrelets forage in nearshore waters where recreational boats are most often found. Disturbance by boats may cause them to abandon the best feeding areas (Environment Canada, 1999).

3.3.2 Short-tailed Albatross

The short-tailed albatross (*Phoebastria albatrus*) was originally listed in 1970, under the Endangered Species Conservation Act of 1969, prior to the passage of today's Endangered Species Act (35 FR 8495). However, as a result of an administrative error (and not from any biological evaluation of status), the species was listed as endangered throughout its range except within the United States (50 CFR 17.11). On July 31, 2000, this error was corrected when the Service published a final rule listing the short-tailed albatross as endangered throughout its range (65 FR 46643). Five-year reviews conducted by USFWS in 2009 and 2014 validate the continuation of this species' Endangered status (USFWS 2009; 2014).

3.3.2.1 Species range

The range of the short-tailed albatross includes most of the North Pacific Ocean, as shown in Figure 3.17. Both adult and juvenile birds extensively use areas of the western Pacific east of Japan. During most of the incubation period and all of chick rearing, adult albatrosses foraged extensively in these waters (Suryan et al., 2007). Albatrosses used the outer Bering Sea shelf most during summer and fall, with a clear pattern of moving north to the northern submarine canyons (Navarin, Pervenets, Zemchug) in late summer and fall (Zador and Fitzgerald 2008, O'Connor 2013). During winter birds moved south, but in Alaska they continued to occupy the southeastern Bering Sea, Aleutian Islands, and Gulf of Alaska (O'Connor 2013). Both adult and juvenile short-tailed make extensive use of the waters among the Kurile Islands, Aleutian Islands, and the outer Bering Sea Continental shelf (Suryan et al., 2006, Suryan and Fischer 2010, Deguchi et al., 2014; Kuletz et al., 2014).

As of 2013, approximately 78% of the known breeding short-tailed albatross use a single colony, Tsubamezaki, on Torishima Island, an active volcano located off the coast of Japan. The rest (approximately 22% breed in the Senkaku Islands in the East China Sea (USFWS 2014). Both islands are shown in Figure 3.17.

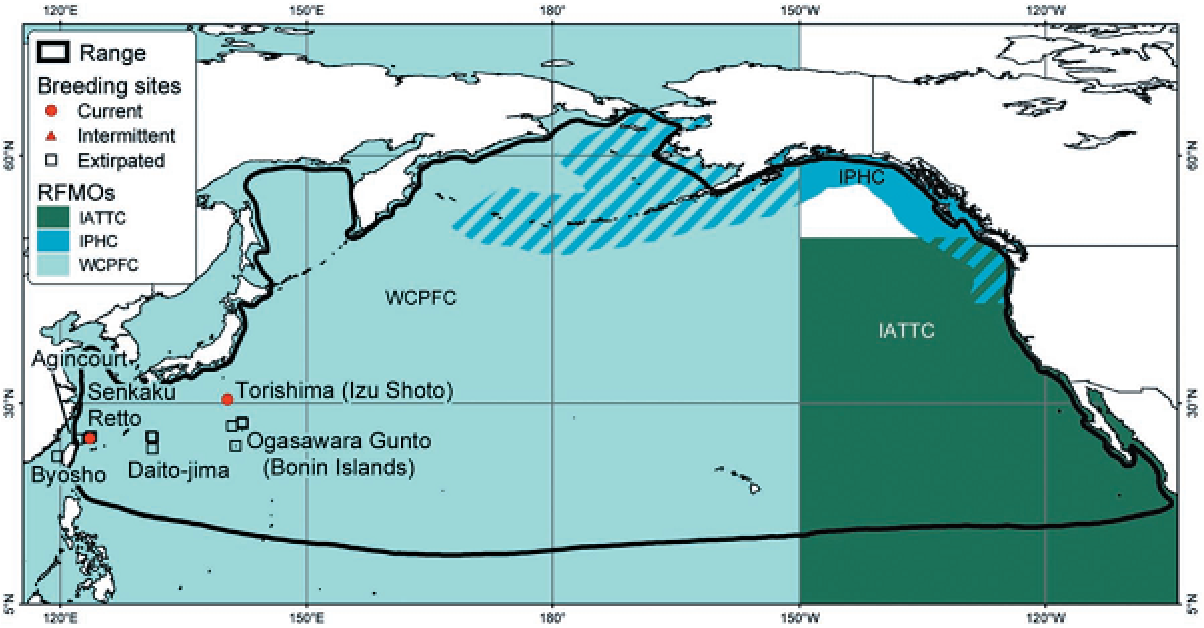


Figure 3.17 Range and Breeding Sites of the Short Tailed Albatross (USFWS, 2008)

3.3.2.2 Critical habitat

Critical habitat has not been designated for this species. In the 2000 final rule, the Service determined that designation of critical habitat was not prudent due to the lack of habitat-related threats to the species, the lack of specific areas in U.S. jurisdiction that could be identified as meeting the definition of critical habitat, and the lack of recognition or educational benefits accruing to the American people as a result of such designation (USFWS 2008).

3.3.2.3 Life history and ecology

Like many seabirds, short-tailed albatrosses are slow to reproduce and are long-lived, with some known to be over 40 years old. They begin breeding at about 7 or 8 years, and mate for life. Short-tailed albatrosses nest on sloping grassy terraces on two rugged, isolated, windswept islands in Japan. Pairs lay a single egg each year in October or November. Eggs hatch in late December through early January. Chicks remain near the nest for about 5 months, fledging in June. After breeding, short-tailed albatrosses move to feeding areas in the North Pacific.

Movements of short-tailed albatross are better understood in recent years. Studies concluded that juvenile (< 1-year-old) short-tailed albatrosses travel much more broadly throughout the North Pacific than adult birds. Seasons of overlap in tracking of non-breeding adult and juvenile/sub-adult albatrosses (those individuals not having to return to the breeding colony to tend eggs or chicks) included summer and early fall (May-September). During summer and early fall, juvenile albatrosses traveled extensively in the Sea of Okhotsk, Russia, and western Bering Sea where few adults ventured. Juvenile albatrosses traveled to the west coast of North America and more extensively throughout the North Pacific transition zone between Hawaii and Alaska. Additionally, juvenile albatrosses were tracked to Arctic regions of the Bering Strait (Deguchi et al., 2014) and at least one individual was sighted from two different survey vessels in the Chukchi Sea in 2012 (Day et al., 2013; Gall et al., 2013). Multi-year tracking studies of juvenile to sub-adult birds indicate that distribution patterns and habitat use of sub-adult birds become similar to adults by age three (Suryan et al., 2013).

Knowledge of marine habitat use at various life history stages has evolved in recent years. The following is a summary of new findings taken from the USFWS latest 5-year review (USFWS 2014):

--The highest concentrations of short-tailed albatross are found in the Aleutian Islands and Bering Sea (primarily outer shelf) regions of Alaska. The waters around the Aleutian Islands are important for feeding while short-tailed albatross undergoing extensive molt.
-- Post-fledging juvenile birds ranged widely throughout the North Pacific rim, and some individuals also spent time in the oceanic waters between Hawaii and Alaska (Deguchi et al., 2014).
-- Juvenile short-tailed albatross have a distinct distribution from adults as juvenile and younger sub-adult birds (up to 2- years- old) range much more widely than the adult birds, inhabiting the Sea of Okhotsk, a broader region of the Bering Sea, and the west coast of North America (O'Connor 2013).
-- Sub-adults appear to be distributed along the west coast of the U.S. more than has been previously reported (Guy et al., 2013). Sub-adult birds also travel great daily distances (mean = 191 km/day in first year of flight and 181 km/day in second year of flight [O'Connor 2013]). These are more extensive than for adults (133 km/day, Suryan et al., 2007).

Albatrosses feed by alighting on the ocean surface and seizing their prey. Generally, their diet consists of squid, fish, and shrimp (USFWS 2001). In an analysis of historic and current distribution of North Pacific albatrosses, Kuletz et al. (2014) speculated that the increase in albatrosses (including short-tailed albatross) and changes in their distribution over the last decade was due to possible increases in squid biomass in the in the Bering Sea/Aleutian Islands region. Overall, the much higher abundance of albatrosses in the Aleutians compared to the Bering Sea mirrored the relative density of squid, which is estimated to be approximately seven times higher in the Aleutian Islands (Ormseth 2012).

3.3.2.4 Population trends and risks

The population of short-tailed albatrosses was estimated at 2,400 birds in 2008, with about 450-500 breeding pairs (USFWS 2008). The current estimated population size for short-tailed albatross is 4,354 individuals (USFWS 2014). The population growth rate is based on annual increases in eggs laid at Torishima. The three-year running average population growth rate since 2000 ranges from 5.2-9.4%. The current population is still well below historic levels and the very rapid population growth of this species infers that the species is not currently limited by breeding or marine habitat. USFWS concluded that ecosystem conditions throughout the species range have generally remained intact. Kuletz et al. (2014) examined four decades of data from the North Pacific Pelagic Seabird Database, and showed that short-tailed albatrosses, along with Laysan and black-footed albatrosses, have increased in abundance in the Aleutians and Bering Sea between 1970s and 2000s. Further, the centers of distribution in the Bering Sea have shifted northward, most dramatically for short-tailed albatrosses, at ~ 17 km (10.5 mi)/year. For short-tailed albatross, as the numbers of observations have increased, so has their occupation of northern areas of the outer domain and shelf slope regions.

Short-tailed albatross are known to be associated with the west coast groundfish fishery. Guy et al. (2013) evaluated the spatial and temporal overlap of west coast groundfish fisheries with albatross to determine which fisheries posed threats to albatrosses and where and when those threats occur. They found that distribution for the more common black-footed albatross (Phoebastria nigripes) is similar to short-tailed albatrosses, and therefore can be used as a proxy for short-tailed albatross. They found the longline fishery for sablefish and the Pacific hake (Merluccius productus) catcher-processor fisheries had the greatest degree of overlap with these two albatrosses (Guy et al., 2013).

Millions of short-tailed albatross were harvested by feather hunters prior to and following the turn of the 20th century, resulting in the near-extinction of the species by the mid-20th century. The major threat of over-exploitation that led to the species' original endangered status no longer occurs. The most notable existing threat to the species' recovery is the possibility of an eruption of Torishima, their main breeding site. Other existing threats include incidental catch in commercial fisheries, ingestion of plastics, contamination by oil and other pollutants, the potential for depredation or habitat degradation by non-native species, and adverse effects related to global climate change (USFWS 2008).

Bycatch of short-tailed albatrosses in commercial fisheries continues to be a major conservation concern, especially for younger age classes. According to Zador and Fitzgerald (2008), the primary impact to albatrosses from seafood processing is related to attraction to the discharge, indirectly resulting in injury and/or mortality due to ship strike and cable interactions (Melvin et al., 2004, 2011) and incidental catch. Since the 2009 5-year review (USFWS 2009), progress has been made toward understanding the extent of and minimizing the impact of commercial fisheries in the U.S. Reported short-tailed albatross bycatch has remained low. Since 2009, five short-tailed albatross mortalities associated with commercial fisheries have been reported, three in the Alaskan cod fishery, one in the Pacific Coast groundfish fishery, and one during bycatch mitigation research in Japan. The reported level of mortality is below the estimated level of individuals that would trigger management concerns (USFWS 2009). As a result of the mortality off the Oregon coast in 2011 associated with a longline fishing vessel, the National Marine Fisheries Service (NMFS) consulted with the USFWS to address the impact of the Pacific Coast Groundfish Fishery on short-tailed albatross (USFWS 2012a). According to the most recent 5-year review (USFWS 2014), changes have been made to minimize risk to short-tailed albatross from the U.S. Groundfish fishery (USFWS 2014). The estimated mortality for the Pacific Coast Groundfish Fishery was estimated at two individuals over a running 2-year average. Similar to the regulations for fisheries in Alaska and Hawaii (described in the most recent 5-year review, USFWS 2009), the outcome of that consultation resulted in the numerous measures to minimize take (i.e., harm or mortality) of short-tailed albatross. Threats have been reduced in some areas through the establishment or improvement of regulations to minimize seabird bycatch, such as the area of the U.S. Pacific Coast groundfish fishery and in longline tuna fishery in Japan (USFWS 2012, Fisheries Agency of Japan 2009). The topic of risks/effects of commercial fisheries on albatross is examined in section 5.4 of the Effects Analysis.

3.4 REPTILES

3.4.1 Green sea turtle

The green sea turtle (*Chelonia mydas*) was listed under the ESA on July 28, 1978 (43 FR 32800). Breeding colony populations in Florida and on Mexico’s Pacific Coast are listed as endangered. All other populations are considered to be threatened.

3.4.1.1 Species range

The green turtle is globally distributed and generally found in tropical and subtropical waters along continental coasts and islands between 30° North and 30° South. In the eastern North Pacific, green turtles have been sighted from Baja California to southern Alaska, but most commonly occur from San Diego south. Nesting occurs in over 80 countries, but none is known to occur in U.S. Pacific waters (NMFS h).

3.4.1.2 Critical habitat

Although they have been sighted along the entire Pacific Coast, the green sea turtle is largely restricted to tropical and sub-tropical waters. Critical habitat for the green sea turtle as designated on September 2, 1998 (63 FR 46693) only includes waters surrounding Isla de Culebra, Puerto Rico. There is no critical habitat for this species along the Pacific Coast of the United States.

3.4.1.3 Life history and ecology

Except when migrating, green turtles are generally found in fairly shallow waters inside reefs, bays, and inlets. The turtles are attracted to lagoons and shoals with an abundance of marine grass and algae. Open beaches with a sloping platform and minimal disturbance are required for nesting. Green turtles apparently have strong nesting site fidelity and often make long distance migrations between feeding grounds and nesting beaches. Hatchlings have been observed to seek refuge and food in Sargassum rafts. Hatchling green turtles eat a variety of plants and animals, but adults feed almost exclusively on seagrass and marine algae (USFWS).

The nesting season varies with the locality. In the Southeastern U.S., it is roughly June through September. Nesting occurs nocturnally at 2, 3, or 4-year intervals. Only occasionally do females produce clutches in successive years. A female may lay as a many as nine clutches within a nesting season (overall average is about 3.3 nests per season) at about 13-day intervals. Clutch size varies from 75 to 200 eggs, with an average clutch size of 136 eggs reported for Florida. Incubation ranges from about 45 to 75 days, depending on incubation temperatures. Hatchlings generally emerge at night. Age at sexual maturity is believed to be 20 to 50 years (USFWS).

3.4.1.4 Population trends and risks

Analysis of historic and recent abundance information by the Marine Turtle Specialist Group (MTSG) indicates that extensive population declines have occurred in all major ocean basins over approximately the past 100-150 years. The MTSG analyzed population trends at 32 index nesting sites around the world and found a 48-65% decline in the number of mature females nesting annually during that time period (NMFS h).

The principal cause of the historical, worldwide decline of the green turtle is long-term harvest of eggs and adults on nesting beaches and juveniles and adults on feeding grounds. These harvests continue in some areas of the world and compromise efforts to recover this species. Incidental capture in fishing gear is another serious ongoing source of mortality that adversely affects the species' recovery. Green turtles are also threatened in some areas of the world by a disease known as fibropapillomatosis (NMFS h).

Another major threat to all marine turtles is ingestion of or entanglement in marine debris such as tar balls, plastic bags, plastic pellets, balloons, and ghost fishing gear. Other marine hazards include environmental contamination from coastal runoff, marina and dock construction, dredging, aquaculture, oil and gas exploration and extraction, increased under water noise, and boat and vessel strikes (NMFS v).

3.4.2 Leatherback sea turtle

The leatherback sea turtle (*Dermochelys coriacea*) was included in the first list of endangered species under the Endangered Species Conservation Act on June 2, 1970 (35 FR 8491).

3.4.2.1 Species range

Leatherbacks are the most migratory and wide ranging of sea turtle species. They are commonly known as pelagic (open ocean) animals, but they also forage in coastal waters. Adult leatherbacks are capable of tolerating a wide range of water temperatures, and have been sighted along the entire west coast of the United States. Nesting grounds are located around the world, with the largest remaining nesting assemblages found on the coasts of northern South America and west Africa. The U.S. Caribbean and southeast Florida support minor nesting colonies, but they represent the most significant nesting activity within the United States (NMFS i).

3.4.2.2 Critical habitat

The original critical habitat for the leatherback sea turtle, designated on September 26, 1978, only included certain areas around the U.S. Virgin Islands (43 FR 43688). Additional areas located in the Pacific Ocean were added on January 26, 2012 (77 FR 4170). This designation includes approximately 16,910 square miles (43,798 square km) along the California coast from Point Arena to Point Arguello east of the 3,000-meter depth contour; and 25,004 square miles (64,760 square km) from Cape Flattery, Washington to Cape Blanco, Oregon east of the 2,000meter depth contour. The designated areas, shown in Figure 3.18, comprise approximately 41,914 square miles (108,558 square km) of marine habitat and include waters from the ocean surface down to a maximum depth of 262 feet (80 m).

The primary constituent element essential for conservation of leatherback turtles is the occurrence of prey species, primarily scyphomedusae (jellyfish) of the order Semaeostomeae, of sufficient condition, distribution, diversity, abundance and density necessary to support individual as well as population growth, reproduction, and development of leatherbacks.

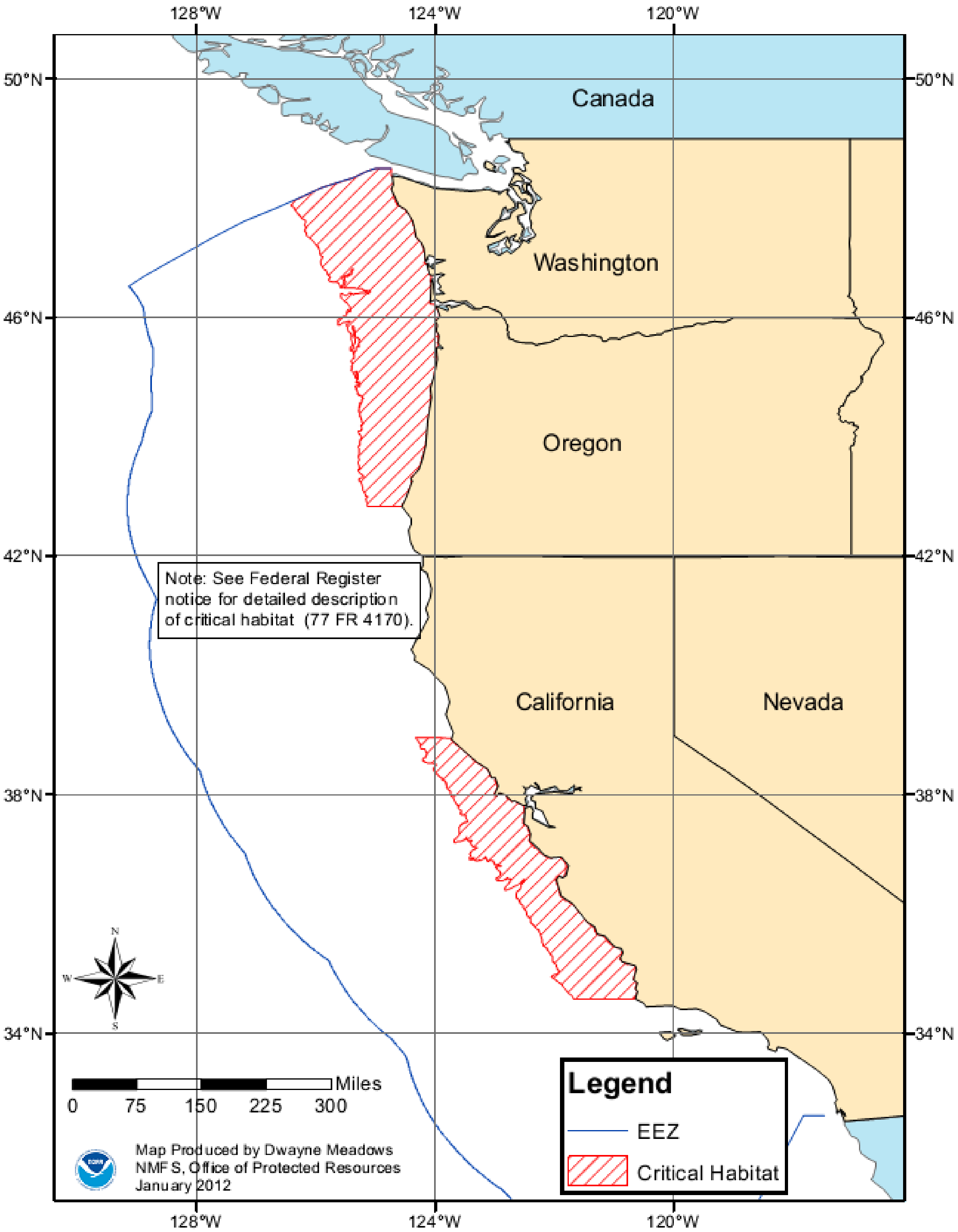


Figure 3.18 Leatherback Sea Turtle Critical Habitat (Source: NMFS)

3.4.2.3 Life history and ecology

The leatherback is the largest turtle and the largest living reptile in the world. It is the only sea turtle that lacks a hard, bony shell. Their mouths are adapted for a diet of soft-bodied pelagic prey, such as jellyfish and salps. Leatherbacks mate in the waters adjacent to nesting beaches and along migratory corridors. Females lay clutches of approximately 100 eggs on sandy, tropical beaches. They nest several times during a nesting season, typically at 8-12 day intervals. Hatchlings emerge from the nest after 60-65 days. After nesting, female leatherbacks migrate from tropical waters to more temperate latitudes, which support high densities of jellyfish prey in the summer (NMFS i).

3.4.2.4 Population trends and risks

The Pacific Ocean leatherback population is generally smaller in size than that in the Atlantic Ocean. Because adult female leatherbacks frequently nest on different beaches, nesting population estimates and trends are especially difficult to monitor. In the Pacific, the IUCN notes that most leatherback nesting populations have declined more than 80%. In other areas of the leatherback's range, observed declines in nesting populations are not as severe, and some population trends are increasing or stable. Nesting trends on U.S. beaches have been increasing in recent years (NMFS i).

Leatherback turtles face threats on both nesting beaches and in the marine environment. The greatest causes of decline and the continuing primary threats to leatherbacks worldwide are long-term harvest and incidental capture in fishing gear. Harvest of eggs and adults occurs on nesting beaches while juveniles and adults are harvested on feeding grounds. Incidental capture primarily occurs in gillnets, but also in trawls and other types of gear. Together these threats are serious ongoing sources of mortality that adversely affect the species' recovery (NMFS i).

Another major threat to all marine turtles is ingestion of or entanglement in marine debris such as tar balls, plastic bags, plastic pellets, balloons, and ghost fishing gear. Other marine hazards include environmental contamination from coastal runoff, marina and dock construction, dredging, aquaculture, oil and gas exploration and extraction, increased under water noise, and boat and vessel strikes (NMFS v).

3.4.3 Loggerhead sea turtle

The loggerhead sea turtle (*Caretta caretta*) was designated as threatened throughout its worldwide range on July 28, 1978 (43 FR 32800). On September 22, 2011 nine Distinct Population Segments were identified, of which five were listed as endangered, including the North Pacific Ocean DPS (76 FR 58868).

3.4.3.1 Species range

Loggerheads are circumglobal, occurring throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans. They are the most abundant species of sea turtle found in U.S. coastal waters. In the eastern Pacific, loggerheads have been reported as far north as Alaska, and as far south as Chile. In the U.S., occasional sightings are reported from the coasts of Washington and Oregon, but most records are of juveniles off the coast of California. The only known nesting areas for loggerheads in the North Pacific are found in southern Japan (NMFS j).

3.4.3.2 Critical habitat

Critical habitat has not yet been designated for loggerhead sea turtles.

3.4.3.3 Life history and ecology

Loggerhead turtles feed on whelks and conch. They occupy three different ecosystems during their lives: (1) beaches (terrestrial zone), (2) water (oceanic zone), and (3) nearshore coastal areas ("neritic" zone).

Females nest on ocean beaches from April-September and generally lay three to five nests during a single season. The eggs incubate approximately two months before hatching sometime between late June and mid-November.

Immediately after hatchlings emerge from the nest, they begin a period of frenzied activity during which they move to the surf, are swept through the surf zone, and continue swimming away from land for up to several days. After this swim frenzy period, post-hatchling loggerheads take up residence in areas where surface waters converge to form local downwellings. These areas are often characterized by accumulations of floating material, such as seaweed.

As post-hatchlings, loggerheads may linger for months in waters just off the nesting beach or may be transported by ocean currents into the oceanic zone. Somewhere between 7-12 years old, oceanic juveniles migrate to nearshore coastal areas (neritic zone) and continue maturing until adulthood (NMFS j).

3.4.3.4 Population trends and risks

The most recent reviews show that only two loggerhead nesting beaches have greater than 10,000 females nesting per year: South Florida (U.S.) and Masirah Island (Oman). Total estimated nesting in the U.S. is approximately 68,000 to 90,000 nests per year. Recent analyses of nesting data from the Index Nesting Beach Survey program in southeast Florida show the population is declining. Similarly, long-term nesting data show loggerhead nesting declines in North Carolina, South Carolina, and Georgia.

Loggerheads face threats on both nesting beaches and in the marine environment. The greatest cause of decline and the continuing primary threat to loggerhead turtle populations worldwide is incidental capture in fishing gear, primarily in longlines and gillnets, but also in trawls, traps and pots, and dredges. Directed harvest for loggerheads still occurs in many places (for example, the Bahamas, Cuba, and Mexico) which is a serious and continuing threat to loggerhead recovery (NMFS j).

Another major threat to all marine turtles is ingestion of or entanglement in marine debris such as tar balls, plastic bags, plastic pellets, balloons, and ghost fishing gear. Other marine hazards include environmental contamination from coastal runoff, marina and dock construction, dredging, aquaculture, oil and gas exploration and extraction, increased under water noise, and boat and vessel strikes (NMFS v).

3.4.4 Olive Ridley sea turtle

The olive or Pacific ridley sea turtle (*Lepidochelys olivacea*) was listed as threatened on July 29, 1978. At the same time, breeding populations on the Mexican Pacific Coast were designated as endangered (43 FR 32800).

3.4.4.1 Species Range

Olive ridleys are globally distributed in the tropical regions of the South Atlantic, Pacific, and Indian Oceans. In the Eastern Pacific Ocean, they occur from Southern California to Northern Chile. Olive ridleys often migrate great distances between feeding and breeding grounds (NMFS k).

3.4.4.2 Critical habitat
Critical habitat has not been designated for the olive ridley sea turtle.

3.4.4.3 Life history and ecology
Adult olive ridleys are relatively small compared to other sea turtles, weighing on average 100 pounds. Nesting females are 22-31 inches long. The size varies from region to region, with the largest animals being observed on the Pacific coast of Mexico. Olive ridleys reach sexual maturity around 15 years. This turtle has what is considered one of the most extraordinary nesting habits in the natural world. Large groups of females gather off shore of nesting beaches. Then, all at once, hundreds to thousands come ashore to lay their eggs in what is known as an “arribada.” Females nest every year, once or twice a season, laying clutches of approximately 100 eggs. Incubation takes 50-60 days (NMFS k).

3.4.4.4 Population trends and risks
The olive ridley is considered the most abundant sea turtle in the world, with an estimated 800,000 nesting females annually; however, it may also be the most exploited. According to the Marine Turtle Specialist Group (MTSG) of the IUCN, there has been a 50% reduction in population size since the 1960s, when the olive ridley fishery developed in Mexico and Ecuador. Although some nesting populations have increased in the past few years, the overall reduction is greater than the overall increase. Degradation of nesting beaches, ongoing directed harvest of both eggs and turtles, and bycatch in fisheries have all contributed to the decline of the species. All of these factors continue to be a threat in at least some parts of the world (NMFS k).

Another major threat to all marine turtles is ingestion of or entanglement in marine debris such as tar balls, plastic bags, plastic pellets, balloons, and ghost fishing gear. Other marine hazards include environmental contamination from coastal runoff, marina and dock construction, dredging, aquaculture, oil and gas exploration and extraction, increased under water noise, and boat and vessel strikes (NMFS v).

SECTION 4.0

ENVIRONMENTAL BASELINE

The environmental baseline describes the habitat that exists within the action area and the amount of degradation that has occurred to date. Much of the information is summarized from a June 2012 draft of the Pacific Coast Fishing Ecosystem Plan (FEP) for the U.S. portion of the California Current large marine ecosystem (CCE). The purpose of the FEP is to enhance the Pacific Fishery Management Council's (PFMC or Council) species-specific management programs with more ecosystem science, broader ecosystem considerations and management policies that coordinate Council management across its FMPs and the CCE.

4.1 THE CALIFORNIA CURRENT ECOSYSTEM

The action area of the Draft Permit is located within the EEZ (between 3 nm and 200 nm from the shoreline) off the coast of Washington and Oregon. The EEZ is part of the California Current large marine ecosystem (CCE), which extends along the Pacific Coast of North America from the northwestern corner of Washington to the southern end of the Baja California Peninsula in Mexico (Figure 4.1). This ecosystem is temperate and represents a transition zone between subtropical and subarctic water masses.

The CCE has been described as an upwelling-dominated ecosystem that is characterized by fluctuations in physical conditions and productivity over several different time scales. Inter-annual variability in productivity occurs as a result of El Niño and the El Niño-Southern Oscillation. Decadal time scales of variability or boom-bust cycles are associated with the food web, which tends to be structured around coastal pelagic species. The top trophic levels of the ecosystem are often dominated by highly migratory species such as salmon, tuna, billfish and marine mammals, whose dynamics may be partially or wholly driven by processes in entirely different ecosystems, even different hemispheres (PFMC, 2012).

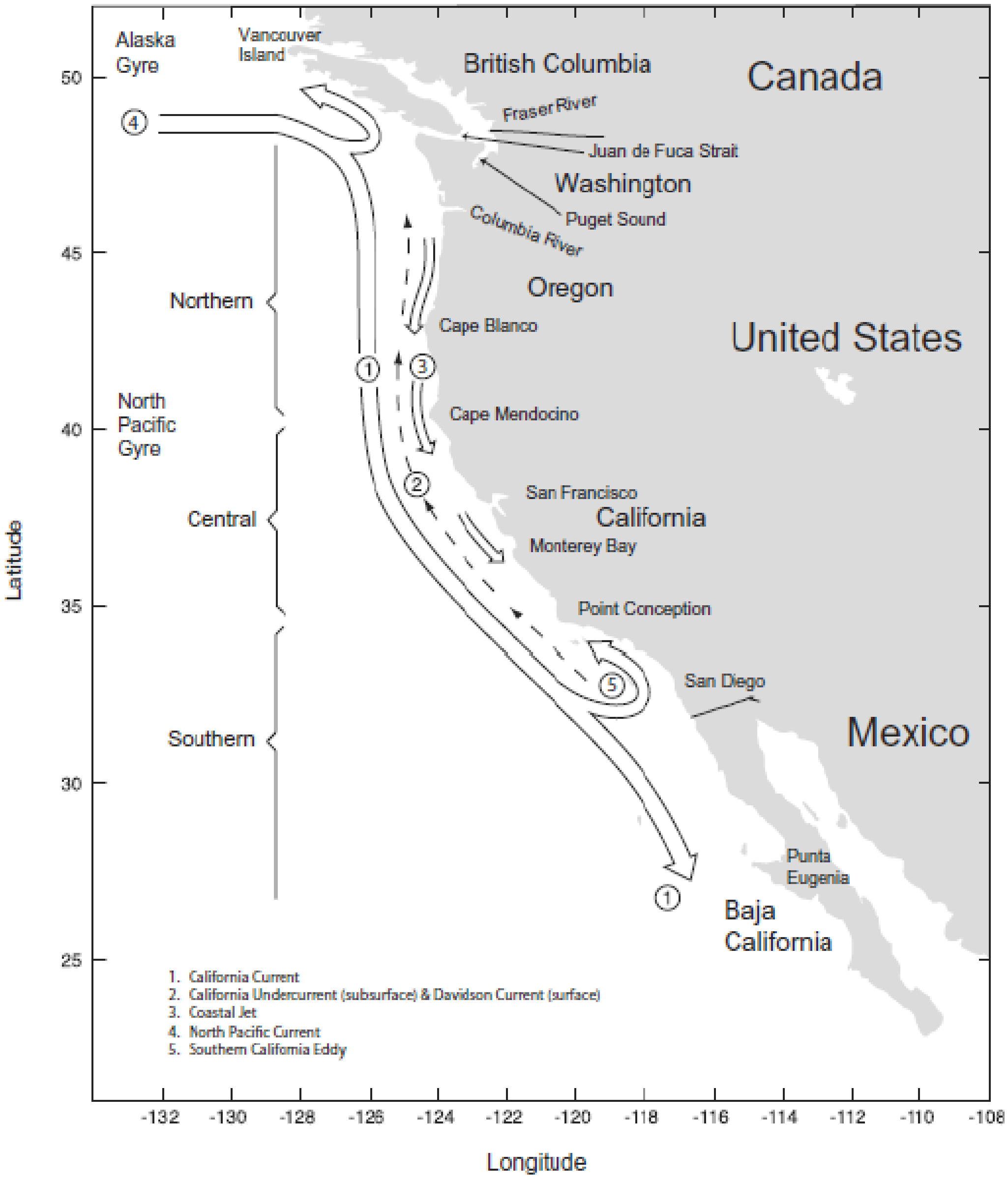


Figure 4.1 The Major Currents along the Pacific Coast Region (taken from PFMC, 2012 which cited http://access.afsc.noaa.gov/ichthyo/history.cfm)

4.2 BIOLOGICAL

The action area contains a diverse array of species. Marine mammals, seabirds and marine reptiles of the CCE tend to occupy the system's mid- to higher trophic levels, and are generally protected species, although many have been historically targeted for harvest. High trophic level fish typically represent highly valued fisheries targets, rather than protected resources subject to conservation laws.

In general, three major communities of mid- to high-trophic level fish assemblages occur in the action area: highly migratory species, groundfish, and anadromous fishes (principally salmonids, but including sturgeon and other species as well). Seasonal patterns appear to be the greatest drivers of migrations and variable distributions for most mid- to higher trophic level species, both pelagic and benthic (associated with the area where the bottom level of water meets the sediment surface), although inter-annual and longer term climate variability also shapes the distribution and abundance of many of the pelagic species (PFMC, 2012).

The most predominant phytoplankton groups within the California current include the single-celled phytoplankton classes as listed and described in Table 4.1. Diatoms are mainly responsible for large productive blooms in the nearshore upwelling regions and often form the basis of the productive food webs in those areas. Dinoflagellates may also bloom in upwelling and other regions, and may also provide an important food source for microzooplankton. Dinoflagellates have a dual role; as certain dinoflagellates may form harmful algal blooms (HABs). Cyanobacteria are the smallest “phytoplankton” and form only a minor portion of phytoplankton biomass, although their productivity rates may be high in offshore regions. Thus, cyanobacteria form an important link in offshore food webs, and may also fuel the growth of the smallest microzooplankton within nearshore regions as well (Whitmire and Clark, 2007).

Phytoplankton Class	
Diatoms	Eukaryotic cells with hard silica based shells, dominant in upwelling areas, occasionally harmful algal bloom (HAB) forming
Dinoflagellates	Eukaryotic cells, many of which are slightly motile, often dominate in stratified regions, and more commonly form HABs than diatoms
Cyanobacteria	Prokaryotic cells, predominant in offshore regions, but still abundant in nearshore regions (~20% of phytoplankton productivity) along with large multicellular plants

Table 4.1 Description of Predominant Phytoplankton Classes along Pacific Coast

4.3 HABITAT

The action area includes diverse habitat types that are described here relative to geological, geochemical and vegetative controls. One key division for all of these controls is between coastal waters and the open ocean (the oceanic area), with the divide occurring roughly at the edge of the continental shelf break or at the 200m water depth, which describes the transition between the shelf and the slope. The action area in the Draft Permit mostly concerns habitat associated with open ocean or seaward from the shelf break.

4.3.1 Geological Controls

Geologic features, which greatly influence current and wave patterns, provide habitats that influence species distribution and productivity. For example, the geology of benthic habitats is one among a variety of important ecological characteristics for managed fish species. The physical substrate or physiography of benthic habitats of the CCE can be described using a classification scheme developed by marine geology experts for deep seafloor habitats; this scheme was used for describing groundfish EFH (PFMC, 2011a).

A multitude of seabed information exists for the Pacific coast region, including swath bathymetric data and sidescan sonar imagery collected during large-scale mapping programs and during targeted geologic investigations, an extensive database of sediment samples collected by the oil industry and during submersible surveys, seismic reflection profiles collected by the oil industry and academic institutions, structural geologic maps created by the state of

California, the USGS and Oregon State University, and photographic and video imagery collected during numerous surveys. A bathymetric map of the Pacific coast is shown in Figure 4.2.

In general, the West Coast EEZ, which is delineated by the black line in Figure 4.2, has a relatively narrow shelf, steep slope and wide abyssal plain. The shelf, ranging from shore to depths of about 200 m, is generally less than 50 nm wide along most of the West Coast, but widens to about 100 nm off the Southern California Bight and northern Washington. Major offshore physiographic features of Washington and Oregon include the continental shelf, slope and Cascadia Basin. Low benches and hills characterize the upper slope. The lower slope intersects the deep sea floor of the Cascadia Basin at 2200 m depth off the north coast, and at about 3,000 m off the central and south Oregon coast (PFMC, 2012).

Other bathymetric features such as pinnacles and seamounts create localized upwelling conditions that concentrate nutrients, thus driving a high level of biologic productivity. For example, Heceta Bank (#14 in Figure 4.2), which rises over 100 meters above the edge of the continental shelf and to within 70 meters of the ocean surface, diverts the main flow of the California Current, introducing eddies and other instabilities that affect areas downstream and along the Oregon coast (Whitmire and Clark, 2007).

Seamounts rise steeply to heights of over 1,000 m from their base and are typically formed of hard volcanic substrate. They tend to create complex current patterns. A series of large ridges occurs at the base of the continental slope offshore of Oregon and Washington with ridge crests elevated 400 m to 1000 m above the abyssal plain of the Cascadia Basin. The Gorda (#29 in Figure 4.2)) and Juan de Fuca (#30 in Figure 4.2) ridges are major tectonic features that are volcanically active (Whitmire and Clark, 2007).

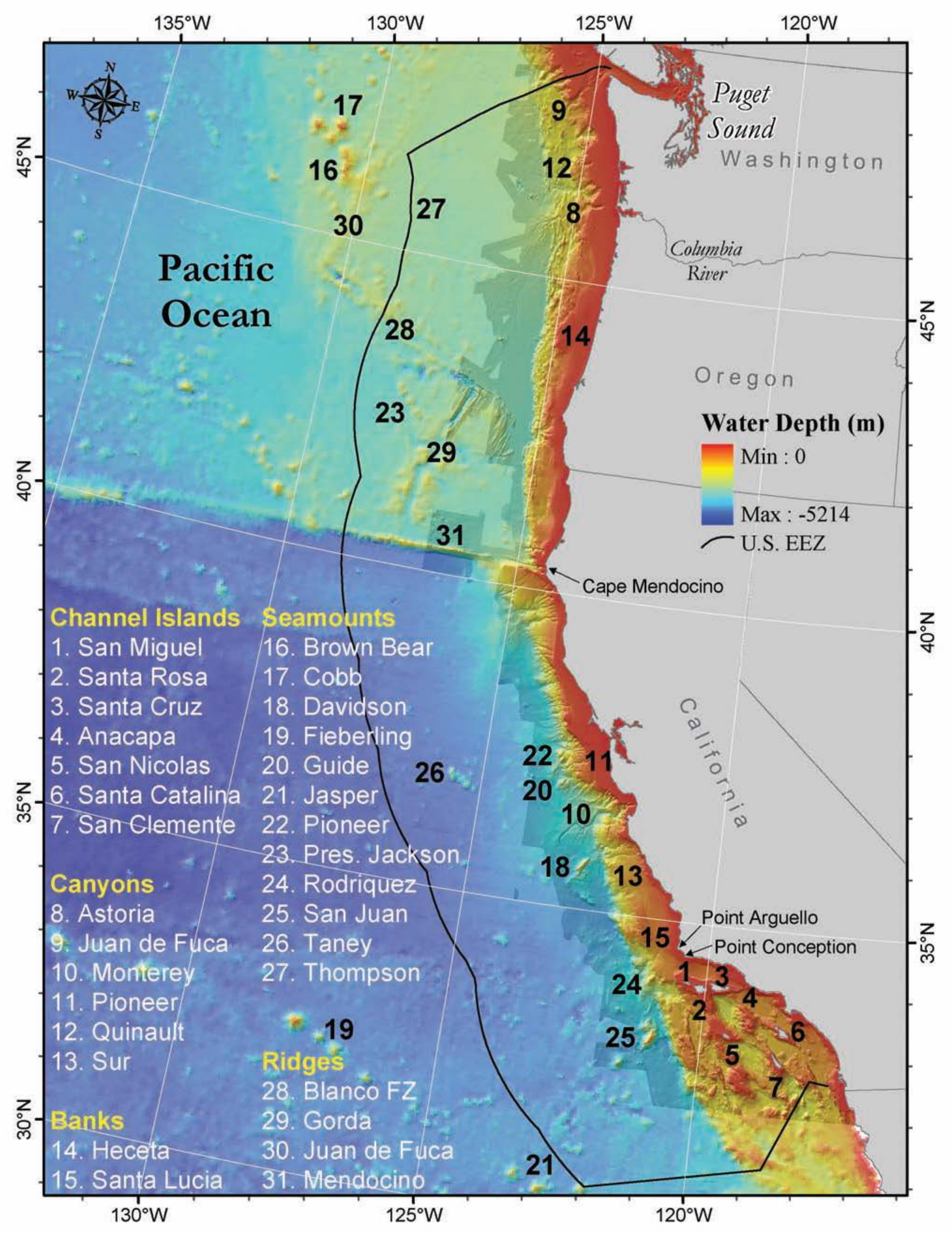


Figure 4.2 Bathymetric Map of the Pacific Coast Region (taken from Whitmire and Clark, 2007)

4.3.2 Geochemical Controls

Marine habitats can vary as much by the motion and physical and chemical properties of seawater (e.g., temperature, salinity, nutrient content) as by particular locations and geologic and biogenic structures. Within the CCE, there are roughly four common modes of water column structure:

- Well mixed nearshore waters
- Surface stratified nearshore waters
- Transition zones and fronts
- Deeply stratified offshore waters.

The action area is mostly transition zones and fronts, and deeply stratified offshore waters. The transition zone lies between the nearshore upwelling region and the far offshore region of the main core of the California Current, and is typically defined by relatively strong horizontal fronts. The front itself is partly what leads to the strong southward flow of the core of the CCE (PFMC, 2012). Beyond the transition zone lies a region of fairly well stratified waters, with a deep pynocline, often at a depth of 100-200 meters. Surface waters are warm, and this region is characterized by low yet steady primary production. These two major vertical water column types form distinct habitats, differentiated primarily in terms of their temperature and primary productivity within the surface layers (PFMC, 2012).

4.3.3 Vegetation

Vegetation forms two major classes of large-scale habitats: large macro-algal attached benthic beds and microalgal blooms (PFMC, 2012). Macroalgae is a collective term used for seaweeds and other benthic (attached to the bottom) marine algae that are generally visible to the naked eye. Larger macroalgae are also referred to as seaweeds. They are distinguished from microalgae (e.g. diatoms, phytoplankton, and the zooxanthellae that live in coral tissue), which require a microscope to be observed.

Macroalgae play important roles in the ecology of coral reefs. They are the major food source for a wide variety of herbivores and are the basis of the reef food-web, they are major reef formers, and they create habitat for invertebrates and vertebrates of ecological and economic importance. They also play critical roles in reef degradation, when abundant corals are often replaced by abundant macroalgae. Several coral taxa in the region are designated as “structure-forming”, meaning they are known to provide vertical structure above the sea floor that can be utilized by other invertebrates or fish (Whitmire and Clark, 2007).

Several federal and state agencies and academic institutions have conducted additional targeted seafloor mapping projects off the Pacific coast to provide base maps for a variety of benthic habitat investigations (Whitmire and Clark, 2007). One of these is depicted in Figure 4.3.

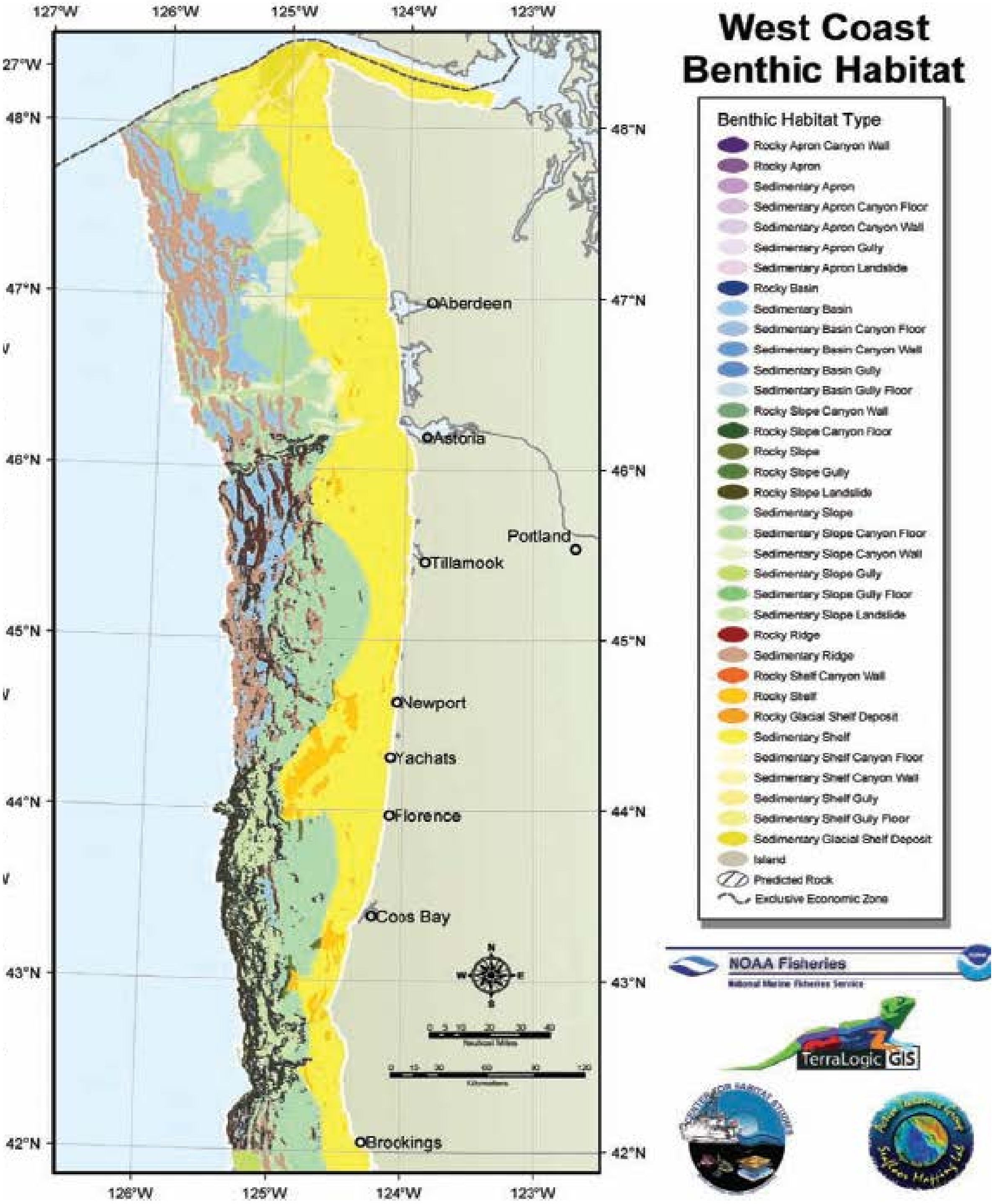


Figure 4.3 Benthic Habitat Map of Pacific Coast Region (taken from Whitmire and Clark, 2007)

4.3.4 Rocky Reefs

The EPA performed additional research on specific rocky reefs which the Oregon Department of Fish and Wildlife considers to be of particular ecological significance: Stonewall Bank, Heceta Bank, Nehalem Bank, Garibaldi, Daisy Bank, Hydrate Knoll, Arago Reef, Bandon High Spot, and Rogue Reef.

Stonewall Bank

Stonewall Bank is a rocky reef between 50 and 200 meters in depth (NOAA N. O., 2017) and is composed mostly of mud and bedrock (Shester et al., 2013). The combination of soft (mud) and hard substrate (bedrock) encourages the habitation of both fish species and structure-forming invertebrates. Many species of rockfish have been observed at Stonewall Bank, including Yelloweye rockfish. Other fish species include: dover and slender sole, lingcod, kelp greenling, and spotted ratfish. Anemones, sponges, hydrocoral, gorgonian coral, and sea pens at Stonewall Bank provide structure and a more diverse habitat for the aforementioned fish species (Shester et al., 2013).

Above water, Stonewall Bank is known as a location to view albatross, shearwaters, fulmars, auklets, and other seabirds (Portland Audobon Society, no date). Seasonal upwelling of nutrients from the ocean floor is one of the driving factors for the wealth of species both above and below the ocean’s surface. Seasonal upwelling also plays a role in the severe hypoxic events that have been occurring along Oregon’s coast in recent years (described in the hypoxia section of this Biological Evaluation).

Stonewall Bank has several conservation designations. This rocky reef has been designated a Yelloweye Rockfish Conservation Area (YRCA), which prohibits the taking or retaining of Pacific halibut and any species of groundfish including; lingcod, rockfish, greenling, pacific cod, skates and flatfish (ODFW, 2012). Inside Stonewall Bank, YRCA sport fishing for salmon, tuna and offshore pelagic species is allowed under Oregon Sport Fishing Regulations. In addition to its YRCA status, Stonewall Bank is a Habitat Area of Particular Concern (as defined by the Pacific Fishery Management Council). Bottom trawl gear is prohibited inside Stonewall Bank because of its listing as an Essential Fish Habitat for groundfish.

Heceta Bank

Heceta Bank is a rocky reef to the south of Stonewall Bank. Depths at Heceta Bank range from <60 – 1000 meters (Pearcy et al., no date). Mud, cobble, boulder and bedrock make up significant portions of the seafloor at Heceta (Shester et al., 2013). Deeper regions consist mostly of mud while shallow areas are composed of harder substrates. Rockfish tend to live near harder substrates, while species such as sablefish, sole, ragfish and flatfish have been almost exclusively observed over deep mud substrate (Pearcy et al., no date). Although Heceta Bank does not contain as many rockfish species as Stonewall Bank, there are more structure-forming invertebrate species, in particular sponges (Shester et al., 2013). Over 50 species of structure-forming invertebrates have been observed on the steep muddy slopes along the escarpment (NOAA, Pacific Coast Groundfish Fishery Management Plan, 2005). Heceta Bank provides habitat for many species, including a variety of groundfish, because of its varied topography and substrates. However, these also contribute to poor circulation conditions and make it a water retentive area (Ressler et al., 2000). Poor circulation at Heceta Bank can worsen hypoxic conditions. The same conditions that occurred at Stonewall Bank have occurred at Heceta (Chan et al., 2008; Grantham et al., 2004). Heceta and Stonewall Banks are connected by Perpetua Bank and together make up a highly productive habitat particularly susceptible to hypoxia (see Section 4.5.2 for more detail.)

Heceta Bank is an Essential Fish Habitat, in addition to being a Habitat of Particular Concern, and is closed to bottom trawling (NOAA, Small Entity Compliance Guide: Pacific Coast Groundfish Essential Fish Habitat Conservation Area Closures and Gear Prohibitions). The size and productivity of Heceta Bank make it a popular commercial fishing area. Rockfish, sablefish, pacific hake, Dungeness crab and sole are economically valuable fish species found at the bank (ODFW, 2015).

Nehalem Bank

Nehalem Bank ranges from 140 to 180 meters in depth (NOAA N. O., 2017). Nehalem Bank, also called Shale Pile, is comprised mostly of rocky shale outcrop with a mud floor. Nehalem Bank is known to be habitat for sponges, sea pens, and other invertebrates (NOAA, Pacific Coast Groundfish Fishery Management Plan, 2005). Although Nehalem Bank has been trawled by commercial vessels in the past, its status as an Essential Fish Habitat has ended the use of bottom trawl gear in the area (NOAA, Small Entity Compliance Guide: Pacific Coast Groundfish Essential Fish Habitat Conservation Area Closures and Gear Prohibitions).

Garibaldi Reef

Garibaldi Reef is also referred to as South Nehalem Reef. The reef is 130 – 200 meters deep (Shester et al., 2013). In a study during August 2013, the substrate at Garibaldi Reef was found to be almost entirely mud (Shester et al., 2013). Substrate forming invertebrates like sea pens, corals, and sponges provide habitat cover for a few species of rockfish (Shester et al., 2013). Shrimp trawling is common to both the east and north of Garibaldi Reef.

Daisy Bank

Daisy Bank is a deep rocky reef between 120 and 700 meters in depth (NOAA, 2009). The bank is an inactive underwater volcano with a steep slope comprised of cobble and boulder substrate. At the base of the volcano, the majority of substrate is mud (Hixon et al., 1991). Major fish and sessile organisms observed at Daisy Bank are rockfish, thornyhead, perch, lingcod, skate, sole, and a variety of sponges. One of the most important species is the Yelloweye rockfish (Shester et al., 2013). A Habitat Area of Particular Concern, Daisy Bank is also an Essential Fish Habitat and therefore closed to bottom trawling (NOAA, Small Entity Compliance Guide: Pacific Coast Groundfish Essential Fish Habitat Conservation Area Closures and Gear Prohibitions).

Hydrate Knoll

Hydrate Knoll, also known as Hydrate Ridge, is 600 – 1400 meters deep (NOAA N. O., 2017). The knoll is home to many species of coral including: soft corals, bubblegum coral, gorgonian corals, and black coral (Shester et al., 2013). Relatively little research has focused on Hydrate Knoll with regard to fish habitat and species. However, a large amount of research has been conducted regarding methane hydrate. Hydrate Knoll is a cold seep system driven by subduction and contains frozen deposits of methane (Suess, 2014). The occurrence of anaerobic oxidation of biogenic methane suggests the presence of an anoxic environment at Hydrate Knoll.

Arago Reef

Arago Reef is a nearshore reef ranging from 50 – 150 meters in depth. Substrate at Arago Reef is predominantly a mix of boulders, cobble, gravel and mud (Enticknap et al., 2013). Arago Reef is home to many species of rockfish, including the canary and yelloweye rockfish. Other fish species found at this reef are; kelp greenling and lingcod (Enticknap et al., 2013). Much of

Arago's complexity comes from structure-forming invertebrates. Gorgonians, branch and shelf sponges, sea stars, sea cucumbers, small orange brittle stars and nudibranchs (Hemery and Henkel, 2015). Sea cucumbers, small orange brittle stars, and other burrowing organisms are common at Arago Reef because of the extensive mud habitat.

Bandon High Spot
Bandon High Spot, also known as Coquille Bank, is 100 meters deep at its shallowest (NOAA N. O., 2017). From its high spot, the depth sharply increases towards the continental shelf. Bandon High Spot is predominantly composed of soft substrate (Enticknap et al., 2013). Structure-forming and other invertebrates are easily found in the soft substrate. Sea pens, urchins, hermit crabs, prawns, crabs, sea stars, sea cucumbers, and octopuses have all been observed at the high spot. Observed fish species of note are sablefish, pacific hake, rockfish species and halibut (Hixon and Tissot, 2007). Bandon High Spot has been closed to bottom trawling with its Essential Fish Habitat Conservation Area status (NOAA, Small Entity Compliance Guide: Pacific Coast Groundfish Essential Fish Habitat Conservation Area Closures and Gear Prohibitions).

Rogue Reef
Relatively little published research has focused on Rogue Reef. Depths at Rogue Reef range from 100 to greater than 200 meters (NOAA N. O., 2017).

4.4 WATER CONDITIONS

Since 2001, US EPA, Office of Research and Development has developed National Coastal Condition Reports that describe the ecological and environmental conditions in U.S. coastal waters. Preparation of these reports represents a coordinated effort among the EPA, the National Oceanic and Atmospheric Administration (NOAA), the USGS, the U.S. Fish and Wildlife Service, coastal states, and the National Estuary Programs.

The most recent report, the National Coastal Condition Report IV, presents an assessment of coastal water conditions based on data collected from 2003 to 2006. As shown in Figure 4.4, ocean water off the coast of Washington and Oregon is part of the West Coast Region. Four main data types are presented in the report including coastal ocean/offshore monitoring data. Five indices of condition are evaluated: water quality, sediment quality, benthic community condition, coastal habitat loss and fish tissue contaminants. The information provides a baseline for evaluating future changes due to natural or human-induced disturbances.

The assessment of offshore monitoring along Washington and Oregon showed no major evidence of poor water quality, and only limited areas of poor sediment quality. None of the offshore sampling area was rated poor for the dissolved oxygen component indicator. An analysis of potential biological impacts revealed no major evidence of impaired benthic condition linked to measured stressors.

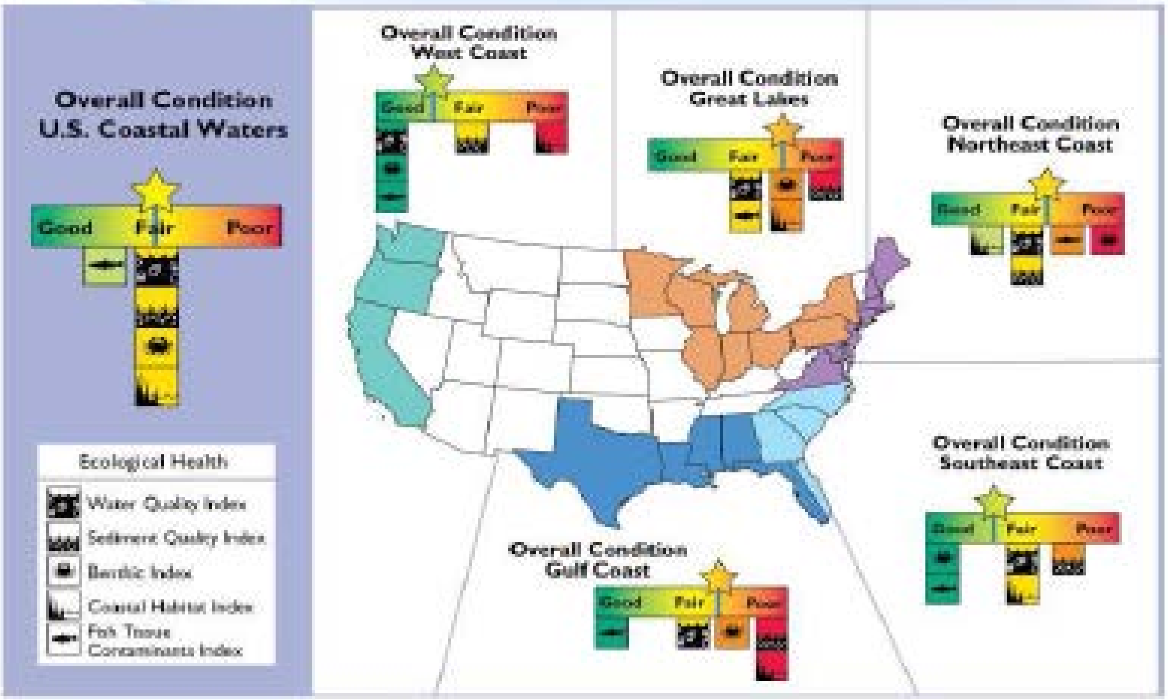


Figure 4.4 Overall Condition of the Nation's Coastal Waters (Source: http://water.epa.gov/type/oceb/assessmonitor/nccr/index.cfm)

4.5 EVIDENCE OF STRESS

Although the water of the West Coast Region is rated as good to fair on all of the major indices presented in the National Coastal Condition Report IV, recent evidence indicates that the region is undergoing stress related to ocean acidification and expanding hypoxia areas. While these are significant water quality issues, these stressors are not considered "impairments" under Section 303(d) of the CWA, and thus, are not subject to associated standards.

4.5.1 Acidification

Ocean acidification refers to the decrease in the pH of the Earth's oceans caused by the uptake of carbon dioxide from the atmosphere. Ocean acidification is related to, but distinct from, climate change. Both climate change and ocean acidification share a common cause: increasing carbon dioxide concentration in the atmosphere. Rising levels of carbon dioxide (CO2) gas, along with other greenhouse gases, indirectly alter the climate system by trapping heat that perturbs the Earth's radiation budget. Ocean acidification is not a climate process, but instead directly impacts ocean chemistry as carbon dioxide is absorbed from the atmosphere. Unlike the uncertainties inherent in climate change models, predictions of ocean acidification are very robust (Ocean Carbon and Biogeochemistry Program, 2008).

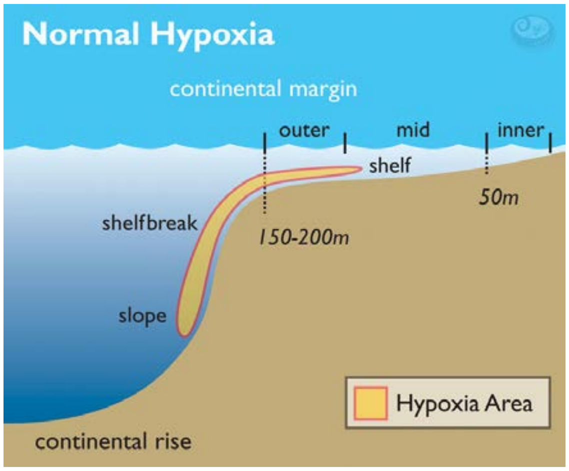
The effects of growing ocean acid levels might be more pronounced off the coast of the Pacific Northwest. Cold water absorbs more carbon dioxide than warm water does. The phenomenon of "upwelling" off the coast of Washington and Oregon also brings deep ocean water — which already is more acidic — to the surface, where it's saturated with even more carbon dioxide. According to one study, upwelling of acidified water off the West Coast had reached levels that had not been anticipated until 2050 (http://www.mcclatchydc.com/2010/04/22/92728/report-ocean-acidification-rising.html).

Scientists monitoring waters off the coast of Washington reported that ocean acidification is linked to a multitude of direct and indirect impacts on marine life that are occurring in concert with other impacts such as climate change, but some important biological effects are now clearly evident. For instance, ocean acidification will reduce calcification rates in corals and may affect economically important shellfish species including oysters, scallops, mussels, clams, sea urchins, crabs and lobsters. Some organisms may benefit from ocean acidification, while others will be negatively impacted, and the impacts may differ from one life stage to another (i.e., adults, eggs, larvae, juveniles, etc.). Overall, the net effect is likely to disrupt the normal functioning of many marine and coastal ecosystems. However, scientists are currently unable to predict the net impacts on most marine ecosystems or the services they provide such as fisheries and coastline protection (Ocean Carbon and Biogeochemistry Program, 2008). Proceedings of the National Academy of Sciences report (Wootton et al., 2008) that the pH of Washington’s coastal waters has declined since 2000 by more than 0.2 standard units, violating the state’s water-quality standard for pH.

4.5.2 Hypoxia

Hypoxia means low-oxygen. It is a term that refers to times when oxygen levels in seawater drop to levels that are too low to support most fishes, crabs and other marine life. Seawater is hypoxic if it the amount of oxygen is less than 1.4 milliliters of oxygen per liter (ml/l) of seawater. Hypoxic areas are also commonly termed “dead zones” because most animals avoid low-oxygen areas or suffocate due to lack of oxygen.

Although it is not unusual to have naturally low-oxygen conditions in deep, offshore waters (e.g., at the edge of the continental shelf and slope), the occurrence of low-oxygen water close to shore (the inner shelf, less than 50 m (165 ft.) of water) is highly unusual and had not been reported prior to 2002 despite over 50 years of scientific observations along the Oregon/Washington coast. Figure 4.5 illustrates the approximate change in shape and extent of the hypoxia area between normal (before 2002) and when it started to expand in 2002. For nearly ten years in a row, a dead zone of low-oxygen water has formed in the Pacific Northwest, killing crabs, fishes, and other marine life. The size, duration, and severity of these dead zones have varied from year to year. The most severe event occurred in the summer of 2006 when oxygen levels dropped to historic lows and hypoxic water could be found in large areas along the Washington and Oregon coasts (Chan et al., 2008).



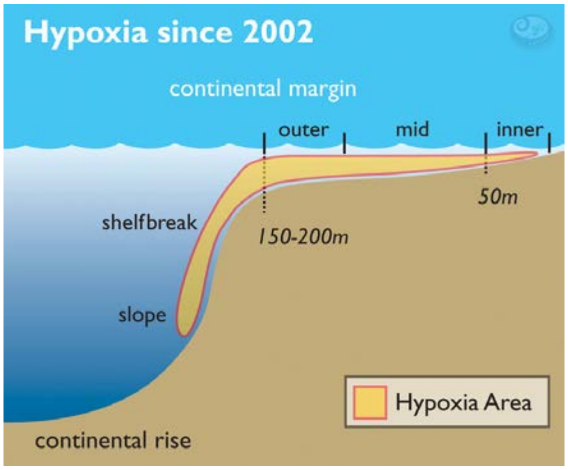


Figure 4.5 Approximate Shape and Location of Hypoxia Area along Oregon and Washington (Source: http://www.piscoweb.org/research/science-by-discipline/coastal-oceanography/hypoxia-new/hypoxia-in-pacific-northwest)

Figure 4.6 shows oxygen levels as they change with the depth of water from the ocean's surface down to depth where low-oxygen levels are normal. Oxygen levels below 1.4 ml/l are hypoxic and do not support most life (Chan et al., 2008).

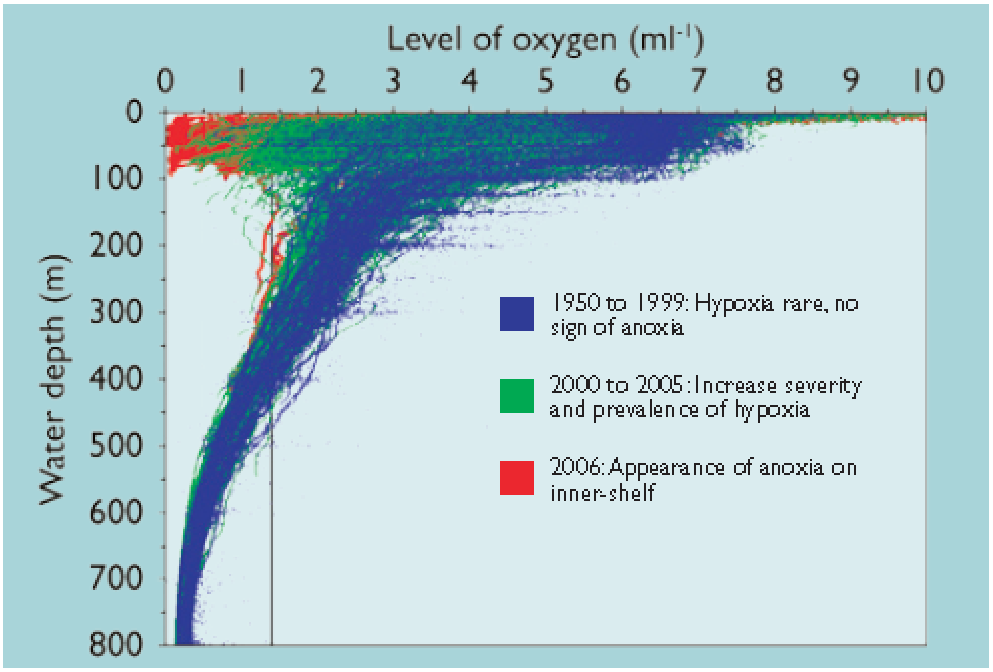


Figure 4.6 Change of Oxygen Level with Depth of Water (taken from Chan et al., 2008)

The dynamics of seasonal hypoxia off the Washington and Oregon coast are well described by Peterson, et al. (2013): "In the northern section of the California Current (NCC), running along the west coast of the U.S.A., seasonal hypoxia events are driven by a combination of relatively low oxygen waters upwelling onto the shelf with further oxygen drawdown stemming from the decomposition of organic matter settling to the seafloor (Chan et al., 2008; Connolly et al., 2010). During the upwelling season (typically mid-April to mid-October), water from 100–150 m depth is transported up onto the shelf and replaces surface waters that move offshore via wind-driven Ekman transport. The upwelled waters are relatively old and tend to be low in oxygen due to extended exposure to water column respiration and isolation from the atmosphere."

According to 15 years of data presented in Peterson, et al. (2013), hypoxia in the Northern California Current is highly seasonal, patchily distributed in both time and space, and can potentially affect over 60% of the continental shelf. Several regions, particularly the wider shelf areas, such as Heceta Bank off Oregon and much of the Washington shelf, are the most prone to early development and persistence of hypoxic bottom waters. Sediment oxygen demand causes the Washington coast to be susceptible to hypoxia and is associated with the broad area of shallow shelf (<60 meters) (Siedlecki, et al., 2015). Low-oxygen conditions result in negative habitat impacts for many organisms (Siedlecki, et al., 2015).

There have been numerous severe hypoxia/anoxia events off the coasts of Oregon and Washington in the last 15 years. For example, in 2002, the Heceta and Stonewall Bank complex experienced unprecedented inner shelf (<70 meter) hypoxia, which resulted in mass die-offs of fish and invertebrates, including Dungeness crab (*Cancer magister*) mortality of >75% in commercial crab pots, compared with the normal 0% (Grantham, et al., 2004). In 2006, the central Oregon coast experienced areas of anoxia, accompanied by the expansion of severe hypoxia across broad sections of the continental shelf. At its peak, hypoxia extended from the shelf break to the inner shelf (<50 meter) and covered at least 3,000 square km off the coast. Hypoxia occupied up to 80% of the water column in shallow (60 meter) shelf waters and continued over the mid to inner-shelf waters from June to October (Chan, et al., 2008).

Although severe hypoxia is a permanent feature of the oxygen minimum zone that intersects the continental slope (>600 meter in this system), there are no previous records of anoxia over the continental shelf or within the oxygen minimum zone (Chan, et al., 2008). Demersal fish and benthic invertebrate communities in these shallow shelf waters have been acutely affected by seasonally persistent anoxia and severe hypoxia. For instance, in August 2006, submersible based surveys revealed the complete absence of all fish from rocky reefs that normally serve as habitats for diverse rockfish (*Sebastes species*) communities. Chan, et al. (2008) also reported near-complete mortality of macroscopic benthic invertebrates (e.g. Dungeness crabs).

The West Coast is one of the first regions in the world to be impacted by ocean acidification, and multiple factors create a confluence of conditions (including ocean currents, coastal upwelling, and winds) that will make ocean acidification’s impacts increasingly severe in the future (Chan, et al., 2016). Since upwelled waters are low in dissolved oxygen, the progression of ocean acidification will be coupled with increasing risk of hypoxic events (Chan, et al., 2016). “OA and hypoxia share a common set of drivers – increased atmospheric CO2 levels and local nutrient and organic carbon inputs. Consequently, OA and hypoxia can be managed synergistically via an overlapping set of management strategies” (Chan, et al., 2016).

The West Coast Ocean Acidification and Hypoxia Science Panel recommends better controls on nutrients and organic matter pollution, since they provide nourishment for algae and bacteria that can trigger hypoxia and exacerbate ocean acidification (Chan, et al., 2016). They recommend that managers reduce local pollutant inputs that exacerbate ocean acidification and hypoxia. “While elevated atmospheric CO2 levels are a major driver of ocean acidification, local discharge of organic carbon and nutrients can exacerbate ocean acidification. Upon discharge, organic carbon is broken down by bacteria, which consume dissolved oxygen during the decomposition process, triggering hypoxic conditions, increasing CO2 levels and lowering pH” (Chan, et al., 2016). Although the Panel’s recommendations are focused on nutrient inputs from land-based sources to semi-enclosed waterbodies, the EPA believes they are still relevant to this permit because: 1) seafood processing waste is high in nutrients and BOD and is a (NPDES “point”) source of organic carbon and nutrients in offshore waters; 2) circulation is sluggish over Heceta and Stonewall Banks and other areas where the continental shelf is wide, and 3) seafood waste could become entrained by eddies or retentive waters.

Although high primary production [from nutrient inputs] produces oxygen at the surface, the system is driven toward hypoxia when the particulate organic carbon sinks and respires into water already low in oxygen (Siedlecki, et al., 2015). Seafood processing waste not consumed at the surface has high biochemical oxygen demand, and could contribute to near-bottom hypoxia off the coast, particularly in wide shelf areas that already experience high sediment oxygen demand. Even if dissolved oxygen has already reached hypoxic levels at the continental shelf break, respiration can further exacerbate hypoxic conditions as bottom water moves shoreward over the shelf, especially if surface organic carbon sources are sizable (Grantham, et al., 2004). Once nutrients sink to the bottom off the Washington and Oregon coast, they stay on the shelf until circulation patterns are strong enough to flush them away (Siedlecki, et al, 2015).

The width of the shallow shelf is the critical factor that controls sediment oxygen demand, probably because proximity of the bottom to the surface allows organic matter to reach the bottom, and sediment oxygen demand is directly proportional to the flux of detritus that sinks to the seafloor (Siedlecki, et al., 2015). Observations of sediment oxygen demand in waters shallower than 70 meters are not available, but biomass is more concentrated near the coast, resulting in more large detrital particles (Siedlecki, et al., 2015). Seafloor oxygen modeling for waters off the Washington and Oregon coasts shows substantial depth dependence, with more sediment oxygen demand in the shallower depths. The larger detritus tends to sink faster, so it reaches the seafloor and respires faster. Generally, more detritus reaches the bed faster in shallower water columns, since there is less area for respiration to occur in the water column (Siedlecki et al., 2015).

The Heceta and Stonewall Bank complex and coastal circulation off central Oregon have been well studied. The central Oregon coast has complex bathymetry; the shelf width increases by a factor of five in the 150 km alongshore, and submarine banks are present over the shelf (Kosro, 2005). Small eddies and interactions with topography modify the currents over Heceta Bank (Kosro, 2005). For a description of the spatial structure of the temperature, salinity, density, and velocity fields during upwelling between the region north of Newport and over Heceta Bank, see Castelao and Barth (2005). It is likely that respiration of enhanced plankton biomass has contributed to hypoxic waters near the bottom in the Heceta Bank area (Wheeler, et al., 2003). According to Barth, et al. (2005), the sinking of organic matter over the Heceta Bank complex, and the subsequent respiration, is probably an important factor in the low-oxygen bottom waters observed there. The Heceta and Stonewall Bank system is also stressed by ocean acidification. Oceanographers interviewed by EPA specifically recommended excluding discharge in the Heceta and Stonewall Bank complex, especially in the quiescent zone where currents are sluggish, and where near-bottom hypoxia is frequently observed during the summer months (Barth, Chan, and Peterson, via separate personal communications, 2016).

4.5.3 Harmful Algal Blooms

Algal blooms are common in aquatic environments. A subcategory of these blooms poses environmental or public health risk, and are therefore referred to as “harmful algal blooms,” or HABs. Some HABs are deleterious because of their sheer biomass, whereas others are associated with algal blooms capable of producing toxins (e.g., the neurotoxin domoic acid). During a HAB event, algal toxins can bioaccumulate up the food web. Animals, including humans, can be exposed to HAB-related toxins when they eat contaminated fish or shellfish, have contact with contaminated water, or inhale contaminated aerosols (Backer and McGillicuddy, 2006).

Harmful algal blooms can cause a number of human health effects, including paralytic shellfish poisoning, neurotoxic shellfish poisoning, and respiratory irritation, diarrhetic shellfish, poisoning, amnesic shellfish poisoning, and cyanobacterial toxin illnesses (Backer and McGillicuddy, 2006). The neurotoxin domoic acid has impacted numerous species along the West Coast since 1991, including razor clams, Dungeness crabs, seabirds, and marine mammals (Trainer et al., 2002 and the references therein). Domoic acid can bioaccumulate via food web transfer from filter-feeding fish and shellfish to birds and mammals (Trainer, et al., 2002).

The Juan de Fuca Eddy (which is located off the Northwest corner of Washington State, in Federal Waters to be covered by this General Permit) is thought to be an initiation site for toxic Pseudo-nitzschia blooms, which can impact the Washington coast (MacFadyen et al., 2008; Trainer, et al., 2002). The Juan de Fuca eddy region is characterized by high phytoplankton biomass (Trainer, et al., 2002). The eddy is seasonal and topographically defined, with typical near-surface eddy radii ranging from ~15 km in the early summer to ~30 km in September (MacFadyen et al., 2008). According to MacFadyen et al. (2008), “The presence of the eddy facilitates large inputs of dissolved inorganic nutrients to the area and thus has a major impact on regional nutrient distributions. Nutrients are supplied to the region through two primary mechanisms: direct upwelling of California Undercurrent water onto the shelf, and enhanced cross-shelf advection of Juan de Fuca Strait outflow. The penetration of Undercurrent source water to increasingly shallow depths throughout the season results in elevated nutrient concentrations over a large portion of the northern Washington shelf.”

Algal blooms can be difficult to identify. HABS have been called “red tides” because many were comprised of red pigmented dinoflagellates, but blooms can also be yellow, green, or brown, depending on the type of algae present (Glibert, et al., 2005). But algal blooms not always visible. According to Zingone and Enevoldsen (2000), the microalgal species that are potentially involved in HABs comprises approximately 80 toxic species and 200 noxious species out of about 4,000 total marine planktonic microalgae that had been described to date. Less than one percent of algal blooms actually produces toxins (http://oceanservice.noaa.gov/facts/habharm.html) and only a handful of Pseudo-nitzschia produce domoic acid. At present, monitoring for the specific domoic acid-producing diatoms provides the only proactive method that permits some early warning that shellfish might become toxic. Unfortunately, P. multiseries, which produces the toxin and P. pungens (which does not produce significant amounts of the toxin) are virtually identical under the standard light microscope. Therefore, a current means to identify the toxic species from non-toxic is by the scanning electron microscope (SEM), a method that magnifies cells about 20,000 times. https://www.nwfsc.noaa.gov/hab/habs_toxins/hab_species/pn/index.cfm. To further complicate matters, there are many places where HAB monitoring and surveillance programs do not exist.

SECTION 5.0

EFFECTS ANALYSIS

This section describes the potential impacts of discharges from offshore seafood processing in Federal Waters off the coast of Washington and Oregon as per the Draft Permit. Figure 5.1 illustrates the general components considered as part of the effects analysis. The focus is on water quality and impacts to threatened and endangered species (TES) and their critical habitat because these resources are among the most vulnerable in the action area.

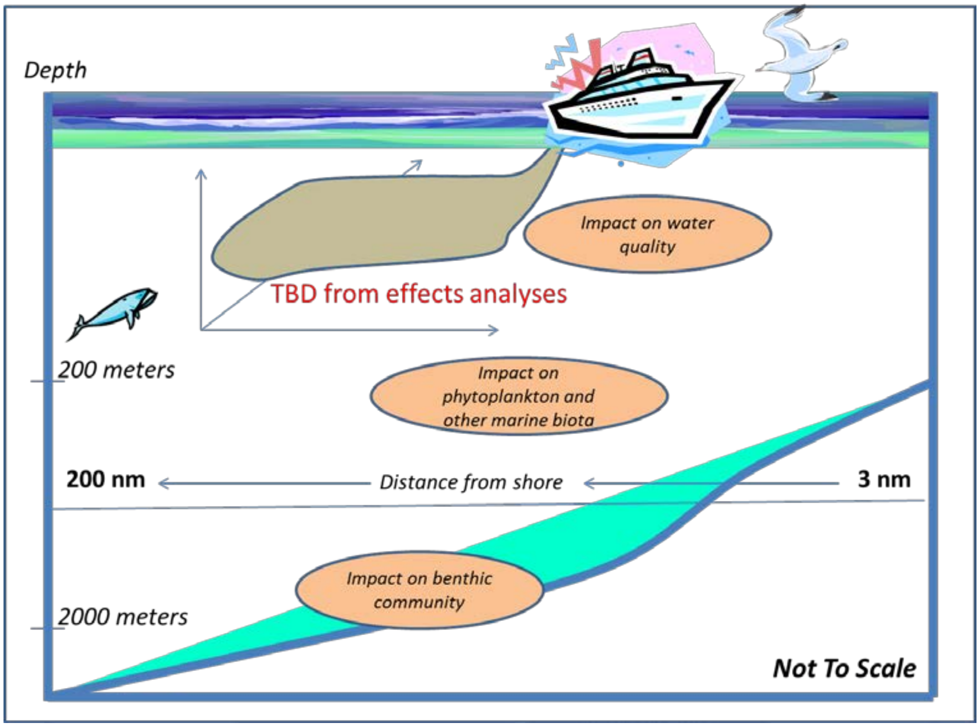


Figure 5.1 Schematic of Components of Effect Analysis

The major constituents of seafood processing wastes are blood, tissue, liquids, meat, viscera, oil and grease, shells, and bones. Except for the bones and shells, which are highly biodegradable, the wastes are primarily organic matter. Major pollutants consist of BOD, solids (sediments and residues), oil and grease, and nutrients. These major pollutants are all considered conventional and of a non-toxic nature.

Potential adverse impacts on receiving water quality resulting from seafood processor wastes include (1) reduction in water column dissolved oxygen due to the decay of particulate and soluble waste matter; (2) the release of toxic levels of sulfide and ammonia from decaying waste; (3) nutrient enrichment and stimulation of phytoplankton growth and alteration of the phytoplankton community; and (4) the accumulation of waste solids and fish oils on the water surface, and the bottom. All of these potential water quality impacts may subsequently affect the biological communities present in the area of the discharge.

In general, impacts of seafood processing wastes on receiving water quality are inversely related to the assimilative properties of the receiving waters. Offshore waters within the action area have strong currents, assimilation is high, waste materials disperse rapidly, and there is likely to be little impact on water quality (USEPA, 1994a).

In addition, as described in the Fact Sheet and above, in order to avoid triggering or exacerbating hypoxic conditions because of additional nutrient inputs from seafood processing waste, the EPA proposes to prohibit the discharge of seafood processing waste in waters shallower than 100 meters in depth during April 15 - October 15 to avoid exacerbating seasonal hypoxia at the seafloor. Heceta Bank and the broad Washington shelf region (e.g. offshore of Grays Harbor at 46 N–47 N) are known ‘‘hot spots’’ of organic matter respiration (Siedlecki, et al., 2015 and the references therein). A depth-based discharge exclusion zone will help to protect the wider shelf areas, where both detrital concentrations and sediment oxygen demand are high (Siedlecki, et al., 2015). The wide shelf areas off the Washington and Oregon coasts are already stressed by ocean acidification and hypoxia, both of which are projected to increase as the global climate continues to change. The EPA also proposes to prohibit discharge (year-round) over the Heceta/Stonewall bank complex, which is especially prone to hypoxia. See Figure 2.3.3c.

In light of the strong ocean currents, high assimilative capacity of the open ocean, and the proposed seasonal and year-round discharge prohibitions in shallow and rocky reef areas, the EPA believes that discharges associated with the proposed General Permit are unlikely to significantly affect water quality or dissolved oxygen levels in the water column or at the seafloor.

5.1 IMPACTS ASSOCIATED WITH SOLID SEAFOOD PROCESS WASTES

During discharge of seafood processing waste, biological impacts are most likely to occur as a result of the discharge of particulates (both direct and indirect effects). The following discussion presents the different potential effects of discharges on biota including burial and habitat modification, the alteration of sediment composition, and the chemistry associated with the decomposition of the waste solids.

5.1.1 Burial and Habitat Modification

Settling of seafood discharges on the seafloor occurs at varying rates according to the size of the particles, volume of waste and dispersion of the waste stream. If particles eventually settle together, an organic mat or waste pile can form that may smother the underlying substrate and benthic communities within it. The degradation of this organic material occurs at varying rates according to different characteristics of the discharge area (i.e. biological, physical, and chemical factors).

Depending on the depth of burial, deposits can make the substrate inhospitable, or influence the species composition favoring opportunistic organisms that may out-compete the normal fauna. Algal blooms caused by high nitrogen concentrations can also alter habitat by smothering benthic substrates when they die, and by reducing the available water column or surface aquatic habitat for visual predators. Deposition could potentially reduce and possibly eliminate abundances of infaunal benthos such as polychaetes, mollusks, and crustaceans, and may affect demersal eggs of various benthic species including fish. Seafood processing waste solids are highly organic material and the decomposition of this material may lead to other impacts on benthos related to localized depression of dissolved oxygen.

Facilities discharging under the Draft Permit should not create piles nor mats of organic waste, and any potential accumulation should be less than 0.2 in (0.5 cm), according to the numerical analysis calculated in the Ocean Discharge Criteria Evaluation (USEPA, 2015). Discharges covered under the Draft Permit are for offshore vessels that are constantly moving and discharging in depths usually greater than 210 ft. In addition, permittees will be required to be underway while discharging, unless doing so will compromise vessel safety. Flushing in the action area is high, which will disperse seafood processing wastes. Discharges in compliance with the Draft Permit should have minimal effects on aquatic biota, especially in light of the seasonal discharge prohibition in waters shallower than 100 meters, and the year-round discharge prohibition above ecologically important rocky reefs (i.e., Heceta/Stonewall Banks).

5.1.2 Altered Sediment

Alteration of sediment characteristics is expected to impact the benthic community structure more subtly, but at greater distances from the point of discharge, than smothering. Benthos would be the group of organisms most affected by changes in the sediment, but other organisms may be affected as well, such as epibenthic and pelagic vertebrates (i.e., fish, turtles, birds, and mammals) that rely on benthic invertebrates for food.

The general changes in benthic community structure and function that occur under conditions of increasing organic enrichment of the sediments (such as occurs as a result of stationary seafood processing waste discharges or municipal sewage effluent discharges) have been well documented (Pearson and Rosenberg, 1978; Germano & Associates, 2004). Slight to moderate enrichment results in slight increases in numbers of individuals and biomass of benthic communities, while species composition remains essentially unchanged. As enrichment increases, the overall abundance of benthic organisms increases. However, there is a corresponding decrease in the number of species as the less tolerant species are eliminated. In more extreme cases, only a relatively small number of species adapt to disturbed environments and/or high organic content become very abundant. When the enrichment levels are optimal for those few species, they become extremely abundant, and overwhelmingly dominate the benthic community. Biomass generally decreases as many of these opportunistic species are very small.

These changes in benthic community variables are accompanied by a progressive reduction in the depth of the oxygenated surficial sediment layer, and changes in the predominant trophic groups of benthic organisms. Mixed assemblages, or assemblages dominated by suspension feeders, are first replaced by assemblages dominated by surface deposit feeders, and then replaced by assemblages dominated by subsurface deposit feeders. Under very highly enriched conditions, the sediments become anoxic and macrobenthic organisms may be entirely absent.

Discharges covered under the Draft Permit are for offshore processing vessels discharging in areas of good flushing, which will rapidly disperse seafood processing wastes and significantly limit any accumulation of solids on the seafloor, according to the numerical analysis calculated in the Ocean Discharge Criteria Evaluation (USEPA. 2015). Discharges covered under the Draft Permit are for offshore discharging in depths usually greater than 210 ft. In addition, permittees will be required to be moving while discharging, unless doing so will compromise vessel safety. Discharges in compliance with the Draft Permit should have minimal effects on aquatic biota, especially in light of the seasonal discharge prohibition in waters shallower than 100 meters, and the year-round discharge prohibition above ecologically important rocky reefs. Therefore, discharges in compliance with the Draft Permit should have minimal effect on sediment alterations.

5.1.3 Decay of Process Waste

As noted above, the decay of organic matter accumulations can affect chemical changes within the sediments and may lead to anoxic conditions within a waste pile. The decay of solid waste accumulations may also result in depletion of dissolved oxygen in the overlying water column and releases of potentially toxic decay byproducts like unionized ammonia and undissociated hydrogen sulfide. Again, benthic communities and demersal eggs would be directly adversely affected by anoxic conditions within the waste pile. Most infauna would either migrate out of the area or be killed as a result of the lack of oxygen. Anoxic conditions are expected to destroy any demersal eggs that might be present. A few species may be able to survive within the thin upper sediment layer of the waste pile (e.g., Capirella spp.).

Since ambient waters containing abundant dissolved oxygen rapidly mix with the affected waters, reductions of dissolved oxygen concentrations throughout the overlaying water column are not expected, nor are significant impacts to mobile marine organisms. Any areas of reduced dissolved oxygen above a waste accumulation would be expected to be small and would be avoided or quickly passed through by mobile organisms.

Indirect impacts could occur with respect to ecosystem interrelationships resulting from behavioral changes, but these would be difficult to observe and correlate with seafood processing waste disposal. For example, altered sediment composition may inhibit larval recruitment or feeding and survival of individual benthic species in some areas, resulting in subtle changes in species composition.

Discharges covered under the Draft Permit are for offshore vessels discharging in depths usually greater than 210 ft. In addition, permittees will be required to be moving while discharging, unless doing so will compromise vessel safety. Flushing in the action area is high, which will disperse seafood processing wastes. Discharges in compliance with the Draft Permit should have minimal effects on aquatic biota, especially in light of the seasonal discharge prohibition in waters shallower than 100 meters, and the year-round discharge prohibition above the Heceta/Stonewall Banks complex.

5.1.4 Cumulative Impacts of Solids Deposition

Impacts from any individual seafood processing facility discharging in compliance with the requirements of the Draft Permit are likely to be localized, although benthic organisms could potentially be smothered or community composition altered in localized areas. These potential effects should be minimal, as processing vessels are constantly moving and discharging in depths usually greater than 210 ft. In addition, permittees will be required to be moving while discharging, unless doing so will compromise vessel safety. Flushing in the action area is high, which will disperse seafood processing wastes. Discharges in compliance with the Draft Permit should have minimal effects on aquatic biota, especially in light of the proposed seasonal discharge prohibition in waters shallower than 100 meters, and the proposed year-round discharge prohibition the Heceta/Stonewall Bank complex. Therefore, the benthic communities in the action area would not be expected to be significantly impacted.

Impacts from toxicity due to anoxic conditions and changes in benthic community structure could occur, but should be limited as disposal of seafood processing wastes in areas of good flushing should disperse wastes and minimize the potential for any waste accumulation. Although a more thorough study would be of value in assessing the magnitude and significance of cumulative environmental impact, available data indicate that unreasonable degradation is not likely to occur in areas of adequate dispersion and dilution (e.g., USEPA 1984a and Germano & Associates, 2004). As stated previously, the mobile offshore discharges proposed by the Draft Permit would be expected to be in deep, high flushing tidal areas with adequate dispersion and dilution where the seafood discharges are not expected to accumulate and effects should be minimal.

5.1.5 Indirect Effects through Food Supply Reduction

The quantity of benthic organisms preyed upon by other species could be reduced in the area of the discharge if benthic organisms migrate from the area, or experience increased mortality or decreased recruitment, through smothering, toxicity, or alteration of sediment grain size characteristics. Issues affecting temporal or spatial extent of such impacts are discussed by Muellenhoff (1985). Processors covered by the Draft Permit discharge wastes in areas that are usually at least 210 feet deep with rapid dispersion and high flushing to minimize accumulation of seafood processing wastes on the seafloor, minimizing the potential for smothering or toxicity to benthos. In addition, Permittees will provide seafood nutrients back into the ecosystem in the form of their discharge. Thus, the degree of food supply reduction caused by discharges of seafood processing waste should be minimal.

5.2 EXPOSURE TO SUSPENDED SOLIDS

Within the action area, zooplankton and fish larvae near the discharge may experience temporary effects including altered respiratory or feeding ability due to stress, or clogging of gills and feeding apparatus. Phytoplankton entrained in the discharge plume may reduce productivity due to decreased light availability. However, such potential impacts may be offset in the far field by increases in nutrient concentrations. These impacts should result in negligible impacts to populations in the region, as impacts should be restricted to the immediate vicinity of the discharge. Mobile invertebrates, fish, birds, and mammals presumably will avoid the discharge plume if conditions become stressful. However, biota may also be attracted to the discharge plume to feed on the discharged particulates. Secondary impacts associated with attraction are discussed in Section 5.4. Infaunal or sessile organisms near the discharge are not likely to be impacted by the suspended solids/smothering since the vessels will be moving while discharging, and the EPA proposes to prohibit discharge year-round over the Heceta/Stonewall Bank rocky reef complex.

In addition to potential chemical and physical alterations of the water column and benthos, seafood processing residues can cause some aesthetic and physical effects on the water surface that could impair existing or designated uses. In addition, seafood processing residues can form a surface layer of scum, foam, or fine particles that could present a physical barrier preventing dissolved oxygen re-aeration, block light to the water column, deter avian feeding, and create an aesthetically undesirable condition. Such effects could also attract nuisance species and unwanted predators that would impair beneficial uses. The Draft Permit proposes to prohibit facilities from discharging wastewaters that contain substances that float as debris, scum, oil, or other matter to form nuisances. The Draft Permit also prohibits the discharge of seafood processing wastes that create an attractive nuisance situation whereby fish or wildlife are attracted to waste disposal or storage areas in a manner that creates a threat to fish or wildlife or to human health and safety. See Section 2.3.8 for a discussion of Draft Permit provisions to avoid impacts to seabirds. If an operator complies with the Draft Permit conditions, these prohibitions would limit such concerns under normal operating conditions.

5.3 LIQUID SEAFOOD PROCESSING WASTES

Liquid seafood processing discharges include two waste streams, one directly associated with the seafood waste and the other associated with ancillary operations whose wastewaters do not come in contact with seafood waste. The seafood processing discharges contain solid and soluble materials that include soluble oxygen demanding substances (i.e., BOD), nutrients, and oil and grease. These discharges may also contain disinfectants, including ammonia and chlorine, which may produce direct toxic effects. Liquid discharges that are not directly associated with seafood processing activity and that do not come into direct contact with seafood waste (e.g., bailwater, cooling water, boiler water, etc.) are generally not expected to impact marine organisms because they are considered to be non-toxic, do not contain significant amounts of oxygen demanding substances and nutrients, or in the case of soluble sanitary wastes, are treated prior to discharge. The potential impacts to marine organisms due to the discharge of substances with elevated BOD, nutrients, and disinfectants are discussed below. Chemicals that are considered bioaccumulative or persistent are not known to be present in seafood processing waste discharges.

5.3.1 Dissolved Oxygen / Biochemical Oxygen Demand

DO is a key element in water that is necessary to support aquatic life. DO is depleted during the breakdown of “oxygen-demanding” substances such as organic matter and ammonia. These substances are usually destroyed or converted to other compounds by bacteria if there is sufficient oxygen present in the water; however, DO needed to sustain fish life may be consumed in this breakdown process.

DO depletion caused by decomposition of organic matter or nitrification of ammonia is sometimes measured as BOD. BOD is a measure of the amount of oxygen consumed by the respiration of microorganisms while feeding on decomposing organic material. Organic seafood processing wastes can exert a large BOD in receiving waters. The impact of BOD on water quality is particularly influenced by the dispersive capacities of the receiving water. In areas of low flushing, BOD from seafood processing effluent may depress DO to unacceptable levels (Ahumada et al., 2004). In areas of relatively low ambient dissolved oxygen concentrations resulting from natural processes (i.e., the hypoxia zones), the potential for adverse effects on marine organisms is increased. Conversely, studies have found little impact of BOD in areas with highly dynamic water regimes (Gates et al., 1985).

Discharges in compliance with the Draft Permit should have minimal effects on DO, especially in light of the proposed seasonal discharge prohibition in waters shallower than 100 meters, and the proposed year-round discharge prohibition above the Heceta/Stonewall Bank complex (which is known to be sluggish and retentive). See hypoxia discussion in Section 4.5.2 and Figures 2.3.3b and 2.3.3c, above, for more detail on how the Draft Permit addresses concerns regarding hypoxia at the seafloor.

5.3.2 Nutrients and Dissolved Oxygen

Excessive nutrients can cause a multitude of problems in coastal areas including eutrophication, harmful algal blooms, fish kills, shellfish poisonings, loss of seagrass and kelp beds, coral reef destruction, and reduced DO. Nitrogen, a common pollutant found in seafood processing waste, is known to be particularly damaging to bays and coastal seas by boosting primary production (the production of algae). With excessive amounts of nitrogen, the growth of algae and denitrifying bacteria increases making the water more turbid. As the algae die and decompose, dissolved oxygen is depleted from the surrounding water if there is insufficient mixing or other re-aeration mechanisms present (Howarth et al., 2000; Novatec, 1994). High levels of living algae can also lead to depletions in oxygen over the nighttime hours due to their oxygen consumption during this time period. Low dissolved oxygen levels can cause direct mortality of organisms, or reduced efficiency of physiological processes (e.g. food processing, growth). These changes in nutrients, light, and oxygen, favor some species over others causing shifts in phytoplankton, zooplankton, and benthic communities (Howarth et al., 2000). In particular, animals that rely directly or indirectly on seagrass beds could be affected by algal blooms caused by excessive nutrients.

Unlike solid residues, nutrients are water soluble and can therefore be transported beyond areas of heavy deposition unless assimilated by aquatic life, sorbed to sediments, or released to the atmosphere (denitrification and volatilization of nitrogen). Insufficient dilution or mixing of transported nutrients could conceivably affect other locations. There have been no analyses of nutrient enrichment impacts from seafood processing waste on the WA/OR coastal waters.

The discharges proposed by the Draft Permit are from constantly moving vessels in areas of good flushing, and good dilution as evaluated in the numerical analysis in the Ocean Discharge Criteria Evaluation (USEPA. 2015), reducing the likelihood of accumulating excess amounts of nutrients and adversely effecting water quality. Discharges in compliance with the Draft Permit should have minimal effects on DO, especially in light of the proposed seasonal discharge prohibition in waters shallower than 100 meters, and the proposed year-round discharge prohibition above the Heceta/Stonewall Bank complex (which is known to be sluggish and retentive). See hypoxia discussion in Section 4.5.2 and Figures 2.3.3b and 2.3.3c, above, for more detail on how the Draft Permit addresses concerns regarding hypoxia at the seafloor.

5.3.3 Enhanced Productivity

Because phytoplankton form the base of the food chain, impacts to the phytoplankton community could have significant effects on the marine ecosystem as a whole (Legendre, 1990). Although enhanced phytoplankton growth would not necessarily be an adverse effect since phytoplankton form the base of the marine food chain, a large increase in phytoplankton standing crop or changes in species composition, particularly to toxic species, could have adverse effects on DO concentrations, aesthetic water quality, other marine organisms, and humans.

Several factors control the rate of phytoplankton productivity and the accumulation of algal biomass. These include temperature, light intensity, mixing depth, and the supply of other nutrients such as nitrogen, phosphorus, silica, and a number of other essential elements (e.g., iron, manganese, zinc, copper, and cobalt). Other factors influencing phytoplankton productivity and biomass that are still poorly understood include inhibitory and stimulatory substances such as vitamin B_{12} and chelating agents (United Nations, 1990). Factors influencing changes in phytoplankton community composition are also poorly understood, but are generally related to adaptations of certain species to specific combinations of the factors identified above. For example, diatoms (a group of marine and freshwater algae) appear to be favored when available nutrient concentrations (especially silica) are high and turbulent water column mixing is adequate to maintain these algae in the upper water column layer where light is available. An additional factor that controls the biomass and species composition of phytoplankton is the grazing activity of zooplankton that may feed selectively on certain species of phytoplankton.

The potential for adverse impacts of nutrient discharges from seafood processing facilities would depend on whether the amount of nitrogen or phosphorus available limit phytoplankton growth in the vicinity of the discharge, or if other influencing factors contained in the waste discharge could significantly influence phytoplankton production. Other relevant factors to consider include water exchange, mixing depth, zooplankton grazing activity, and the depth of light penetration in the water column. These variables make it difficult to predict the potential impact of nutrient rich waste discharges from seafood processors on marine phytoplankton communities. However, impacts are most likely to occur in relatively shallow areas of restricted water circulation where nitrogen or phosphorus limitation of phytoplankton growth occurs. EPA proposes to prohibit discharge in waters shallower than 100 meters during the summer upwelling season (April 15 – October 15), and to prohibit discharge year-round over the Heceta/Stonewall Bank complex. Therefore, discharge will only be to well-flushed open ocean areas, which have lower potential to cause enhanced phytoplankton growth and biomass.

5.3.4 Alterations in Phytoplankton Species Composition / Toxic Phytoplankton

Alterations in phytoplankton species composition is another potential impact of nutrient rich discharges on marine phytoplankton. Concerns regarding alterations in the phytoplankton community composition are related to indirect effects resulting from increasing the populations of phytoplankton species that may produce adverse effects on marine organisms and humans. Effects produced by some phytoplankton species include physical damage to marine organisms (e.g., diatom species of *Chaetoceros* that have caused mortality of penned salmon), toxic effects to marine organisms (e.g., a raphidophyte flagellate species of *Hererosigma*), and toxic effects to humans due to the concentration of algal toxins in marine fish and shellfish (e.g., Paralytic Shellfish Poisoning (PSP), Diarrheic Shellfish Poisoning (DSP), Neurotoxic Shellfish Poisoning (NSP), Amnesic Shellfish Poisoning (ASP), and ciguatera) (Taylor, 1990; Haigh and Taylor, 1990).

The west coast of the USA, including Oregon and Washington, has experienced a marked increase in phytoplankton blooms, harmful and benign, over the last 10 to 15 years (Tweddle et al., 2010). Blooms of species belonging to the diatom genus *Pseudo-nitzschia* Peragallo, which contains many producers of the toxin domoic acid, have been repeatedly documented along the Pacific coast of the USA. In Oregon and Washington, domoic acid was first detected in1991, following seabird deaths in California, which led to the closing of shellfish and crab fisheries in November of that year (Wood et al., 1993). Phycotoxins such as domoic acid can enter the food chain through consumption of toxic algae by, for example, zooplankton and filter-feeding organisms such as mussels. In 1998, California sea lions were killed by domoic acid poisoning (Scholin et al., 2000), and high levels of domoic acid were subsequently found in Washington razor clams (Adams et al., 2000). In recent years, particularly 2003, 2004, and 2005, domoic acid contamination has resulted in spatially large and prolonged closures of Oregon razor clam and mussel beds to harvesting (Tweddle et al., 2010).

Although there is a potential for the discharge of seafood processing waste to cause localized changes in phytoplankton species composition, there are no known studies to verify that discharges of seafood processing wastes have produced toxic or harmful phytoplankton blooms. The discharges authorized by the Draft Permit are at least 3 nm from shore, and the proposed permit prohibits discharge in waters shallower than 100 meters during April 15 – October 15. The EPA also proposes to prohibit discharge year-round over the Heceta/Stonewall Banks complex, which is a hotspot for harmful algal blooms on the west coast. While PSP has been documented in Washington and Oregon, there is currently no evidence suggesting a linkage with seafood processing discharges.

5.3.5 Impacts of Disinfectants/Residual Chlorine

Soluble wastes from seafood processing discharges may contain residual concentrations of chlorine-based disinfectants. Residual chlorine and chlorine-produced oxidants have been shown to be toxic to marine organisms at relatively low concentrations (USEPA, 2002; Thatcher, 1978). Thatcher (1978) conducted 96-hr LC_{50} continuous-flow bioassays on a number of species of fishes and invertebrates typical of the Pacific Northwest and determined that juvenile species of salmon were particularly sensitive. The lowest LC_{50} determined for coho salmon was 32 µg/L.

The Draft Permit does not include a chlorine limit, but does require the development of a best management practice (BMP) Plan. The BMP Plan specifically requires that Permittees include measures to minimize the use of toxic disinfectants where applicable. Chlorine dissipates rapidly and would not be expected to degrade the receiving water quality in the open ocean.

5.4 SECONDARY IMPACTS DUE TO SEAFOOD PROCESSING WASTES

Potential secondary impacts of seafood processing waste discharges involve effects on marine mammals and birds due to their attraction to seafood processing waste discharges. Additionally, bacteria associated with the decaying seafood processing waste may adversely impact marine mammals and birds. The potential indirect impacts resulting from eutrophication or excessive nutrients in marine waters have been previously discussed in Section 5.3.

5.4.1 Attraction of Organisms to the Discharge

The attraction of marine mammals to seafood processing waste discharges can create several potential issues for marine fauna. Attraction to waste can influence predator/prey relationships. Loughlin and York (2000) cited that discharges from offshore seafood processing facilities attract both Steller sea lions and killer whales, resulting in increased predation above natural levels, although actual increases in mortality has not been accurately quantified. Seafood waste discharges can increase localized populations of gulls and parasitic birds, which may adversely affect the breeding success of some bird species. Similarly, Reed and Flint (2007) cite the correlation of eiders attracted to an area with seafood processing with increased predation by eagles. Another potential secondary impact involves the development of dependence on an anthropogenic food supply that may result in the concentration and growth of populations of marine mammal and birds that could be adversely affected with a reduction or elimination of this food supply.

Birds that are attracted to surface plumes of seafood waste (especially floating particulates) may potentially become oiled or their feathers fouled if there is an accumulation of waste fish oils on the water surface. Unless the volume of floating oils was significant and the birds were constantly diving through it, it is unlikely that fouling of the feathers would occur, especially in light of the Draft Permit requirement to be moving during discharge (in order to increase dilution).

A significant issue with bird attraction to commercial fishing operations is encounters with the fishing gear. Seabirds can be killed in trawl fisheries when they become entangled in cables and nets (BirdLife International 2008). The frequency and severity of cable strikes is a function of a variety of operational and physical factors (Sullivan et al., 2006a, b). The FWS states in their first 5-year review (USFWS 2009) that seabirds attracted to offal and discards from trawl vessels may strike cables while they fly about, presumably in search of offal. They may also get pinned against any wire or cable by hydrostatic pressure and forced underwater if the cable comes upon them as they sit on the water. Third wire cable strikes can occur at particularly high rates when the third wire enters the water within or near the offal plume emanating from a vessel. This is especially likely to occur when a vessel changes course while towing gear or when cables are towed through plumes of offal. A short-tailed albatross was killed in the longline fisheries of the Oregon coast in 2011 (Fish and Wildlife Service 2014).

Although it is the actual fishing process and gear that can injure or kill birds, the discharge of offal, even minced offal, has been shown to act as an attractant. The offal draws birds to the area where they both exposed to the fishing gear, or where they are further attracted to the fishing activity, which can also result in injury from the gear. The influence of offal as an attractant has been recognized in trawl fishing around the world for some time. In an Antarctic scientific trawling study, Santora et al. (2009) found that the presence of discards coincided with an increase in numbers of Black-browed albatrosses and cape petrels. Vessel trawl activity alone (no discharge) was not correlated to seabird attendance. A seabird observational study of the Falkland Islands demersal trawl fishery found significant mortalities associated with trawler operation (Sullivan et al., 2006b). This extensive study (157 operation days) found that all bird mortalities occurred during times of offal discharge. In a study of seabird attendance in the

Alaskan groundfish fishery, bird observations occurred only during times when offal was being discharged (i.e., when potential food was available) (Zador and Fitzgerald 2008). Wienecke and Robertson (2002) found wildlife-fisheries interactions with the Australian patagonian toothfish trawler operations were rare. Minimal interactions were attributed to fisheries management requirements including controls on discharge (i.e., meal plant discharge only, discharging at night, and leaving the fishing grounds to discharge). Similar conclusions on seabird attraction to discards and that the form of discards influences attraction have been reached by other researchers (Furness et al., 2007, Pierre et al., 2010).

As stated in the FWS Biological Opinion for the Alaskan fishery (2015), in the pelagic trawl fleet, discards vary greatly with the largest of catcher processor operating fish meal plants that result in little discard, to other vessels that discard whole fish or a macerated offal (Zador and Fitzgerald 2008, Melvin et al., 2011). Seabird attraction to vessels varies based on the many factors, including the type, form, and amount of discard as well as other environmental factors such as time of year (Zador and Fitzgerald 2008). Abrahams et al. (2009) compared three treatments of New Zealand trawler offal discharge to assess effectiveness of reducing seabird attraction (attendance): 1) ‘unprocessed’ waste (fish offal and whole discards), (2) minced small particle size, and 3) fishmeal processing waste discharged as sump water. They found mince discharge reduced the numbers of large albatrosses (Diomedea spp.) but had no significant effect on other groups of seabirds. In contrast, reducing discharge to sump water resulted in a significant reduction attendance numbers of all groups of seabirds, including the small albatross group (mostly Thalassarche spp.). Melvin et al. (2011) compared two catcher-processors in the Bering Sea walleye pollock fishery, one that processed fish oil and meal (minimal discharge) and one that discharged minced offal. Bird attendance was significantly higher at the vessel that discharged minced offal. Their findings were consistent with Abrahams et al. (2009), in that mincing of the offal had no effect but discharge of rendering offal reduced the number of individuals of all seabird species including ones that are similar in size to the North Pacific albatrosses.

As stated in a September 29, 2015 letter to the EPA from the USFWS, additional species may be attracted to lights used in nighttime operations of fisher-processors, such as fork-tailed and Leach's storm-petrels. These photo-tactic seabirds are attracted to light and may become stunned and exhausted from circling lights. To reduce these effects, the EPA has proposed a requirement that lights used during night operations should be minimized as much as possible and directed downward. In addition, crews should be educated on correct handling and release protocols should storm-petrels become stranded on fisher-processors.

5.5 SUMMARY

The potential adverse effects of seafood processing waste include direct and indirect impacts of the solid and liquid waste discharges to marine organisms. Potential direct impacts of solid waste discharges, including burial of benthic communities, alteration of sediments, and other associated issues with the accumulation of waste on the seafloor are highly unlikely, especially since the EPA proposes to prohibit discharge in waters shallower than 100 meters during the April 15 – October 15 summer upwelling season. The Draft Permit requirement that discharges be located in areas of high current activity (and a year-round discharge prohibition over the Heceta/Stonewall Bank complex) should minimize the potential accumulation of seafood processing wastes. Discharges of ground seafood waste that comply with Draft Permit requirements and limitations are not expected to cause adverse effects on marine organisms.

Eutrophication of marine waters may indirectly result in enhancement of phytoplankton species that are toxic to marine organisms and humans. Eutrophication of coastal marine waters is not expected to occur in offshore locations where water exchange is adequate to dilute nutrient inputs from seafood processing waste discharges, in part because the EPA is proposing a requirement that vessels be underway during discharge. Although toxic phytoplankton species occur in marine waters of Washington and Oregon, there is no known evidence to date to establish a link between the occurrence of toxic phytoplankton and seafood processing waste discharges.

Residual concentrations of chlorine disinfectants in the liquid waste stream, and additional oxidants produced by the reactions of chlorine with other compounds, are expected to be low due to the nature of the treated discharge, amount of dilution, and rapid dispersion. Each vessel must address disinfectant use as a part their BMP plans to minimize disinfectant use to extent practicable.

The attraction of marine mammals and birds to seafood processing waste discharges has the potential to create indirect impacts. It is anticipated that restrictions and limitations included in the Draft Permit will diminish these types of potential impacts. As explained above, in order to reduce seabird interaction with the discharge, the EPA took the initiative to work with the USFWS and with seabird/short-tailed albatross experts, and developed provisions described in Section 2.3.8.

Eutrophication of marine waters may also indirectly result in enhancement of phytoplankton species that are toxic to marine organisms and humans. Although toxic phytoplankton species occur in marine waters of Washington and Oregon, there is no evidence to date to establish a link between the occurrence of toxic phytoplankton and seafood processing waste discharges (Trainer, personal communication, 2016).

5.6 THREATENED AND ENDANGERED SPECIES

As discussed in Section 5.1, discharges of seafood processing wastes can have an adverse effect on water quality. These water quality impacts can, in turn, impact biological communities including threatened and endangered (T&E) species. Potential effects to T&E species and effects to critical habitat are discussed in the following sections to assist in determining the effect for each listed species.

According to a December 18, 2015 letter from the NMFS to the EPA in response to the EPA's August 2015 BE for this Draft Permit:

"Discharges will occur in the open ocean, where no individuals from the listed ESUs of Bocaccio, yelloweye rockfish, canary rockfish occur, therefore they will not be affected by the proposed action. The EPA's permit indicates that the ocean discharges will occur in areas where significant dispersal of effluent will occur through tidal and wave action, with dispersal further these factors will largely avoid deep layering or matting of effluent materials on the ocean bottom that could otherwise modify benthic conditions, dissolved oxygen, and biotic communities. These same factors are also considered largely effective at dispersal of effluent in the water column. Wind and currents are also expected to disperse those components that remain afloat on the sea surface. Effluent and floating materials, if not sufficiently dispersed, could induce algal growth from the increased nutrients, and create episodes of low dissolved oxygen at the benthic interface as the materials decay. Shifts in algal conditions, phytoplankton abundance, and dissolved oxygen creating hypoxic areas can each yield indirect effects on food

web production. These effects, as associated with the action, will be ephemeral and localized and are not expected to be of the magnitude to diminish prey resources. For this reason, we consider these effects to be insignificant.

Vessel operation during seafood processing is an activity associated with this permit. EPA indicates that during fish processing and discharge, vessels will be in motion at a range of 3-18 knots. Vessel movement poses a potential risk of ship strike among whales, but the issuance of the NPDES permit will not increase the number of operating vessels, the discharge is unlikely to function as an attractant to the listed whales, the discharge is unlikely to alter prey composition for whales, and vessel speeds during discharge are sufficiently slow to allow whales to avoid strike if they happen to co-occur within vessel operation areas. For these reasons, effects on these marine mammals are discountable.

In conclusion, because: 1) the effluent is mostly composed of readily decomposable and consumable fish byproducts and water; 2) the project impact is largely limited to the short duration diminishment of water quality as outlined in the preceding paragraph; and 3) all of the ESA-listed species that are likely to encounter these conditions are highly mobile and can avoid the effluent plumes, ***we concur with the EPA's effect determination that the proposed action is Not Likely to Adversely affect the 21 species*** *listed in Table 1"* (emphasis added).

In a September 29, 2015 letter to the EPA from the USFWS, the USFWS indicated that did not concur with the EPA's determination that the Draft Permit is not likely to adversely affect the marbled murrelet and short-tailed albatross. Since 2015, the EPA has made significant improvements to the revised Draft Permit. Effects of the Pacific whiting trawl fleet were also considered in the May 2, 2017 Biological Opinion on the Pacific coast groundfish fishery, and the RPM and subsequent terms and conditions specifically addressed offal management techniques and interaction with trawl cables (USFWS, 2017). The EPA proposes to incorporate the terms and conditions of RPM 2 into this General Permit in order to be consistent with the Biological Opinion. The Biological Opinion included an Incidental Take Statement, and found that continued operation of the Pacific groundfish fishery (which includes the vessels to be covered under this NPDES General Permit) would not result in jeopardy to the short-tailed albatross.

In light of these factors, the EPA has determined that approval of the Draft Permit is ***not likely to adversely affect the short-tailed albatross.*** See Sections 5.6.23 and 5.6.24, below. As of the date of this revised BE, ESA consultation with the USFWS is ongoing.

The USFWS also expressed concern about several species of migratory birds that are attracted to fishing boats and processing vessels, including black-footed albatross *(Phoebastria nigripes*), pink-footed shearwater (*Puffinus creatopus*), sooty shearwater *(Puffinus griseus),* and flesh-footed shearwater (*Puffinus carneipes).* The black-footed albatross and pink-footed shearwater are USFWS Birds of Conservation Concern (BCCs) and represent the highest conservation priorities for the Service. As stated above, the Permit's jurisdiction does not include seabird nesting habitat or National Wildlife Refuge Islands.

5.6.1 Guadalupe Fur Seal

Guadalupe fur seals usually reside in tropical waters of the Southern California/Mexico region. Critical habitat has not been designated. Although a few seals have been seen in the Pacific Northwest, they are considered non-migratory and their breeding grounds are almost entirely on Guadalupe Island, Mexico.

While Guadalupe fur seals may occasionally venture into the offshore waters off of Washington and Oregon, neither their center of abundance, nor their primary habitat occurs in the action area. Since it is expected there would be little, if any, overlap with offshore seafood processors, the EPA has determined that the Draft Permit will have **no effect** on the Guadalupe fur seal. On December 18, 2015, the EPA received a letter of concurrence from the NMFS. The NMFS concurred with the EPA that the proposed action is not likely to adversely affect the ESA-listed fish, marine mammals, and turtles under the NMFS' jurisdiction.

5.6.2 Blue Whale

Blue Whales are found in offshore waters throughout oceans worldwide, including the action area, however, no critical habitat is designated.

Since blue whale are highly mobile and, therefore, able to avoid discharge areas, direct impacts from localized seafood processing discharge plumes, or potential ship strikes on individual animals is greatly reduced. Some temporary disturbance of whale activities may occur, due to increases in vessel traffic and noise.

The blue whale does not rely on phytoplankton as a food source. Therefore, the effects of seafood processing waste discharge on phytoplankton community abundance and structure, would only have indirect impacts on these marine mammals. If zooplankton abundance is affected indirectly by changes in the phytoplankton community or directly by the discharge itself, blue whale which feed on zooplankton could be indirectly affected.

Habitat degradation, depletion of prey, and aquatic pollution are considered to be threats to all threatened and endangered marine mammals. Impacts due to seafood processing waste are limited to the immediate vicinity of the discharge, and the receiving waters are sufficiently oxygenated and well-mixed to allow for rapid dispersion and dilution of pollutants.

Based on the above information, effects from offshore seafood processing discharges are expected to be insignificant and discountable. Therefore, the EPA has determined that the Draft Permit is **not likely to adversely affect** the blue whale. On December 18, 2015, the EPA received a letter of concurrence from the NMFS. The NMFS concurred with the EPA that the proposed action is not likely to adversely affect the ESA-listed fish, marine mammals, and turtles under the NMFS' jurisdiction.

5.6.3 Finback whale

Fin whales are found in deep, offshore waters of all major oceans, primarily in temperate to polar latitudes, including the action area of the Draft Permit. No critical habitat has been designated.

Since fin whale are highly mobile and, therefore, able to avoid discharge areas, direct impacts from localized seafood processing discharge plumes, or potential ship strikes on individual animals is greatly reduced. Some temporary disturbance of whale activities may occur, due to increases in vessel traffic and noise.

The fin whale does not rely on phytoplankton as a food source. Therefore, the effects of seafood processing waste discharge on phytoplankton community abundance and structure, would only have indirect impacts on these marine mammals. If zooplankton abundance is affected indirectly by changes in the phytoplankton community or directly by the discharge itself, fin whale which feed on zooplankton could be indirectly affected.

Habitat degradation, depletion of prey, and aquatic pollution are considered to be threats to all threatened and endangered marine mammals. Impacts due to seafood processing waste are limited to the immediate vicinity of the discharge, and the receiving waters are sufficiently oxygenated and well-mixed to allow for rapid dispersion and dilution of pollutants.

Based on the above information, effects from offshore seafood processing discharges are expected to be insignificant and discountable. Therefore, the EPA has determined that the Draft Permit is **not likely to adversely affect** the fin whale. On December 18, 2015, the EPA received a letter of concurrence from the NMFS. The NMFS concurred with the EPA that the proposed action is not likely to adversely affect the ESA-listed fish, marine mammals, and turtles under the NMFS' jurisdiction.

5.6.4 Humpback whale

Summer and fall ranges for the California/Oregon/Washington stock of humpback whales include the action area of the Draft Permit. No critical habitat has been designated.

Since humpback whale are highly mobile and, therefore, able to avoid discharge areas, direct impacts from localized seafood processing discharge plumes, or potential ship strikes on individual animals is greatly reduced. Some temporary disturbance of whale activities may occur, due to increases in vessel traffic and noise.

The humpback whale does not rely on phytoplankton as a food source. Therefore, the effects of seafood processing waste discharge on phytoplankton community abundance and structure, would only have indirect impacts on these marine mammals. If zooplankton abundance is affected indirectly by changes in the phytoplankton community or directly by the discharge itself, humpback whale which feed on zooplankton could be indirectly affected.

Habitat degradation, depletion of prey, and aquatic pollution are considered to be threats to all threatened and endangered marine mammals. Impacts due to seafood processing waste are limited to the immediate vicinity of the discharge, and the receiving waters are sufficiently oxygenated and well-mixed to allow for rapid dispersion and dilution of pollutants.

Based on the above information, effects from offshore seafood processing discharges are expected to be insignificant and discountable. Therefore, the EPA has determined that the Draft Permit is **not likely to adversely affect** the humpback whale. On December 18, 2015, the EPA received a letter of concurrence from the NMFS. The NMFS concurred with the EPA that the proposed action is not likely to adversely affect the ESA-listed fish, marine mammals, and turtles under the NMFS' jurisdiction.

5.6.5 Killer whale, Southern Resident DPS

The Southern Resident killer whale population range during the spring, summer, and fall in the inland waterways of Puget Sound, Strait of Juan de Fuca, and Southern Georgia Strait, which are all excluded from coverage under the Draft Permit. Although little is known about the wintering movements and range of the Southern Resident stock, research conducted during the winters of 2013 and 2014 indicated that they spend much of their time in the offshore waters of Washington, Oregon, and California (NMFS. 2014). These waters are included in the action area of the Draft Permit.

Designated critical habitat for the Southern Resident killer whale includes (1) the Summer Core Area in Haro Strait and waters around the San Juan Islands; (2) Puget Sound; and (3) the Strait of Juan de Fuca, which comprise approximately 2,560 square miles (6,630 sq km) of marine habitat. All designated critical habitat for the Southern Resident killer whale is excluded from coverage under the Draft Permit.

Since Southern Resident killer whale are highly mobile and, therefore, able to avoid discharge areas, direct impacts from localized seafood processing discharge plumes, or potential ship strikes on individual animals is greatly reduced. However, because Southern Resident killer whales have a primarily fish diet, they might be attracted to discharge as a food source. This would put them at increased risk of vessel strike. This attraction could also create dependence on an anthropogenic food supply which might run out, and could habituate the animals to humans, potentially increasing danger to them if they are perceived as a nuisance. The Draft Permit requires that the discharge of seafood processing wastes must not create an attractive nuisance situation whereby fish or wildlife are attracted to waste disposal or storage areas in a manner that creates a threat to fish or wildlife or to human health and safety. Some temporary disturbance of whale activities may occur, due to increases in vessel traffic and noise.

The Southern Resident killer whale does not rely on phytoplankton as a food source. Therefore, the effects of seafood processing waste discharge on phytoplankton community abundance and structure, would only have indirect impacts on these marine mammals. Since Southern Resident killer whale feed at higher trophic levels, they are very unlikely to be impacted.

Habitat degradation, depletion of prey, and aquatic pollution are considered to be threats to all threatened and endangered marine mammals. Impacts due to seafood processing waste are limited to the immediate vicinity of the discharge, and the receiving waters are sufficiently oxygenated and well-mixed to allow for rapid dispersion and dilution of pollutants.

Based on the above information, effects from offshore seafood processing discharges are expected to be insignificant and discountable. Therefore, the EPA has determined that the Draft Permit is **not likely to adversely affect** the Southern Resident killer whale. On December 18, 2015, the EPA received a letter of concurrence from the NMFS. The NMFS concurred with the EPA that the proposed action is not likely to adversely affect the ESA-listed fish, marine mammals, and turtles under the NMFS' jurisdiction.

5.6.6 North Pacific right whale

The North Pacific right whale inhabit the Pacific Ocean between 20º and 60º latitude, including the action area of the Draft Permit. North Pacific right whale are currently believed to prefer coastlines and sometimes large bays, spending the summer feeding in the north then migrating south to breed in the winter. Designated critical habitat for the North Pacific right whale include (1) a portion of the Bering Sea and (2) a portion of the Gulf of Alaska, both of which are excluded from the Draft Permit.

Since North Pacific right whale are highly mobile and, therefore, able to avoid discharge areas, direct impacts from localized seafood processing discharge plumes, or potential ship strikes on individual animals is greatly reduced. Some temporary disturbance of whale activities may occur, due to increases in vessel traffic and noise.

The North Pacific right whale does not rely on phytoplankton as a food source. Therefore, the effects of seafood processing waste discharge on phytoplankton community abundance and structure, would only have indirect impacts on these marine mammals. If zooplankton abundance is affected indirectly by changes in the phytoplankton community or directly by the discharge itself, North Pacific right whale which feed on zooplankton could be indirectly affected.

Habitat degradation, depletion of prey, and aquatic pollution are considered to be threats to all threatened and endangered marine mammals. Impacts due to seafood processing waste are limited to the immediate vicinity of the discharge, and the receiving waters are sufficiently oxygenated and well-mixed to allow for rapid dispersion and dilution of pollutants.

Based on the above information, effects from offshore seafood processing discharges are expected to be insignificant and discountable. Therefore, the EPA has determined that the Draft Permit is **not likely to adversely affect** the North Pacific Right whale. On December 18, 2015, the EPA received a letter of concurrence from the NMFS. The NMFS concurred with the EPA that the proposed action is not likely to adversely affect the ESA-listed fish, marine mammals, and turtles under the NMFS' jurisdiction.

5.6.7 Sei whale

The sei whale is a pelagic species, usually observed in deeper waters far from the coastline, near the continental shelf edge, including the action area of the Draft Permit. No critical habitat has been designated.

Since sei whales are highly mobile and, therefore, able to avoid discharge areas, direct impacts from localized seafood processing discharge plumes, or potential ship strikes on individual animals is greatly reduced. Some temporary disturbance of whale activities may occur, due to increases in vessel traffic and noise.

The sei whale does not rely on phytoplankton as a food source. Therefore, the effects of seafood processing waste discharge on phytoplankton community abundance and structure, would only have indirect impacts on these marine mammals. If zooplankton abundance is affected indirectly by changes in the phytoplankton community or directly by the discharge itself, sei whales which feed on zooplankton could be indirectly affected.

Habitat degradation, depletion of prey, and aquatic pollution are considered to be threats to all threatened and endangered marine mammals. Impacts due to seafood processing waste are limited to the immediate vicinity of the discharge, and the receiving waters are sufficiently oxygenated and well-mixed to allow for rapid dispersion and dilution of pollutants.

Based on the above information, effects from offshore seafood processing discharges are expected to be insignificant and discountable. Therefore, the EPA has determined that the Draft Permit is **not likely to adversely affect** the sei whale. On December 18, 2015, the EPA received a letter of concurrence from the NMFS. The NMFS concurred with the EPA that the proposed action is not likely to adversely affect the ESA-listed fish, marine mammals, and turtles under the NMFS' jurisdiction.

5.6.8 Sperm whale

The sperm whale inhabits all of the world's oceans in deep waters between 60º N and 60º S latitudes, including the action area of the Draft Permit. No critical habitat has been designated for the sperm whale.

Since sperm whales are highly mobile and, therefore, able to avoid discharge areas, direct impacts from localized seafood processing discharge plumes, or potential ship strikes on individual animals is greatly reduced. However, because sperm whales have a primarily fish diet, they might be attracted to discharge as a food source. This would put them at increased risk of vessel strike. This attraction could also create dependence on an anthropogenic food supply which might run out, and could habituate the animals to humans, potentially increasing danger to them if they are perceived as a nuisance. The Draft Permit requires that the discharge of seafood processing wastes must not create an attractive nuisance situation whereby fish or wildlife are attracted to waste disposal or storage areas in a manner that creates a threat to fish or wildlife or to human health and safety. Some temporary disturbance of whale activities may occur, due to increases in vessel traffic and noise.

The sperm whale does not rely on phytoplankton as a food source. Therefore, the effects of seafood processing waste discharge on phytoplankton community abundance and structure, would only have indirect impacts on these marine mammals. Since sperm whale feed at higher trophic levels, they are very unlikely to be impacted.

Habitat degradation, depletion of prey, and aquatic pollution are considered to be threats to all threatened and endangered marine mammals. Impacts due to seafood processing waste are limited to the immediate vicinity of the discharge, and the receiving waters are sufficiently oxygenated and well-mixed to allow for rapid dispersion and dilution of pollutants.

Based on the above information, effects from offshore seafood processing discharges are expected to be insignificant and discountable. Therefore, the EPA has determined that the Draft Permit is **not likely to adversely affect** the sperm whale. On December 18, 2015, the EPA received a letter of concurrence from the NMFS. The NMFS concurred with the EPA that the proposed action is not likely to adversely affect the ESA-listed fish, marine mammals, and turtles under the NMFS' jurisdiction.

5.6.9 Bocaccio

Bacaccio range from California to Alaska, most commonly between Oregon and northern Baja California. They primarily inhabit waters between 160-820 feet depth and can be found in the action are of the Draft Permit. Designated critical habitat lies completely within Puget Sound, which is excluded from coverage by the Draft Permit.

Due to their small size while in larvae stage, and reliance on currents for transport, bocaccio are susceptible to water quality effects of offshore seafood processing discharge such as hypoxia, turbidity, and presence of disinfectants. Juvenile and adult fish are mobile and thus able to avoid discharge plumes as necessary.

There is potential for indirect impacts of seafood processing discharge if their prey is affected. Bocaccio larvae could suffer if abundance of the phytoplankton they consume is reduced due to eutrophication or if primary production is shifted from beneficial to harmful types of algae. Zooplankton could experience altered respiratory or feeding ability or be indirectly affected by alteration of the phytoplankton community. This would affect juveniles, which feed on zooplankton. Adult bocaccio feed on benthic invertebrates and small demersal fish, which could be impacted by anoxic zones if waste accumulated on the seafloor.

Bocaccio might be attracted to seafood processing discharge as a food source, which could put them at increased risk of lethal effects due to reduced water quality in the vicinity of the discharge or create dependence on an anthropogenic food supply which might run out. It could also put them at increased risk of predation, or increase the risk of being caught as bycatch because of their proximity to fishing vessels. The Draft Permit requires that the discharge of seafood processing wastes must not create an attractive nuisance situation whereby fish or wildlife are attracted to waste disposal or storage areas in a manner that creates a threat to fish or wildlife or to human health and safety.

The biggest threat to bocaccio is overharvest. They are either fished for as a target species or are caught as bycatch from other fisheries.

Impacts due to seafood processing waste are limited to the immediate vicinity of the discharge, where the high tidal activity promotes significant dispersion and dilution. Based on the above information, effects from offshore seafood processing discharges are expected to be insignificant and discountable. Therefore, the EPA has determined that the Draft Permit is **not likely to adversely affect** the bocaccio. On December 18, 2015, the EPA received a letter of concurrence from the NMFS. The NMFS concurred with the EPA that the proposed action is not likely to adversely affect the ESA-listed fish, marine mammals, and turtles under the NMFS' jurisdiction.

5.6.10 Canary rockfish

Canary rockfish range from California to Alaska, most commonly off the coast of central Oregon. They primarily inhabit waters between 160-820 feet depth and can be found in the action area of the Draft Permit. Designated critical habitat lies completely within Puget Sound, which is excluded from coverage by the Draft Permit.

Due to their small size while in larvae stage, and reliance on currents for transport, canary rockfish are susceptible to water quality effects of offshore seafood processing discharge such as hypoxia, turbidity, and presence of disinfectants. Juvenile and adult fish are mobile and thus able to avoid discharge plumes as necessary.

There is potential for indirect impacts of seafood processing discharge to fish if their prey is affected. Canary rockfish larvae could suffer if abundance of the phytoplankton they consume is reduced due to eutrophication or if primary production is shifted from beneficial to harmful types of algae. Zooplankton could experience altered respiratory or feeding ability or be indirectly affected by alteration of the phytoplankton community. This would affect juveniles, which feed on zooplankton. Adult canary rockfish feed on benthic invertebrates and small demersal fish, which could be impacted by anoxic zones if waste accumulated on the seafloor.

Canary rockfish might be attracted to the seafood processing discharge as a food source, which could put them at increased risk of lethal effects due to reduced water quality in the vicinity of the discharge or create dependence on an anthropogenic food supply which might run out. It could also put them at increased risk of predation, or increase the risk of being caught as bycatch because of their proximity to fishing vessels. The Draft Permit requires that the discharge of seafood processing wastes must not create an attractive nuisance situation whereby fish or wildlife are attracted to waste disposal or storage areas in a manner that creates a threat to fish or wildlife or to human health and safety.

The biggest threat to canary rockfish is overharvest. They are either fished for as a target species or are caught as bycatch from other fisheries.

Impacts due to seafood processing waste are limited to the immediate vicinity of the discharge, where the high tidal activity promotes significant and rapid dispersion and dilution. Based on the above information, effects from offshore seafood processing discharges are expected to be insignificant and discountable. Therefore, the EPA has determined that the Draft Permit is **not likely to adversely affect** the canary rockfish. On December 18, 2015, the EPA received a letter of concurrence from the NMFS. The NMFS concurred with the EPA that the proposed action is not likely to adversely affect the ESA-listed fish, marine mammals, and turtles under the NMFS' jurisdiction.

5.6.11 Yelloweye rockfish

Yelloweye rockfish range from California to Alaska, most commonly between central California and the Gulf of Alaska. They primarily inhabit waters between 160-820 feet depth and can be found in the action are of the Draft Permit. Designated critical habitat lies completely within Puget Sound, which is excluded from coverage by the Draft Permit.

Due to their small size while in larvae stage, and reliance on currents for transport, yelloweye rockfish are susceptible to water quality effects of offshore seafood processing discharge such as hypoxia, turbidity, and presence of disinfectants. Juvenile and adult fish are mobile and thus able to avoid discharge plumes as necessary.

There is potential for indirect impacts of seafood processing discharge to fish if their prey is affected. Yelloweye rockfish larvae could suffer if abundance of the phytoplankton they consume is reduced due to eutrophication or if primary production is shifted from beneficial to harmful types of algae. Zooplankton could experience altered respiratory or feeding ability or be indirectly affected by alteration of the phytoplankton community. This would affect juveniles, which feed on zooplankton. Adult yelloweye rockfish feed on benthic invertebrates and small demersal fish, which could be impacted by anoxic zones if waste accumulated on the seafloor.

Yelloweye rockfish might be attracted to seafood processing discharge as a food source, which could put them at increased risk of lethal effects due to reduced water quality in the vicinity of the discharge or create dependence on an anthropogenic food supply which might run out. It could also put them at increased risk of predation, or increase the risk of being caught as bycatch because of their proximity to fishing vessels. The Draft Permit requires that the discharge of seafood processing wastes must not create an attractive nuisance situation whereby fish or wildlife are attracted to waste disposal or storage areas in a manner that creates a threat to fish or wildlife or to human health and safety.

The biggest threat to yelloweye rockfish is overharvest. They are either fished for as a target species or are caught as bycatch from other fisheries.

Impacts due to seafood processing waste are limited to the immediate vicinity of the discharge, where the high tidal activity promotes significant dispersion and dilution. Based on the above information, effects from offshore seafood processing discharges are expected to be insignificant and discountable. Therefore, the EPA has determined that the Draft Permit is **not likely to adversely affect** the yelloweye rockfish. On December 18, 2015, the EPA received a letter of concurrence from the NMFS. The NMFS concurred with the EPA that the proposed action is not likely to adversely affect the ESA-listed fish, marine mammals, and turtles under the NMFS' jurisdiction.

5.6.12 Pacific eulachon

While in marine waters Pacific eulachon range in nearshore ocean waters up to 1000 feet depth, from California to Alaska, and are found in the action area of the Draft Permit. Of the sixteen critical habitat areas designated for the Pacific eulachon, none are located within the action area of the Draft Permit, as they only include freshwater creeks and rivers as well as their associated estuaries.

Due to their small size while in larvae stage, and reliance on currents for transport, Pacific eulachon are susceptible to water quality effects of offshore seafood processing discharge such as hypoxia, turbidity, and presence of disinfectants. Juvenile and adult fish are mobile and thus able to avoid discharge plumes as necessary.

There is potential for indirect impacts of seafood processing discharge to fish if their prey is affected. Pacific eulachon larvae could suffer if abundance of the phytoplankton they consume is reduced due to eutrophication or if primary production is shifted from beneficial to harmful types of algae. Zooplankton could experience altered respiratory or feeding ability or be indirectly affected by alteration of the phytoplankton community. This would affect juveniles and adults, which feed on zooplankton.

The primary threats to recovery of Pacific eulachon are disruptions in spawning paths and degradation or loss of spawning grounds, often associated with water storage, conveyance, and withdrawal projects in fresh water. Another threat is global climate change where warming trends could alter prey, spawning, and rearing success.

Impacts due to seafood processing waste are limited to the immediate vicinity of the discharge, where the high tidal activity promotes significant dispersion and dilution. Based on the above information, effects from offshore seafood processing discharges are expected to be insignificant and discountable. Therefore, the EPA has determined that the Draft Permit is **not likely to adversely affect** the Pacific eulachon. On December 18, 2015, the EPA received a letter of concurrence from the NMFS. The NMFS concurred with the EPA that the proposed action is not likely to adversely affect the ESA-listed fish, marine mammals, and turtles under the NMFS' jurisdiction.

5.6.13 Chinook salmon

There are nine ESA listed Chinook salmon ESUs and one species of concern which range from Alaska to Southern California and are found in the action area of the Draft Permit. Of the nine critical habitat areas designated for the Chinook salmon, none are located within the action area of the Draft Permit, as they only include freshwater creeks and rivers as well as their associated estuaries.

Chinook salmon remain in fresh water and estuaries for a few months to a few years, depending on the type, before migrating to the open ocean. Juvenile and adult fish are mobile and thus able to avoid discharge plumes as necessary.

There is potential for indirect impacts of seafood processing discharge to fish if their prey is affected. Zooplankton could experience altered respiratory or feeding ability or be indirectly affected by alteration of the phytoplankton community. This would affect juveniles, which feed on zooplankton. Adult Chinook salmon are less likely to be affected as they prey on higher trophic organisms such as squid and other fish.

Chinook salmon might be attracted to the seafood processing discharge as a food source, which could put them at increased risk of lethal effects due to reduced water quality in the vicinity of the discharge or create dependence on an anthropogenic food supply which might run out. It could also put them at increased risk of predation, or increase the risk of being caught as bycatch because of their proximity to fishing vessels. The Draft Permit requires that the discharge of seafood processing wastes must not create an attractive nuisance situation whereby fish or wildlife are attracted to waste disposal or storage areas in a manner that creates a threat to fish or wildlife or to human health and safety.

The primary threats to recovery of Chinook salmon are disruptions in spawning paths and degradation or loss of spawning grounds, often associated with water storage, conveyance, and withdrawal projects in freshwater. Another threat includes overharvest, both directly and as bycatch for other fisheries.

Seafood processing waste is discharged in high tidal activity areas which allow for adequate dispersion and dilution, therefore, effects on habitat and prey of these fish species should be minimal.

Impacts due to seafood processing waste are limited to the immediate vicinity of the discharge, where the high tidal activity promotes significant dispersion and dilution. Based on the above information, effects from offshore seafood processing discharges are expected to be insignificant and discountable. Therefore, the EPA has determined that the Draft Permit is **not likely to adversely affect** Chinook salmon. On December 18, 2015, the EPA received a letter of concurrence from the NMFS. The NMFS concurred with the EPA that the proposed action is not likely to adversely affect the ESA-listed fish, marine mammals, and turtles under the NMFS' jurisdiction.

5.6.14 Coho salmon

There are four coho ESA listed salmon ESUs and one species of concern, which range from Alaska to Southern California and are found in the action area of the Draft Permit. Of the four critical habitat areas designated for the coho salmon, none are located within the action area of the Draft Permit, as they only include freshwater creeks and rivers as well as their associated estuaries.

While there is potential for indirect impacts of seafood processing discharge to fish if their prey is affected, by the time coho salmon reach ocean waters they prey on higher trophic organisms such as other fish, so they are less likely to be affected.

Coho salmon might be attracted to the seafood processing discharge as a food source, which could put them at increased risk of lethal effects due to reduced water quality in the vicinity of the discharge or create dependence on an anthropogenic food supply which might run out. It could also put them at increased risk of predation, or increase the risk of being caught as bycatch because of their proximity to fishing vessels. The Draft Permit requires that the discharge of seafood processing wastes must not create an attractive nuisance situation whereby fish or wildlife are attracted to waste disposal or storage areas in a manner that creates a threat to fish or wildlife or to human health and safety.

The primary threats to recovery of coho salmon are disruptions in spawning paths and degradation or loss of spawning grounds, often associated with water storage, conveyance, and withdrawal projects in freshwater. Another threat includes overharvest, both directly and as bycatch for other fisheries.

Seafood processing waste is discharged in high tidal activity areas which allow for adequate dispersion and dilution, therefore, effects on habitat and prey of these fish species should be minimal.

Impacts due to seafood processing waste are limited to the immediate vicinity of the discharge, where the high tidal activity promotes significant dispersion and dilution. Based on the above information, effects from offshore seafood processing discharges are expected to be insignificant and discountable. Therefore, the EPA has determined that the Draft Permit is **not**

likely to adversely affect coho salmon. On December 18, 2015, the EPA received a letter of concurrence from the NMFS. The NMFS concurred with the EPA that the proposed action is not likely to adversely affect the ESA-listed fish, marine mammals, and turtles under the NMFS' jurisdiction.

5.6.15 Chum salmon

There are two ESA listed chum salmon ESUs, which range from Alaska to California and are found in the action area of the Draft Permit. Of the two critical habitat areas designated for the chum salmon, none are located within the action area of the Draft Permit, as they only include freshwater creeks and rivers as well as their associated estuaries.

There is potential for indirect impacts of seafood processing discharge to fish if their prey is affected. Zooplankton could experience altered respiratory or feeding ability or be indirectly affected by alteration of the phytoplankton community. This would affect juveniles and adults, which feed on zooplankton and fish while in ocean waters.

Chum salmon might be attracted to the seafood processing discharge as a food source, which could put them at increased risk of lethal effects due to reduced water quality in the vicinity of the discharge or create dependence on an anthropogenic food supply which might run out. It could also put them at increased risk of predation, or increase the risk of being caught as bycatch because of their proximity to fishing vessels. The Draft Permit requires that the discharge of seafood processing wastes must not create an attractive nuisance situation whereby fish or wildlife are attracted to waste disposal or storage areas in a manner that creates a threat to fish or wildlife or to human health and safety.

The primary threats to recovery of chum salmon are disruptions in spawning paths and degradation or loss of spawning grounds, often associated with water storage, conveyance, and withdrawal projects in freshwater. Another threat includes overharvest, both directly and as bycatch for other fisheries.

Seafood processing waste is discharged in high tidal activity areas which allow for adequate dispersion and dilution, therefore, effects on habitat and prey of these fish species should be minimal.

Impacts due to seafood processing waste are limited to the immediate vicinity of the discharge, where the high tidal activity promotes significant dispersion and dilution. Based on the above information, effects from offshore seafood processing discharges are expected to be insignificant and discountable. Therefore, the EPA has determined that the Draft Permit is **not likely to adversely affect** chum salmon. On December 18, 2015, the EPA received a letter of concurrence from the NMFS. The NMFS concurred with the EPA that the proposed action is not likely to adversely affect the ESA-listed fish, marine mammals, and turtles under the NMFS' jurisdiction.

5.6.16 Sockeye salmon

There are two ESA listed sockeye salmon ESUs, which range from Alaska to Southern Oregon and are found in the action area of the Draft Permit. Of the two critical habitat areas designated for the sockeye salmon, none are located within the action area of the Draft Permit, as they only include freshwater creeks, rivers, and lakes as well as their associated estuaries.

There is potential for indirect impacts of seafood processing discharge to fish if their prey is affected. Zooplankton could experience altered respiratory or feeding ability or be indirectly affected by alteration of the phytoplankton community. This would affect juveniles and adults, which feed on zooplankton and fish while in ocean waters.

Sockeye salmon might be attracted to the seafood processing discharge as a food source, which could put them at increased risk of lethal effects due to reduced water quality in the vicinity of the discharge or create dependence on an anthropogenic food supply which might run out. It could also put them at increased risk of predation, or increase the risk of being caught as bycatch because of their proximity to fishing vessels. The Draft Permit requires that the discharge of seafood processing wastes must not create an attractive nuisance situation whereby fish or wildlife are attracted to waste disposal or storage areas in a manner that creates a threat to fish or wildlife or to human health and safety.

The primary threats to recovery of sockeye salmon are disruptions in spawning paths and degradation or loss of spawning grounds, often associated with water storage, conveyance, and withdrawal projects in freshwater. Another threat includes overharvest, both directly and as bycatch for other fisheries.

Seafood processing waste is discharged in high tidal activity areas which allow for adequate dispersion and dilution, therefore, effects on habitat and prey of these fish species should be minimal.

Impacts due to seafood processing waste are limited to the immediate vicinity of the discharge, where the high tidal activity promotes significant dispersion and dilution. Based on the above information, effects from offshore seafood processing discharges are expected to be insignificant and discountable. Therefore, the EPA has determined that the Draft Permit is **not likely to adversely affect** sockeye salmon. On December 18, 2015, the EPA received a letter of concurrence from the NMFS. The NMFS concurred with the EPA that the proposed action is not likely to adversely affect the ESA-listed fish, marine mammals, and turtles under the NMFS' jurisdiction.

5.6.17 Steelhead

There are eleven ESA listed steelhead ESUs and one species of concern, which range from Alaska to California and are found in the action area of the Draft Permit. Of the one proposed and ten finalized critical habitat areas designated for steelhead, none are located within the action area of the Draft Permit, as they only include freshwater creeks, and rivers, as well as their associated estuaries.

There is potential for indirect impacts of seafood processing discharge to fish if their prey is affected. Zooplankton could experience altered respiratory or feeding ability or be indirectly affected by alteration of the phytoplankton community. This would affect juveniles and adults, which feed on zooplankton and fish while in ocean waters.

Steelhead might be attracted to the seafood processing discharge as a food source, which could put them at increased risk of lethal effects due to reduced water quality in the vicinity of the discharge or create dependence on an anthropogenic food supply which might run out. It could also put them at increased risk of predation, or increase the risk of being caught as bycatch because of their proximity to fishing vessels. The Draft Permit requires that the discharge of seafood processing wastes must not create an attractive nuisance situation whereby fish or wildlife are attracted to waste disposal or storage areas in a manner that creates a threat to fish or wildlife or to human health and safety.

The primary threats to recovery of Steelhead are disruptions in spawning paths and degradation or loss of spawning grounds, often associated with water storage, conveyance, and withdrawal projects in freshwater. Another threat includes overharvest, both directly and as bycatch for other fisheries.

Seafood processing waste is discharged in high tidal activity areas which allow for adequate dispersion and dilution, therefore, effects on habitat and prey of these fish species should be minimal.

Impacts due to seafood processing waste are limited to the immediate vicinity of the discharge, where the high tidal activity promotes significant dispersion and dilution. Based on the above information, effects from offshore seafood processing discharges are expected to be insignificant and discountable. Therefore, the EPA has determined that the Draft Permit is **not likely to adversely affect** Steelhead. On December 18, 2015, the EPA received a letter of concurrence from the NMFS. The NMFS concurred with the EPA that the proposed action is not likely to adversely affect the ESA-listed fish, marine mammals, and turtles under the NMFS' jurisdiction.

5.6.18 Green Sturgeon

Green sturgeon range includes the entire west coast of North America. These fish are believed to spend the majority of their lives in nearshore oceanic waters, bays, and estuaries. The marine portion of the Southern DPS's critical habitat includes all U.S. coastal marine waters out to the 60 fathom (110 m) depth bathymetry line (relative to MLLW) off the coasts of Washington and Oregon. The western part of this critical habitat intersects with the eastern part of the action area, as the 3 nm line delineating the boundary between state and Federal Waters is almost entirely in waters that are shallower than 60 fathoms.

The three primary constituent elements of this critical habitat area are a safe migratory corridor, adequate water quality, and sufficient food resources, as described in Section 3.2.10.2. Safe migration is not expected to be affected by offshore seafood processing waste discharge. Discharge could result in reduced dissolved oxygen levels and increased levels of contaminants such as organochlorides in the immediate vicinity of the discharge. This deterioration of water quality could disrupt the normal behavior, growth, and viability of green sturgeon. Green sturgeon feed on benthic invertebrates including shrimp, mollusks, and amphipods, as well as small fish. Disruptions to benthic communities caused by seafood processing discharge could indirectly affect green sturgeon by decreasing food abundance.

Offshore seafood processing discharges will take place in high tidal activity areas which should allow for dispersion and dilution, minimizing effects on the sturgeon's prey sources and habitat. Therefore, EPA has determined that approval of the Draft Permit is **not likely to adversely affect** the North American green sturgeon, Southern DPS. On December 18, 2015, the EPA received a letter of concurrence from the NMFS. The NMFS concurred with the EPA that the proposed action is not likely to adversely affect the ESA-listed fish, marine mammals, and turtles under the NMFS' jurisdiction.

5.6.19 Green sea turtle

Green sea turtles are found in ocean waters worldwide, from beaches to open ocean waters. Although they have been seen as far north as Alaska, green sea turtles prefer subtropical and tropical waters and are therefore, not likely to be found in the action area of the Draft Permit. Critical habitat does exist for the green sea turtle, but none along the Pacific Coast of the United States.

While green sea turtles may occasionally venture into the offshore waters of Washington and Oregon, neither their area of high density nor their critical habitat occurs in the action area. They are also very mobile and would be able to easily avoid the areas of discharge. Since it is expected there would be little, if any, overlap with offshore seafood processors, the EPA has determined that the Draft Permit will have **no effect** on the green sea turtle.

5.6.20 Leatherback Sea Turtle

Although nesting is generally limited to tropical and subtropical latitudes, leatherbacks have a global range. Primarily pelagic but also found foraging in coastal waters, they follow their prey, which mainly consists of jellyfish, to temperate waters in the summer. Thermoregulatory adaptations allow them to tolerate colder water temperatures (NMFS i). Therefore, it is likely that leatherbacks will be found in the Draft Permit action area.

One of the two newly designated critical habitat areas for this species, the 25,004 square miles (64,760 square km) from Cape Flattery, Washington to Cape Blanco, Oregon east of the 2,000 meter depth contour, covers approximately 20% of the action area. The primary constituent element essential for conservation of leatherback turtles is the sufficient availability of prey species, primarily scyphomedusae (jellyfish).

While fishing does pose threats to leatherbacks through incidental capture and vessel strikes, offshore seafood processor discharges are not expected to add to this risk. Discharges will take place in high tidal activity areas which should allow for dispersion and dilution, minimizing effects on the leatherback’s prey sources and habitat.

Since offshore seafood discharges should result in insignificant effects to this species, EPA has determined that the Draft Permit is **not likely to adversely affect** the leatherback sea turtle or its critical habitat. On December 18, 2015, the EPA received a letter of concurrence from the NMFS.

5.6.21 Loggerhead sea turtle

In the Eastern Pacific Ocean, loggerhead sea turtles have been reported from Alaska to Chile, with only occasional sightings from the Washington and Oregon coasts. It is moderately likely that the loggerhead sea turtle will be found in the action area of the Draft Permit. No critical habitat is designated on the west coast of the United States.

While fishing does pose threats to loggerhead sea turtles through incidental capture and vessel strikes, offshore seafood processor discharges are not expected to add to this risk. They are also very mobile and would be able to easily avoid the areas of discharge. Discharges will take place in high tidal activity areas which should allow for dispersion and dilution, minimizing effects on the loggerhead’s habitat.

Since offshore seafood discharges should result in insignificant effects to this species, EPA has determined that the Draft Permit is **not likely to adversely affect** the loggerhead sea turtle. On December 18, 2015, the EPA received a letter of concurrence from the NMFS.

5.6.22 Olive Ridley sea turtle

In the Eastern Pacific Ocean, olive ridley sea turtles are mainly found in tropical regions from California southward, and are not likely to be found in the action area of the Draft Permit. No critical habitat has been designated.

While olive ridley sea turtles may occasionally venture into the offshore waters off of Washington and Oregon, neither their center of abundance nor their critical habitat occurs in the action area. They are also very mobile and would be able to easily avoid the areas of discharge. Since it is expected there would be little, if any, overlap with offshore seafood processors, the EPA has determined that the Draft Permit will have **no effect** on the olive ridley sea turtle.

5.6.23 Marbled murrelet

Marbled murrelet range includes the Pacific coasts of North America from Alaska to central California, including ocean waters within 5 miles of shore and 60 m in depth. Critical habitat is designated in Washington and Oregon, which is excluded from the Draft Permit as it only includes upland nesting areas. Potential impacts from seafood processing discharge to marbled murrelet are primarily related to floating wastes. The marbled murrelet is especially vulnerable to oil pollution. The Draft Permit prohibits the occurrence of substances that float as debris, scum, oil, or other matter to form nuisances on the surface. It also requires surface waters to be virtually free from floating nonpetroleum oils of vegetable or animal origin, as well as petroleum-derived oils. These protections should ensure that marbled murrelet are not likely to be directly harmed by oil.

Marbled murrelet may be attracted to discharge plumes as a food source and, therefore, be at increased risk of ship strikes, incidental catch or predation. Sea birds could also be indirectly affected by seafood processing waste if abundance of fish and other prey is disrupted due to eutrophication and related effects. These concerns are addressed via the seabird protection provisions in the Draft Permit, which are described in Section 2.3.8, above.

Murrelets usually feed in shallow, near-shore water less than 98 feet (30 m) deep (Huff, et al., 2006), but are thought to be able to dive up to depths of 157 feet (47 m) (Mathews and Burger 1998). During the breeding season, marble murrelets are usually found within five miles from shore off of Washington, just over three miles off shore from Oregon (Huff, et al., 2006). The Draft Permit only covers waters at least 3 nm offshore, farther in the case of offshore rocks and emergent islands. In addition, the EPA proposes to prohibit discharge in waters shallower than 100 meters in depth during April 15 – October 15 (i.e., additional miles from the coast, see Figure 2.3.3b) and year-round over the Heceta/Stonewall Banks complex (which extends 36 miles off the coast). Thus, permitted discharge will occur mostly outside of the marbled murrelet's range.

The primary threat to marbled murrelet is the loss and modification of upland nesting habitat. Marbled murrelet critical habitat is only designated within nesting areas on land and will not be impacted by the proposed Permit. The Draft Permit's jurisdiction does not include offshore rocks and emergent islands, therefore seabird nesting habitat and National Wildlife Refuge Islands will not be affected by the issuance of this Permit, since the EEZ begins 3 miles from those islands. Seafood processing waste discharges are localized and limited to well-mixed waters in order to allow for significant and rapid dispersion and dilution of pollutants, and the Draft Permit prohibits the occurrence of substances that float as debris, scum, oil, or other matter to form nuisances on the surface, therefore, potential impacts to marbled murrelet are likely to be minimal. Based on the above information, effects from offshore seafood processing discharges are expected to be insignificant and discountable. In light of the fact that ***the discharge will occur almost entirely outside the marbled murrelet's range***, the EPA has determined that approval of the Draft Permit is **not likely to adversely affect** the marbled murrelet. The EPA notes that, in its recent Biological Opinion, the USFWS concurred with the NMFS that the continuation of the Pacific Coast Groundfish Fishery (i.e., continued operation of the Pacific whiting trawl fleet) is "not likely to adversely affect marbled murrelets, because adverse interactions with vessels and gear, and forage depletion are extremely unlikely to occur" (USFWS 2017).

5.6.24 Short-tailed albatross

Short-tailed albatross are found throughout the North Pacific Ocean, including the action area of the Draft Permit. No critical habitat has been designated, as the short-tailed albatross breeds primarily on islands in Japan. Short-tailed albatross life history and threats are discussed in Section 3.3.2.

Potential impacts from seafood processing discharge to short-tailed albatross are, in part, related to floating wastes. The Draft Permit prohibits the occurrence of substances that float as debris, scum, oil, or other matter to form nuisances on the surface. It also requires surface waters to be virtually free from floating nonpetroleum oils of vegetable or animal origin, as well as petroleum-derived oils. These protections should ensure that short-tailed albatross are not likely to be directly harmed by oil or other floating substances.

Short-tailed albatross may be attracted to discharge plumes as a food source and, therefore, be at increased risk of ship strikes, incidental catch or predation (Melvin et al., 2004, 2011). Seabirds could also be indirectly affected by seafood processing waste if abundance of fish and other prey is disrupted due to eutrophication and related effects. The EPA is proposing a requirement that vessels be underway during discharge, in order to aid dispersion. Seafood processing waste discharges are localized and limited to well-mixed waters in order to allow for dispersion and dilution of pollutants, and the Draft Permit prohibits the occurrence of substances that float as debris, scum, oil, or other matter to form nuisances on the surface, therefore, potential impacts to short-tailed albatross are likely to be minimal.

As indicated in the USFWS's September 29, 2015 letter to the EPA, there could be risk of injury or mortality from issuance of this Permit to short-tailed albatross, especially if discharge is not managed in a manner that minimizes interactions with the ship, trawl cables, or nets. In response to the USFWS' concerns, the EPA has coordinated with the Services and incorporated the relevant terms and conditions from the recent Biological Opinion for the Pacific coast groundfish fishery regarding short-tailed albatross interaction with trawl vessels (USFWS, 2017). See Section 2.3.8 of this BE for detail.

According to the Audubon Society of Portland, the Heceta/Stonewall Banks complex is an "Important Bird Area," where large numbers of many seabirds can be found, including Short-tailed Albatross, Black-footed Albatross, Pink-footed Shearwater, Northern Fulmar, and Cassin's Auklet.[2] The EPA proposes to prohibit seafood processing discharge year-round over the Heceta/Stonewall Banks complex; this would protect albatross habitat up to 36 nm off the coast in the area in which they are commonly sited.

In light of the fact that the EPA proposes to prohibit discharge year-round over the Heceta/Stonewall Banks complex (where albatrosses tend to congregate), as well as April 15 – October 15 in waters shallower than 100 meters, and because of additional (forthcoming) provisions to minimize interactions between seabirds and trawl cables, the EPA has determined that approval of the Draft Permit is **not likely to adversely affect** the short-tailed albatross. This is consistent with the USFWS's recent Biological Opinion for the groundfish fishery (USFWS 2017), which included trawl cable interaction and offal management, and the EPA has included the requirements of RPM 2 in order to avoid jeopardizing the species.

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[2] http://audubonportland.org/local-birding/iba/iba-map/heceta

5.7 EFFECT OF THE PROPOSED ACTION ON TRIBAL RESOURCES

The Treaty Tribes of Oregon and Washington (Tribes) have both exclusive and shared authority to manage a wide variety of fisheries and natural resources affected by both current and future actions of the Pacific Coast Fishery Council. Off the northern Washington coast, four treaty Indian tribes have Usual and Accustomed (U&A) fishing areas that include marine waters out to 40 nm offshore and thus overlap with the action area of the Draft Permit. These tribes have active ocean fisheries operating under the Pacific Coast Fishery Council's current fishery management plans. Each Treaty Tribe exercises its management authorities within U&A fishing locations. The restriction of treaty-right fisheries to specific geographic boundaries creates place-based reliance on local resource abundance (PFMC, 2011a).

The Tribes manage and harvest marine species covered by the PCFC's fishery management plans as well as other species governed by the Tribes' own exclusive authorities or by co-management agreements with the states of Oregon and Washington. The Tribes also retain property interests in species they do not currently manage or harvest but may choose to do so at a future time (PFMC, 2011a).

Tribal fisheries harvests are used for commercial, personal-use and cultural purposes. Authorities to plan, conduct and regulate fisheries, manage natural resources and enter into cooperative relationships with state and federal entities are held independently by each of the Tribes based on their own codes of law, policies and regulations (PFMC, 2011a).

NMFS adopted U&A fishing area boundaries for several Pacific Coast Tribes in 1996 and published those boundaries in Federal fishing regulations for species managed under the Magnuson-Stevens Act (MSA). Since 1996, some tribal U&A fishing area boundaries have been amended, as ordered by the courts. On September 3, 2015, the United States District Court set forth boundaries for the Quileute Indian Tribe and the Quinault Indian Nation usual and accustomed fishing areas off the Washington coast.[3] NMFS announced publication of a final rule on June 8, 2016 implementing the courts final judgement. An illustration of the tribal accustomed fishing areas is shown below in Figure 5.7. To learn more about the NMFS regulations describing the Pacific Coast Treaty Indian Tribes' usual and accustomed fishing areas, see MSA Title 50 § 660.4, Subpart A.

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[3] *United States v. Washington*, 2:09-sp-00001-RSM, (W.D. Wash. Sept. 3, 2015) (Amended Order Regarding Boundaries of Quinault & Quileute U&As)

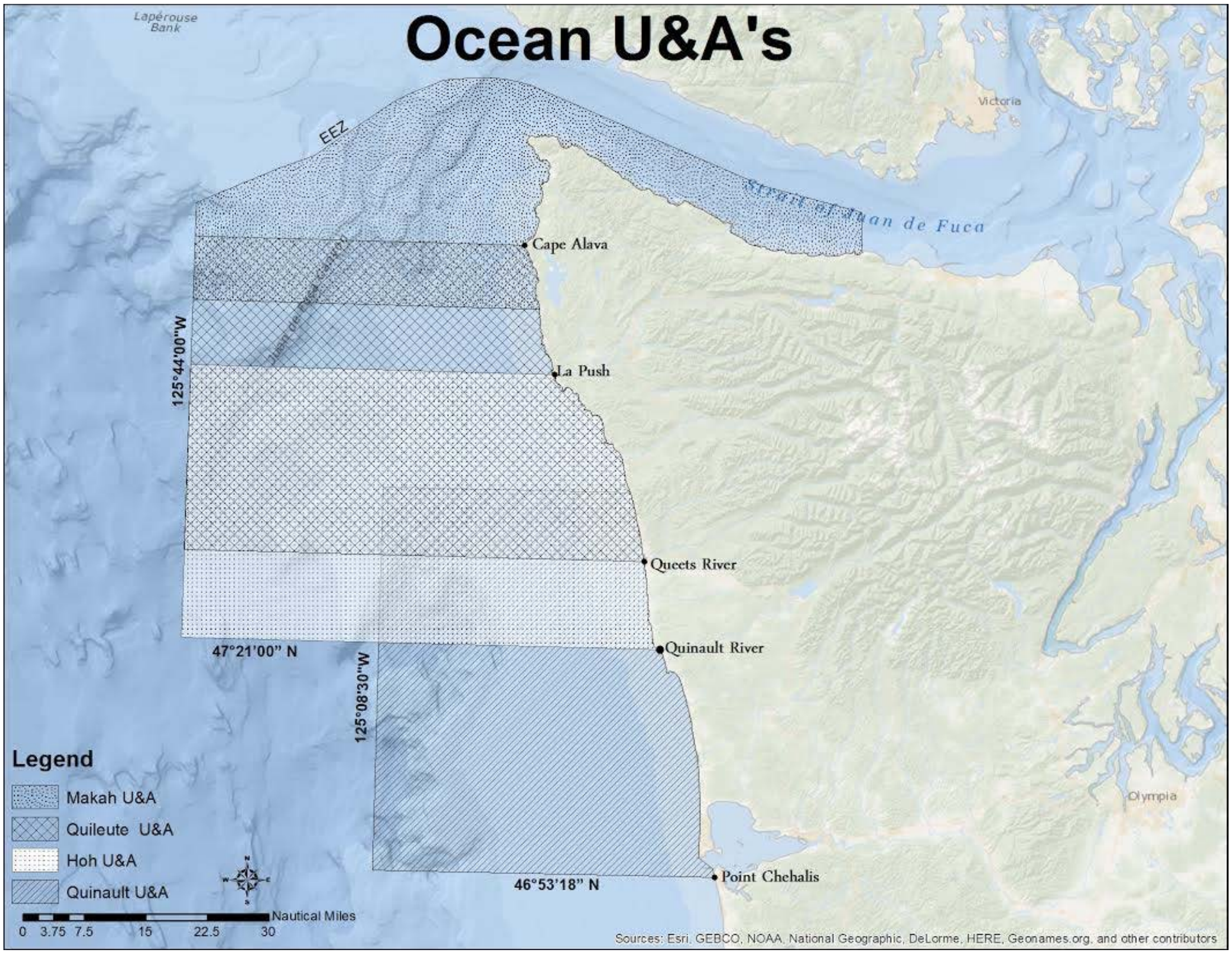

Figure 5.7. Depiction of Pacific coast treaty Tribes' usual and accustomed (U&A) fishing areas off the Washington coast. Note: this map depicts U&A fishing areas that occur both inside and outside of the exclusive economic zone (EEZ).
Source:
http://www.westcoast.fisheries.noaa.gov/publications/fishery_management/groundfish/public_notices/public_notice_tribal_u_a.pdf

On August 20, 2015, the EPA invited these Tribes to engage in government-to-government consultation. Since then, the EPA has conducted additional outreach via the Northwest Indian Fisheries Commission and with individual tribal staff. On July 21, 2016, EPA staff met with representatives of the Quileute Tribe in La Push, Washington for an informal discussion to discuss the draft General Permit. On August, 15, 2016, EPA staff met with representatives of the Makah Tribe in Seattle, Washington. On December 5, 2016, the EPA and the Quileute Tribe conducted a consultation leadership meeting in La Push, Washington. On December 14, 2016, the EPA and the Makah Tribe conducted a consultation leadership meeting. Coordination and outreach efforts have been ongoing throughout these consultations. During permit development, NPDES permits staff followed the EPA Region 10 Tribal Consultation and Coordination Procedures, available online at http://www.epa.gov/region10/pdf/tribal/consultation/r10_tribal_consultation_and_coordination_procedures.pdf.

SECTION 6.0

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological evaluation. Future federal actions that are unrelated to the proposed action are not considered in this action because they require separate consultation pursuant to Section 7 of ESA. The purpose of the cumulative effects section is to weigh the significance of other actions before determining whether the effects of the proposed action, when added to the effects of non-federal actions, will result in jeopardy to the federally listed species occurring in the action area, or adversely modify or destroy their designated critical habitat.

No known future State, tribal, local or private actions are reasonably certain to occur in the action area of this biological evaluation.

SECTION 7.0

CONCLUSIONS

Table 7.1 Effect Conclusions for ESA Species

Species or Population	Summary of Effect Analysis Conclusions
Marine Mammals (8)	
Guadalupe fur seal	No effect
Blue whale	Not likely to adversely effect
Finback whale	Not likely to adversely effect
Humpback whale	Not likely to adversely effect
Killer whale (Southern Resident DPS)	Not likely to adversely effect
North Pacific right whale	Not likely to adversely effect
Sei whale	Not likely to adversely effect
Sperm whale	Not likely to adversely effect
Fish (33)	
Bocaccio	Not likely to adversely effect
Canary rockfish	Not likely to adversely effect
Yelloweye rockfish	Not likely to adversely effect
Pacific eulachon	Not likely to adversely effect
Chinook salmon - CA coastal	Not likely to adversely effect
Chinook salmon - Central Valley spring-run ESU[2]	Not likely to adversely effect
Chinook salmon - Lower Columbia River ESU	Not likely to adversely effect
Chinook salmon - Puget Sound ESU	Not likely to adversely effect
Chinook salmon - Sacramento River winter-run ESU	Not likely to adversely effect
Chinook salmon - Snake River fall-run ESU	Not likely to adversely effect
Chinook salmon - Snake River spring/summer-run ESU	Not likely to adversely effect
Chinook salmon - Upper Columbia spring-run ESU	Not likely to adversely effect
Chinook salmon - Upper Willamette River ESU	Not likely to adversely effect
Chum salmon - Columbia River ESU	Not likely to adversely effect
Chum salmon - Hood Canal summer-run	Not likely to adversely effect
Coho salmon - Central California Coast ESU	Not likely to adversely effect
Coho salmon - Lower Columbia River ESU	Not likely to adversely effect
Coho salmon - Oregon Coast ESU	Not likely to adversely effect
Coho salmon - Southern Oregon/Northern California Coasts ESU	Not likely to adversely effect
Sockeye salmon - Ozette Lake ESU	Not likely to adversely effect
Sockeye salmon - Snake River ESU	Not likely to adversely effect
Steelhead - Central CA coast	Not likely to adversely effect
Steelhead - Central Valley CA	Not likely to adversely effect
Steelhead - Lower Columbia River	Not likely to adversely effect
Steelhead - Middle Columbia River	Not likely to adversely effect

Species or Population	**Summary of Effect Analysis Conclusions**
Steelhead - Northern California	Not likely to adversely effect
Steelhead - Puget Sound	Not likely to adversely effect
Steelhead - Snake River Basin	Not likely to adversely effect
Steelhead - South central CA coast	Not likely to adversely effect
Steelhead - Southern CA coast	Not likely to adversely effect
Steelhead - Upper Columbia River Basin	Not likely to adversely effect
Steelhead - Upper Willamette River	Not likely to adversely effect
North American green sturgeon	Not likely to adversely effect
Birds (2)	
Marbled murrelet	Not likely to adversely effect
Short-tailed albatross	Not likely to adversely effect
Turtles (4)	
Green sea turtle	No effect
Leatherback sea turtle	Not likely to adversely effect
Loggerhead sea turtle	Not likely to adversely effect
Olive ridley sea turtle	No effect

SECTION 8.0

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SECTION 9.0

ESSENTIAL FISH HABITAT ASSESSMENT

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), requires federal agencies to consult with the National Marine Fisheries Service (NMFS) on activities that may adversely affect Essential Fish Habitat (EFH). EFH is defined as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity” (50 CFR § 600.10). All federal agencies are required to consult with the NMFS on any actions authorized, funded, or undertaken by the agency that may adversely affect EFH (50 CFR § 600.920.10). The objective of this EFH assessment is to determine whether or not the proposed actions “may adversely affect” designated EFH for relevant commercially, federally-managed fisheries species within the proposed action area. NMFS has defined “adverse effect” in the context of EFH consultation as “any impact which reduces the quality and/or quantity of EFH. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and/or quantity of EFH. Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions” (50 CFR 600.810).

9.1 ESSENTIAL FISH HABITAT WITHIN THE DRAFT PERMIT ACTION AREA

The Draft Permit will cover seafood processing discharges to Federal Waters off the coasts of Washington and Oregon. Please refer to Section 2 of this document for a complete discussion of the proposed activity and action area.

Fisheries in the Draft Permit area are managed by the Pacific Fishery Management Council (PFMC), which has documented EFH for groundfish, salmon, coastal pelagic species, and highly migratory species in separate Fishery Management Plans (FMPs) for each group (see Table 9.1). A description of relevant EFH information for each fishery management group follows.

Table 9.1 Pacific Coast Fisheries Management Plan (FMP) managed species

Category	**Species**
Groundfish (91)	Rockfish (64 species)
	Flatfish (12 species)
	Roundfish (6 species)
	Sharks & Skates (6 species)
	Other (3 species)
Salmon (3)	Chinook
	Coho
	Puget Sound Pink
Coastal Pelagic Species (5)	Northern anchovy
	Pacific sardine
	Pacific (chub) mackerel
	Jack mackerel
	Market squid
Highly Migratory Species (13)	Sharks (5 species)
	Tunas (5 species)
	Striped marlin
	Broadbill swordfish
	Dorado (mahimahi)

9.1.1 Groundfish

The complete list of 91 groundfish species managed by the PFMC can be found in Table 3-1 on pp. 15-17 of the Pacific Coast Groundfish Fishery Management Plan (FMP, December 2011): http://www.pcouncil.org/wp-content/uploads/GF_FMP_FINAL_Dec2011.pdf

PFMC designates EFH for groundfish in Amendment 19 to this FMP as all waters and substrate within the following areas:

- Depths less than or equal to 3,500 m (1,914 fathoms) to mean higher high water level (MHHW) or the upriver extent of saltwater intrusion, defined as upstream and landward to where ocean-derived salts measure less than 0.5 ppt during the period of average annual low flow.
- Seamounts in depths greater than 3,500 m as mapped in the EFH assessment GIS.
- Areas designated as Habitat Areas of Particular Concern (HAPC) not already identified by the above criteria.

Figure 9.1 shows the area within the EEZ off the US continental west coast which meets the first two criteria. HSP in this map refers to Habitat Suitability Probability, the modeling approach which was used to identify EFH. All 100% HSP areas occur in depths less than 3,500 m.

The third criterion refers to HAPC, which are shown in Figure 9.2. These are subsets of EFH that are considered especially important. They are identified based on one or more of the following considerations:

- The importance of the ecological function provided by the habitat.
- The extent to which the habitat is sensitive to human-induced environmental degradation.
- Whether, and to what extent, development activities are or will be stressing the habitat type.
- The rarity of the habitat type.

(50 CFR 600.815(a)(8)).

The PFMC’s groundfish FMP is the only one of the four that contains HAPC designation (PFMC, 2005a).

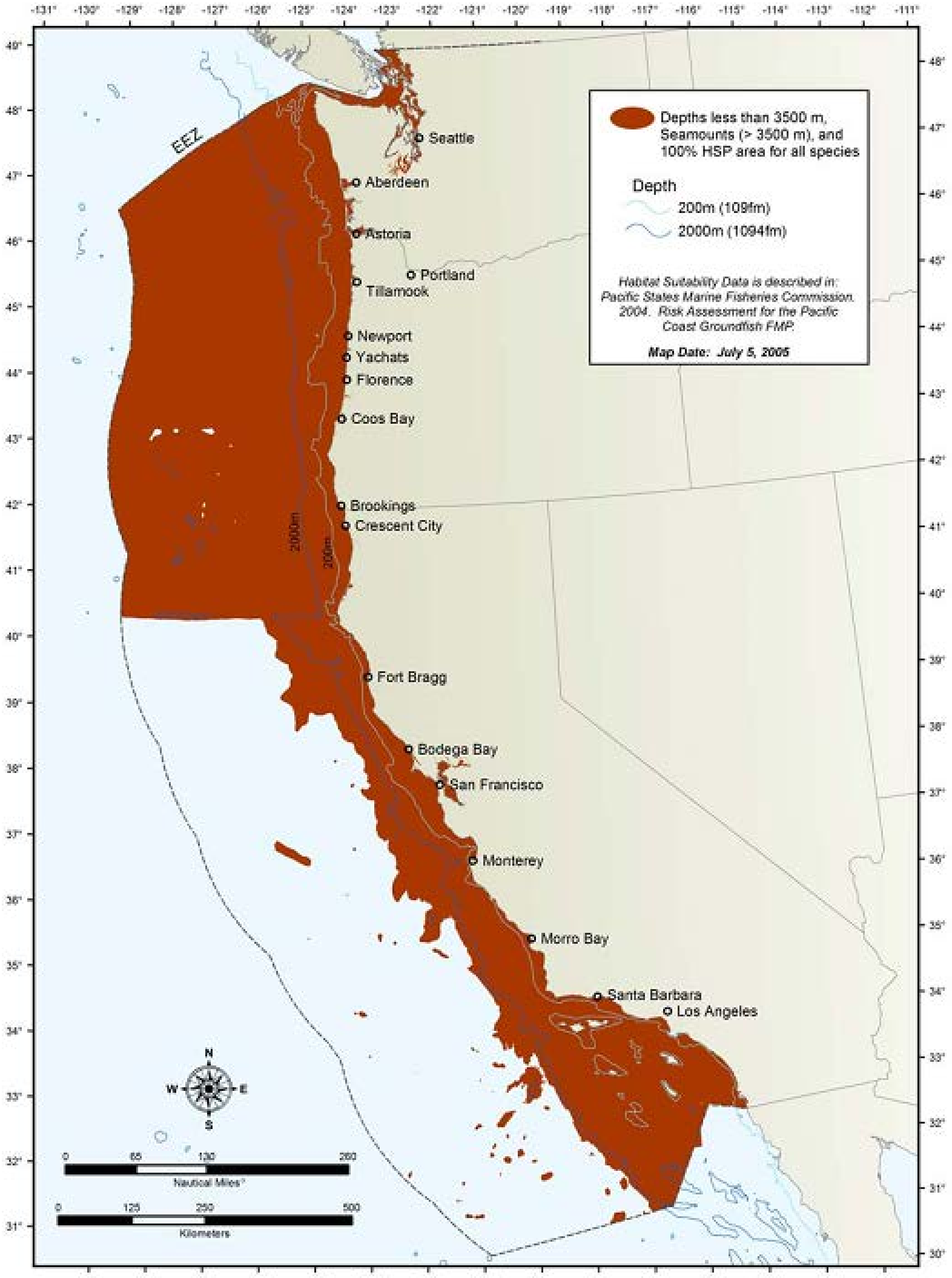


Figure 9.1 Groundfish EFH (PFMC, 2005a)

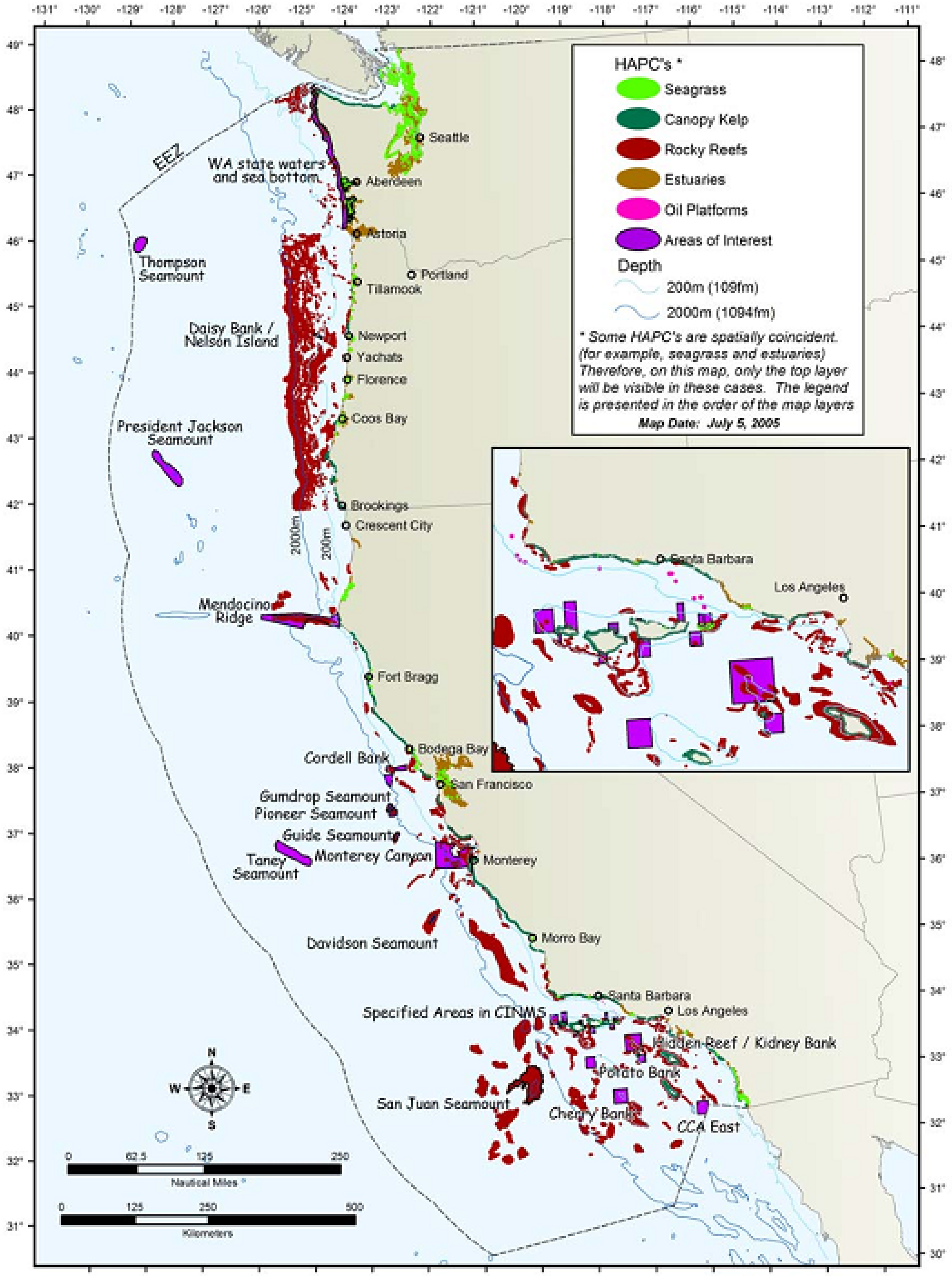


Figure 9.2 Groundfish HAPC (PFMC, 2005a)

9.1.2 Salmon

Three salmon species are managed under the PFMC's Salmon Fishery Management Plan (FMP): chinook, coho, and Puget Sound pink salmon. Most salmon are anadromous, spending portions of their lives in both fresh water and the ocean. Since the proposed action area is offshore, only the marine portion of EFH is discussed. Marine salmon EFH is important to rearing of juveniles and migration of both juveniles and adults. Important habitat features include water quality, temperature, presence of prey species and forage base, adequate depth in offshore areas and adequate cover, vegetation and algae in estuarine and near-shore habitats.

Distribution of salmon in the marine environment is extensive, varies seasonally and interannually, and can only be defined generally as it has not been extensively sampled in many ocean areas. Therefore, a comprehensive rather than a limiting approach was used to define salmon EFH. The marine portion of the EFH includes the full extent of the U.S. exclusive economic zone (EEZ) north of Point Conception, CA; this is shown by the dashed line in Figure 9.3. Waters off the coast of Canada are salmon habitat but are not included in these designations because they are outside of the jurisdiction of the United States.

Salmon EFH is fully identified and described in Appendix A of Amendment 18 to the Pacific Coast Salmon Fishery Management Plan (PFMC, 2014).

Figure 9.3 Overall geographic extent of EFH for Chinook salmon, coho salmon, and Puget Sound pink salmon (PFMC 2014)

9.1.3 Coastal Pelagic Species

The coastal pelagic species (CPS) fishery includes four finfish (Pacific sardine, Pacific mackerel, northern anchovy, and jack mackerel) and one invertebrate (market squid). The finfish, generally occur above the thermocline in the upper mixed layer, and thus are not associated with substrate. For purposes of EFH, the finfish are treated as a single species complex due to similarities in their life histories and habitat requirements. Although market squid spawn in benthic regions, they are considered part of the same species complex because they are fished above spawning aggregations. There is also more distributional data available for finfish, so this data is used to define EFH for all five species including the squid.

EFH for the CPS is identified in Appendix D of Appendix 8 to The Coastal Pelagic Species Fishery Management Plan. EFH is defined based on presence/absence distribution data. The geographic extent of CPS finfish varies widely over time in response to the temperature of the upper mixed layer of the ocean. Adults are generally only found in waters between 10° and 26° C, and spawning is most common from 14° to 16° C. EFH for these species is thus defined as all marine and estuarine waters above the thermocline from the western shoreline of the continental U.S. to the limits of the EEZ where sea surface temperatures range from 10° to 26° C.

Sea temperature is consistently below 26° C north of the U.S-Mexico border, so the southern boundary of U.S. EFH for CPS is the maritime boundary with Mexico. The northern boundary, corresponding to the 10° C isotherm, is dynamic due to seasonal and annual variations in sea surface temperature. In February during winters with cold sea temperatures, the 10° C isotherm is near Cape Mendocino, CA along the coast (about 40° N latitude) and at about 43° N latitude further offshore. In February of warm winters, the 10° C isotherm is further north along the coast but still at about 43° N latitude offshore. In August of both warm and cold years the 10° isotherm is located off of Alaska and Canada, so in summertime the EFH includes the entire EEZ off the coast of the continental U.S. Figure 9.4 and Figure 9.5 show the variation in the northern boundary of the EFH as defined by the 10° C isotherm, as well as in the preferred spawning range between 14° and 16° C (PFMC, 1998a).

Figure 9.4 February Sea Surface Temperatures of the Three Coldest Winters Recorded prior to 1998 (PFMC, 1998a)

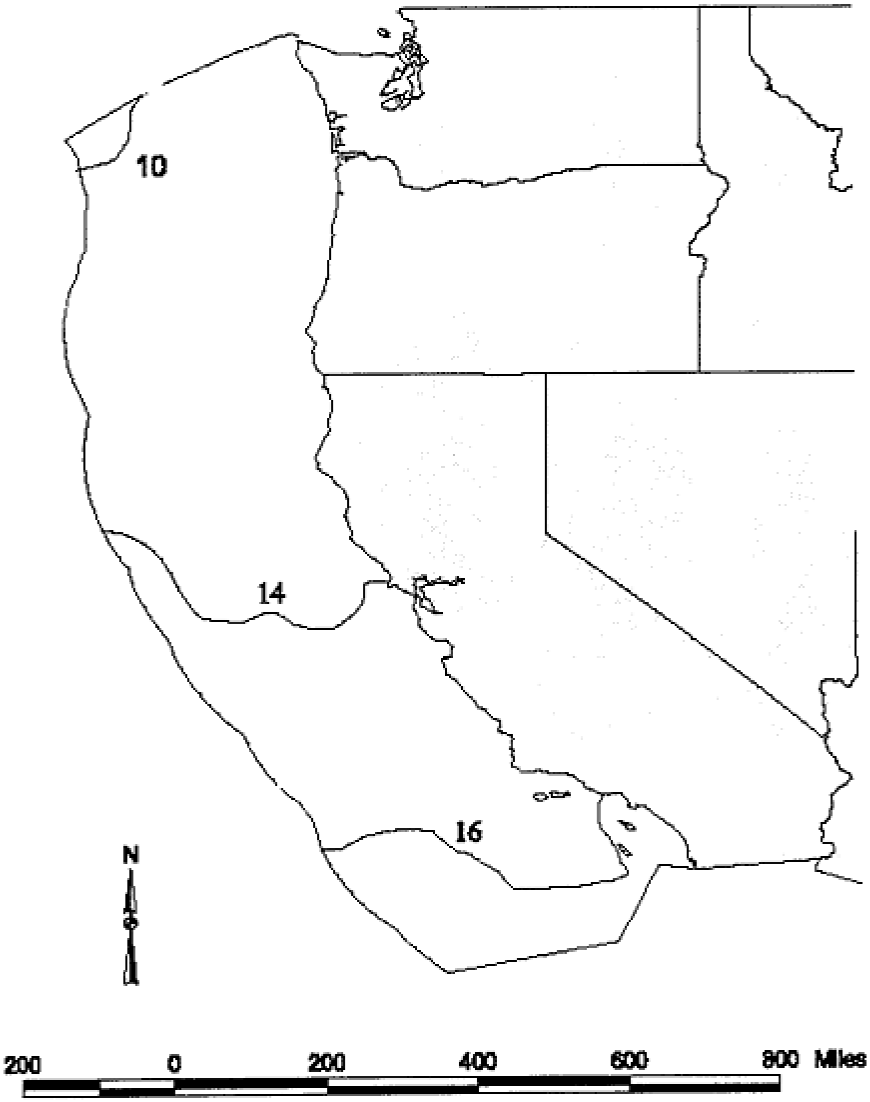


Figure 9.5 February Sea Surface Temperatures of the Three Warmest Winters Recorded prior to 1998 (PFMC, 1998a)

9.1.4 Highly Migratory Species

The 13 highly migratory species (HMS) managed by the PFMC are listed in Table 9.2 along with checkmarks indicating if EFH for a particular life stage is part of the Draft Permit action area. EFH for each potentially affected life stage for those seven species is further described below, based on descriptions found in Appendix F of the Fishery Management Plan for U.S. West Coast Fisheries for Highly Migratory Species (PFMC, 2007).

The following habitat terms are defined as follows:

> *Epipelagic*: Vertical habitat within the upper ocean water column from the surface to depths generally not exceeding 200 m (0-109 fathom), i.e., above the mesopelagic zone;

Mesopelagic: Vertical habitat within the mid-depth ocean water column, from depths between 200 and 1000 m (109-547 fm.);

Neritic: Inhabiting coastal waters primarily over the continental shelf; generally over bottom depths equal to or less than 183 m or 100 fm. deep;

Oceanic: Inhabiting the open sea, ranging beyond continental and insular shelves, beyond the neritic zone.

Table 9.2 EFH intersection with Draft Permit action area for highly migratory species

Sharks	Neonate / early juveniles	Late juveniles / sub-adults	Adults
Common Thresher			✓
Pelagic Thresher			
Bigeye Thresher			✓
Shortfin Mako	✓	✓	✓
Blue Shark	✓	✓	✓
	Eggs and larvae	Juvenile	Adult
Tunas			
Albacore		✓	✓
Bigeye			
Northern Bluefin		✓	
Skipjack			
Yellowfin			
Striped Marlin			
Broadbill Swordfish			✓
	Spawning, eggs and larvae	Juveniles and sub-adults	Adults
Dorado (Mahimahi)			

9.1.4.1 Common thresher shark

EFH for adult common thresher sharks, in other words those with a fork length (FL) greater than 166 cm, is defined as epipelagic, neritic and oceanic waters off beaches and open coast bays, in near surface waters from the U.S.-Mexico EEZ border north seasonally to Cape Flattery, WA. North of the Mendocino Escarpment EFH extends from the 40 fathom isobath westward to about 127° 30' W longitude. Adult common thresher shark EFH is shown in Figure 9.6.

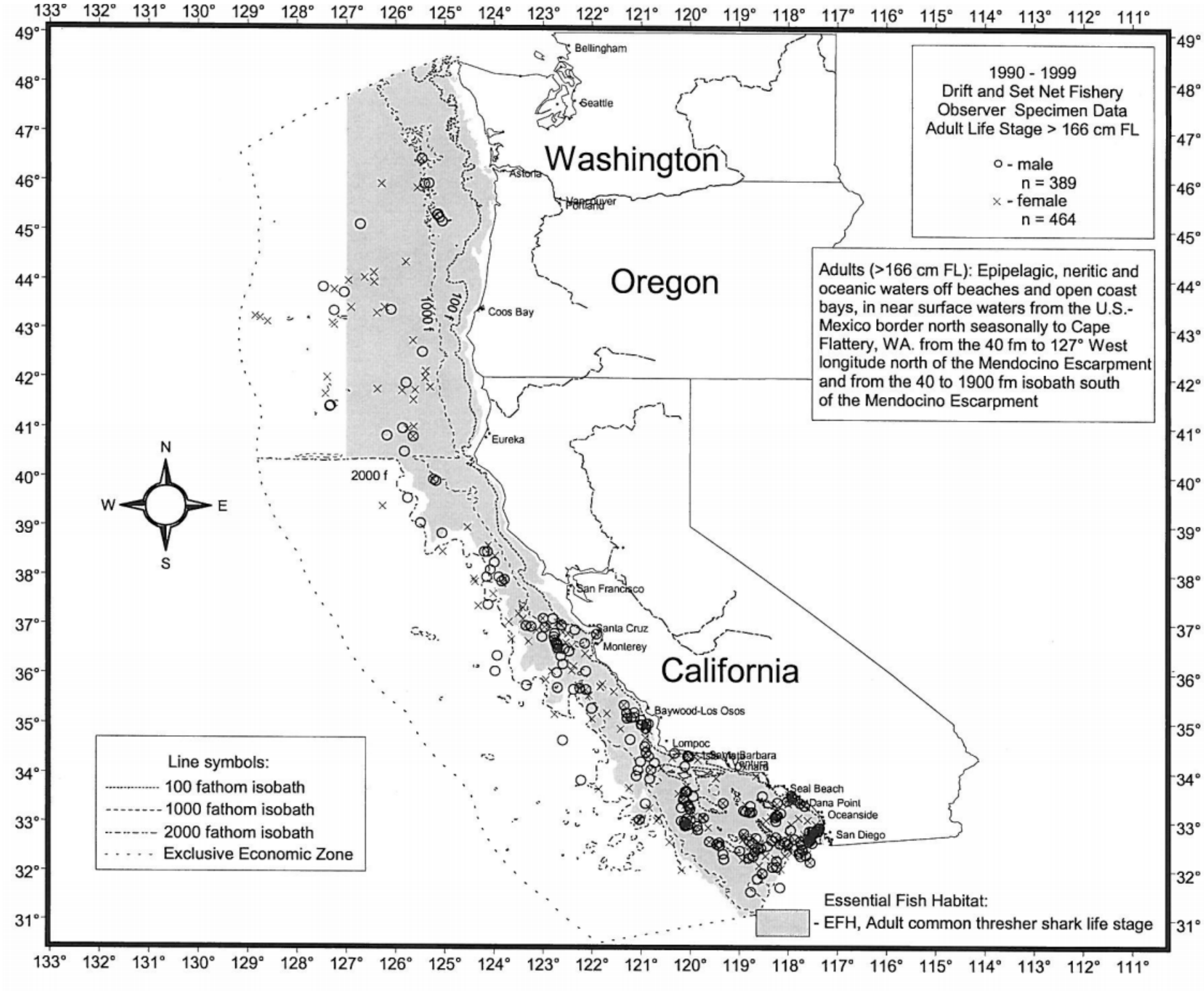


Figure 9.6 Essential Fish Habitat for Common Thresher Shark, Adult Life Stage (PFMC, 2007)

9.1.4.2 Bigeye thresher shark

EFH for adult bigeye thresher sharks (males > 154 cm FL and females >188 cm FL), shown in Figure 9.7, is defined as coastal and oceanic waters epi- and mesopelagic zones from the U.S.-Mexico border north to 45° N latitude off Cascade Head, Oregon. North of 34° N latitude (Southern California) EFH extends from the 800 fm. isobath out to the outer EEZ boundary.

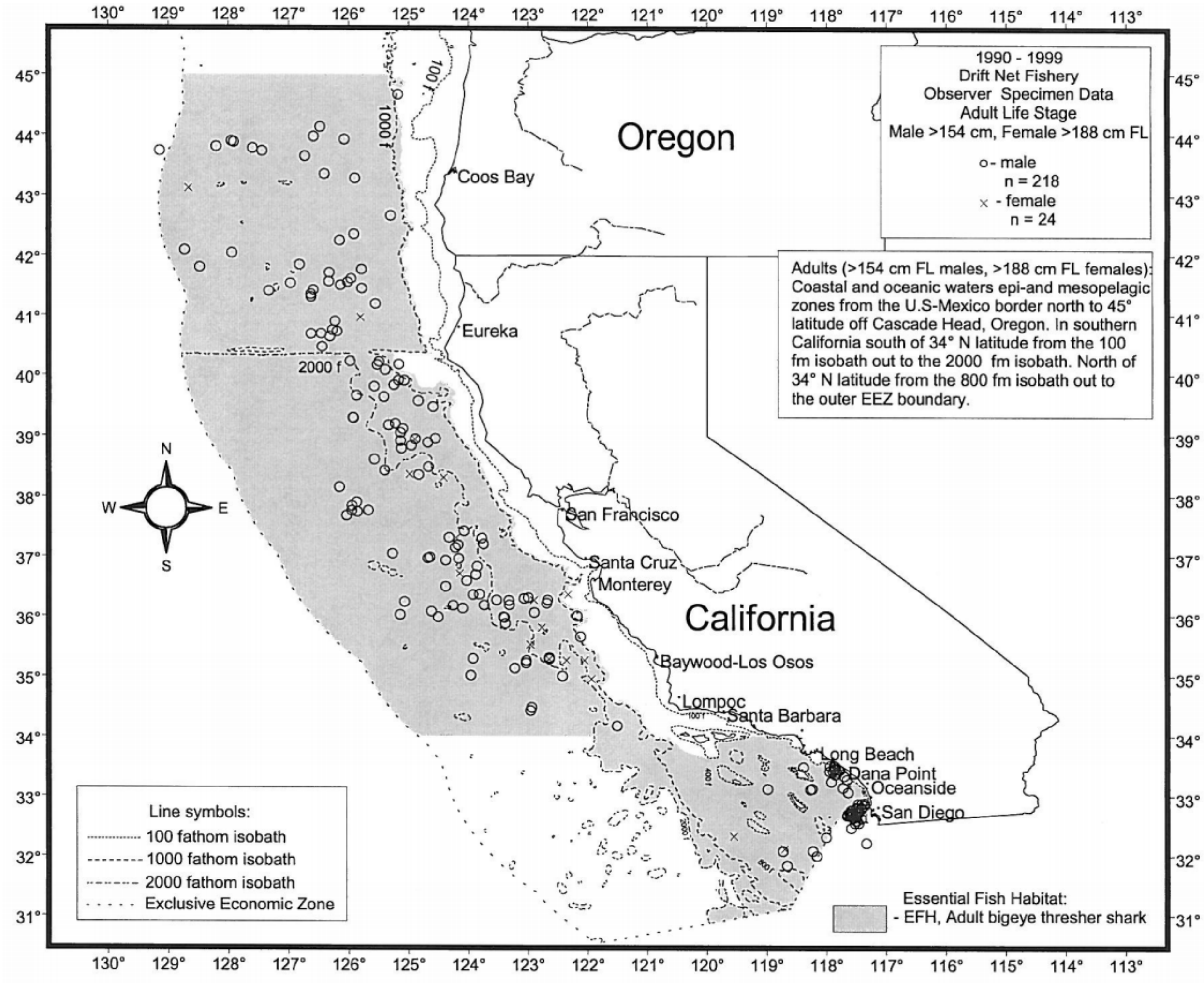


Figure 9.7 Essential Fish Habitat for Bigeye Thresher Shark, Adult Life Stage (PFMC 2007)

9.1.4.3 Shortfin mako shark

EFH for neonate and early juvenile shortfin mako sharks (< 101 cm FL) is defined as oceanic and epipelagic waters of the U.S. West Coast from the 100 fm. isobath out to the 2000 fm. isobath (and possibly beyond) from the Mexico border to Point Pinos, CA, especially the Southern California Bight, from the 1000 fm. isobath out to 2000 fm. isobath from Monterey Bay north to Cape Mendocino; and from the 1000 fm. isobath out to the EEZ boundary north of Cape Mendocino to latitude 46° 30' N latitude. The shortfin mako occupies northerly habitat during warm water years.

EFH for late juveniles and sub-adults (> 100 cm FL and < 180 cm FL males and < 249 cm FL females) is defined as oceanic and epipelagic waters from the U.S.-Mexico EEZ border north to 46° 30' N latitude from the 100 fm. isobath out to the EEZ boundary north to San Francisco (38° N), and from 1000 fm. out to the EEZ boundary north of San Francisco. The large majority of makos within the EEZ are juveniles.

EFH for adults (> 179 cm FL males and > 248 cm FL females--Most adults within the U.S. West Coast EEZ are males) is defined as epipelagic oceanic waters from the U.S.-Mexico EEZ border north to 46° 30' N latitude extending from the 400 fm. isobath out to the EEZ boundary south of Point Conception, CA, and from 1000 fm. isobath out to the EEZ boundary and beyond north of Point Conception.

EFH for all life stages of shortfin mako shark is shown in Figure 9.8.

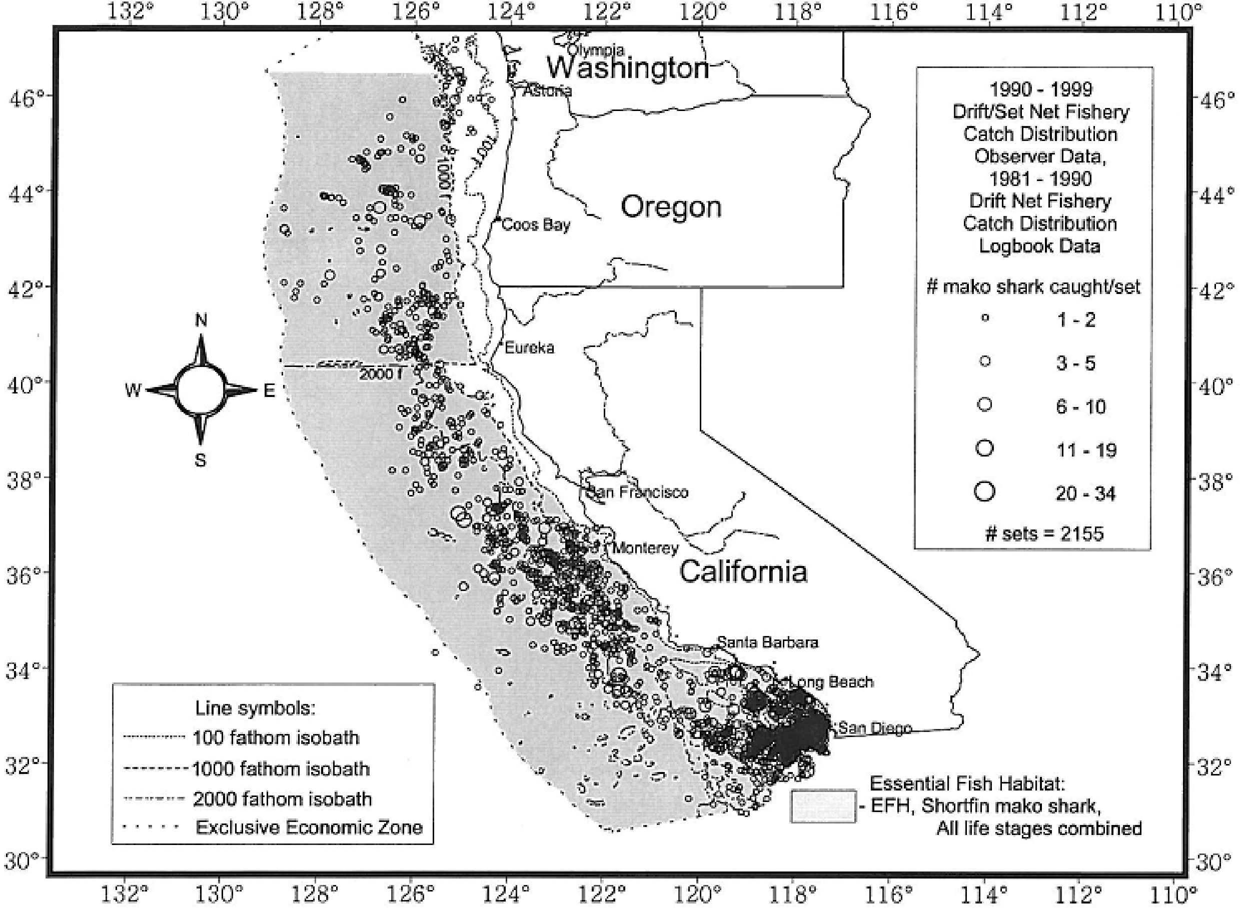


Figure 9.8 Essential Fish Habitat for Shortfin Mako Shark, All Life Stages Combined (PFMC, 2007)

9.1.4.4 Blue shark

EFH for neonate and early juvenile blue sharks (< 83 cm FL) is defined as epipelagic, oceanic waters from the U.S.-Mexico border north to the U.S.-Canada border from the 1000 fm. isobath seaward to the outer boundary of the EEZ and beyond; extending inshore to the 100 fm. isobath south of 34° N latitude.

EFH for late juveniles and sub-adults (> 82 cm FL and < 167 cm FL males and < 153 cm FL females) is defined as epipelagic, oceanic waters from the U.S.-Mexico border north to 37° N latitude (off Santa Cruz, CA) from the 100 fm. isobath seaward to the outer boundary of the EEZ and beyond; and north to the U.S.-Canada border from the 1000 fm. isobath seaward to the EEZ outer boundary.

EFH for adults (> 166 cm FL males and > 152 cm FL females) is defined as epipelagic, oceanic waters from the U.S.-Mexico border north to the U.S.-Canada border from the 1000 fm. isobath seaward to the outer boundary of the EEZ and beyond; extending inshore to the 200 fm. isobath south of 37° N latitude off Santa Cruz, CA.

EFH for all life stages of blue shark is shown in Figure 9.9.

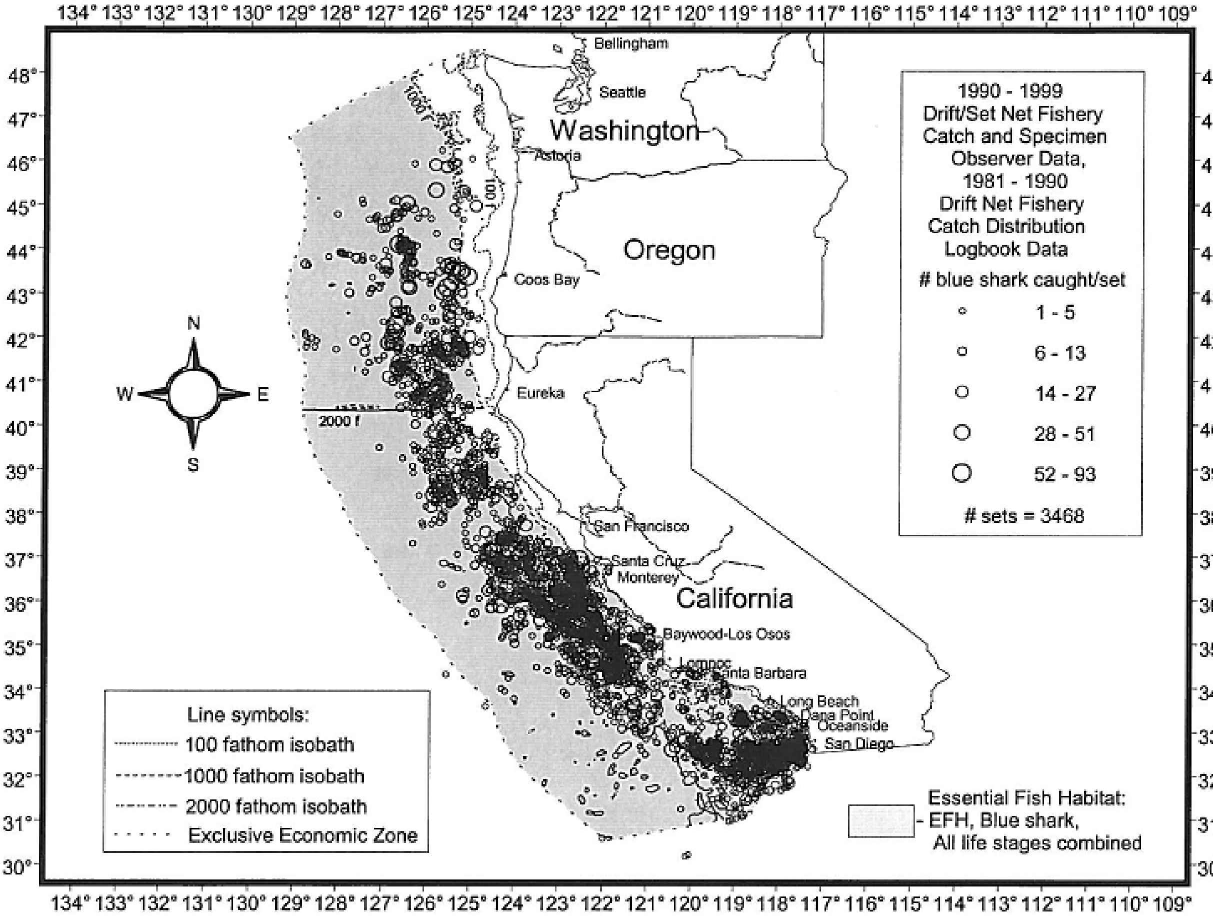


Figure 9.9 Essential Fish Habitat for Blue Shark, All Life Stages Combined (PFMC, 2007)

9.1.4.5 Albacore tuna

EFH for juvenile albacore (< 85 cm FL) is defined as oceanic, epipelagic waters generally beyond the 100 fm. isobath from the U.S.-Mexico EEZ border north to U.S.-Canada border, and westward to the outer edge of the EEZ boundary. There are habitat concentrations off southern and central California and the area of the Columbia River Plume. Juvenile albacore are associated with sea surface temperatures (SSTs) between 10°C and 20°C in waters of the North Pacific Transition Zone in dissolved oxygen saturation levels greater than 60%. In the PFMC region, they may aggregate in the vicinity of upwelling fronts for feeding.

EFH for adult albacore (>84 cm FL) is defined as oceanic, epipelagic waters generally beyond the 100 fm. isobath from the U.S.-Mexico EEZ border north to U.S.-Canada border, and westward to the outer edge of the EEZ boundary. Adult albacore are associated with SSTs between 14°C and 25°C in waters of the North Pacific Transition Zone in dissolved oxygen saturation levels greater than 60%.

EFH for both of these life stages for albacore tuna is shown in Figure 9.10.

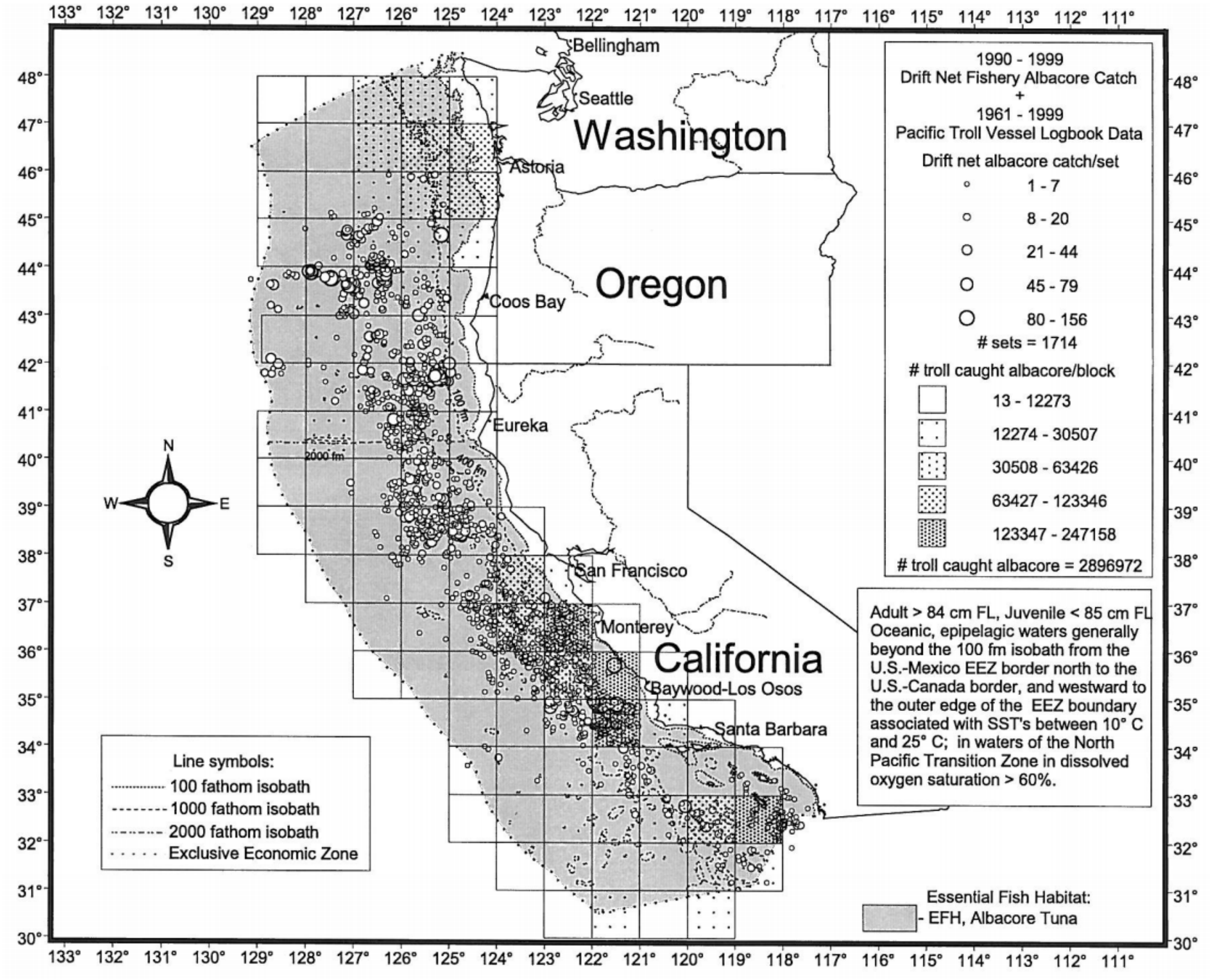
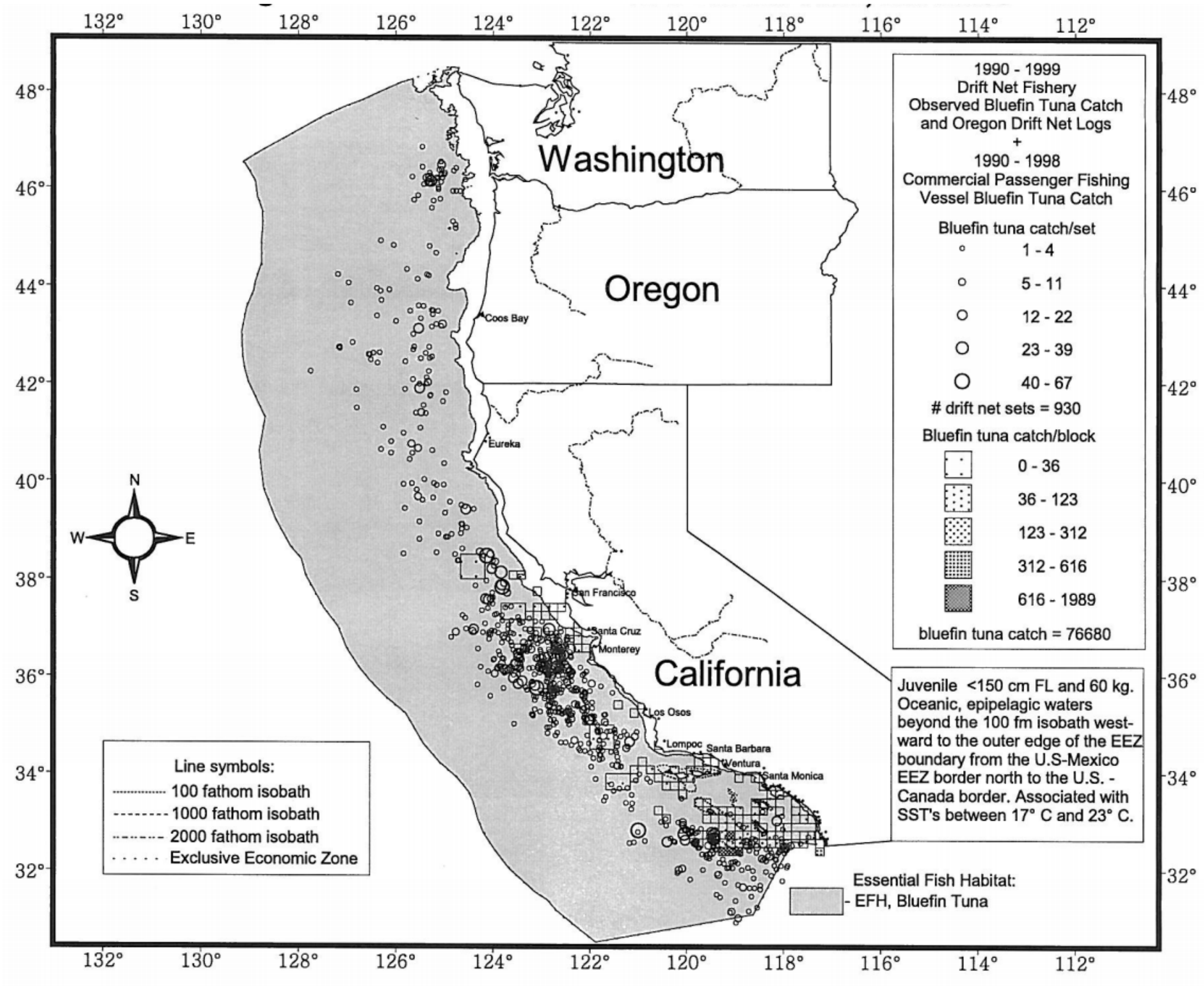


Figure 9.10 Essential Fish Habitat for Albacore Tuna, Adults and Juveniles (PFMC, 2007)

9.1.4.6 Northern bluefin tuna

EFH for juvenile northern bluefin tuna (<150 cm FL and 60 kg), shown in Figure 9.11, is defined as oceanic, epipelagic waters beyond the 100 fm. isobath from the U.S.-Mexico EEZ border north to U.S.-Canada border, and westward to the outer edge of the EEZ boundary. Juvenile bluefins are associated with SSTs between 14°C and 23°C. Northerly migratory extension appears dependent on the position of the North Pacific Subarctic Boundary.



Juvenile <150 cm FL and 60 kg. Oceanic, epipelagic waters beyond the 100 fm isobath westward to the outer edge of the EEZ boundary from the U.S-Mexico EEZ border north to the U.S. - Canada border. Associated with SST's between 17° C and 23° C.

Figure 9.11 Essential Fish Habitat for Bluefin Tuna, Juveniles (PFMC, 2007)

9.1.4.7 Broadbill swordfish

EFH for adult broadbill swordfish (Males > 102 cm eye fork length (EFL) or 117 jaw-to-fork length (JFL); females > 144 cm EFL or 162 JFL), shown in Figure 9.12, is defined as oceanic, epipelagic and mesopelagic waters out to the EEZ boundary inshore to the 400 fm. isobath in southern and central California from the U.S.-Mexico EEZ border north to 37° N latitude; beyond the 1000 fm. isobath northward to 46° 40' N.

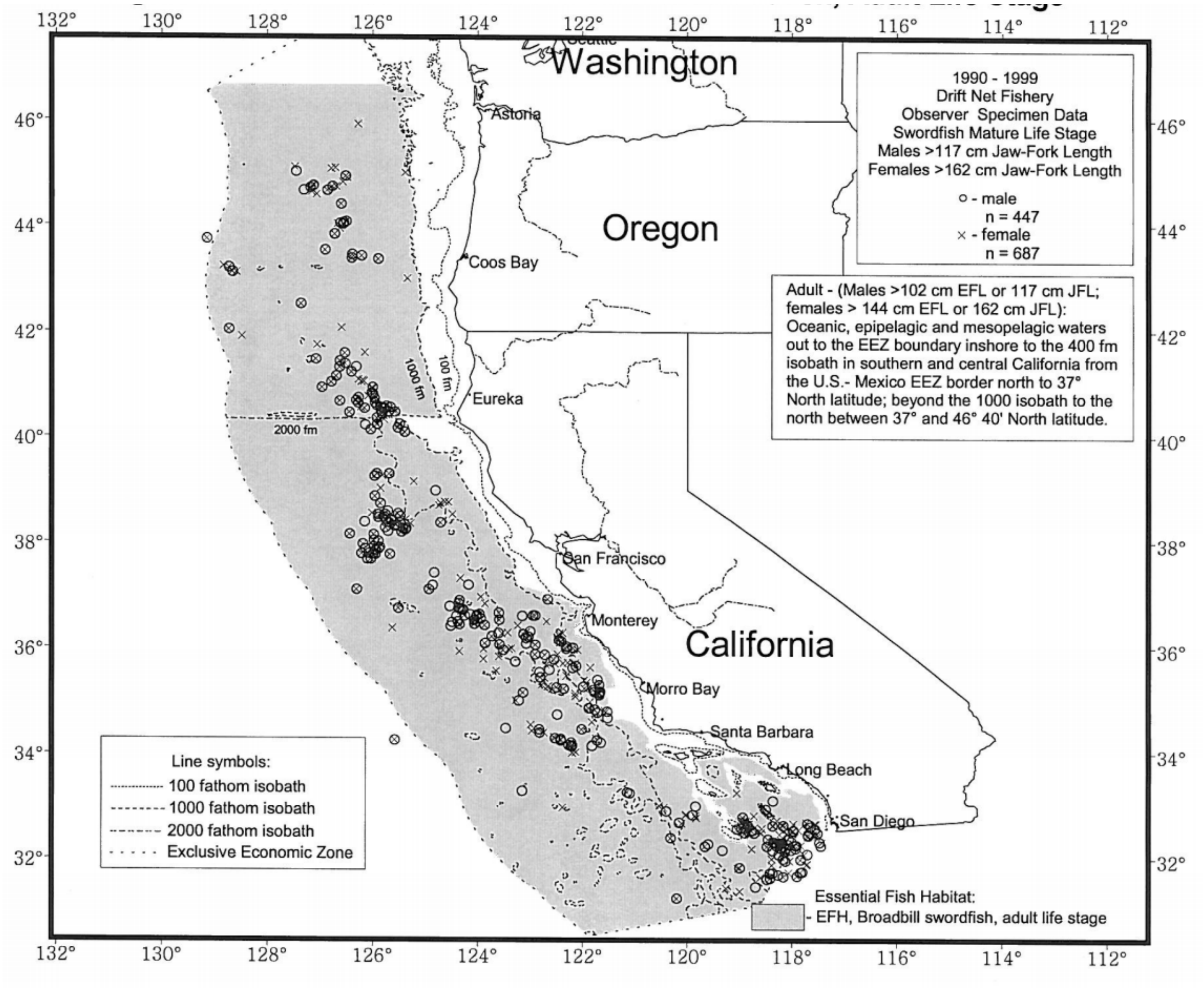


Figure 9.12 Essential Fish Habitat for Broadbill Swordfish, Adult Life Stage (PFMC, 2007)

9.2 POTENTIAL EFFECTS OF PROPOSED ACTION

As described in the previous section, offshore seafood processing waste discharge proposed by this Draft Permit is likely to occur within essential fish habitat (EFH) for groundfish, salmon, coastal pelagic species, and seven of the thirteen highly migratory species managed by the Pacific Fisheries Management Council (PFMC).

The following description of potential adverse effects from seafood processing discharges is taken nearly verbatim from a NOAA Fisheries document called Non-Fishing Impacts to Essential Fish Habitat and Recommended Conservation Measures (NOAA, 2003). Seafood processing wastes consist of biodegradable materials that contain high concentrations of soluble organic material. Offshore seafood processing operations have the potential to adversely affect EFH through (1) direct source discharge, (2) particle suspension, and (3) increased turbidity and surface plumes.

Offshore seafood processing operations have the potential to adversely affect EFH through the direct discharge of nutrients, chemicals, fish byproducts and “stickwater” (water and entrained organics originating from the draining or pressing of steam-cooked fish products). EPA investigations show that impacts affecting water quality are direct functions of the receiving waters. In areas with strong currents and high tidal ranges, waste materials disperse rapidly. In areas of quieter waters, waste materials can accumulate and result in shell banks, sludge piles, dissolved oxygen depressions, and associated aesthetic problems (Stewart and Tangarone, 1977). There is a potential for disposal of fish waste in areas without enough flushing to prevent decomposition and the resulting dissolved oxygen depression (USEPA, 1993). However, this Draft General Permit only allows discharge in the open ocean, and prohibits discharge during April 15 – October 15 in waters shallower than 100 meters, as well as year-round over the Heceta/Stonewall Bank complex (which is known to be sluggish, retentive, and prone to hypoxia).

Vessels discharging seafood processing waste are required to have NPDES permit coverage. Although fish waste, including heads, viscera, and bones, is biodegradable, fish parts that are ground to fine particles may remain suspended for some time, thereby overburdening habitats from particle suspension (NPFMC, 1999). Such pollutants have the potential to adversely impact EFH. The wide differences in habitats, types of processors, and seafood processing methods define those impacts and can also prevent the effective use of technology-based effluent limits.

Scum and foam from seafood processing waste deposits can also occur on the water surface and/or increase turbidity. Increased turbidity decreases light penetration into the water column, reducing primary production. Reduced primary production decreases the amount of food available for consumption by higher trophic level organisms. In addition, stickwater can take the form of a fine gel or slime that can concentrate on surface waters and move onshore to cover intertidal areas.

These effects are further discussed in Section 5.4

9.2.1 Potential Effects of Action on Groundfish EFH

As shown in Figure 9.1, nearly the entire action area is part of groundfish EFH, meaning that discharge of seafood processing waste will occur in locations deemed necessary to these fish for spawning, breeding, feeding, or growth to maturity. In addition, at least two types of Habitat Areas of Particular Concern (a large area of rocky reefs and two seamounts) occur within the action area.

As the name suggests, groundfish are generally demersal for most of their lives. Nevertheless, only a small number of PFMC-managed groundfish species lay demersal eggs. The rest either give birth to live young or lay eggs that are pelagic or epipelagic. The exceptions to this are rock sole, most roundfish, skates, and ratfish (PFMC, 2005b). Smothering of eggs lain by these species could occur due to burial by anoxic decomposing waste piles on the seafloor. Larvae, juveniles, and adults are mobile, so they may be able to avoid waste accumulations.
Seafood processing wastes that are discharged during spawning and egg production periods have the most potential to adversely affect these species. Near-shore seafood operations have a greater likelihood to adversely impact spawning activities than off-shore operations because spawning grounds are more commonly found in these waters, and because waste dispersal is expected to be faster in deeper waters. It is not known at what depth of deposition egg survival would be impaired. However, it is reasonable to conclude that impairment may occur at fairly shallow waste depths if that depth of waste was sufficient to impair oxygen transfer to the egg or if anoxic conditions were present such as those commonly observed in and around a deposition zone (e.g., Germano & Associates, 2004).

Localized areas of poor water quality (increased turbidity, increased particle suspension, lower dissolved oxygen content) could occur within groundfish EFH, particularly in shallower areas with less tidal flushing. Parts of the benthic habitat in which they spend most of their lives may be altered by accumulation of waste piles, but the EPA believes that accumulation of waste piles is extremely unlikely given that discharge will take place in the open ocean from moving vessels. In addition to potential direct impacts caused by this contamination, groundfish could be indirectly affected if the abundance and health of invertebrates and other prey species are affected by seafood processing waste discharge. However, the Draft Permit only allows discharge in the open ocean, and prohibits discharge year-round over the Heceta/Stonewall Bank complex, and in waters shallower than 100 meters during the summer upwelling season. In addition, the EPA proposes that vessels must be moving while discharging.

9.2.2 Potential Effects of Action on Salmon EFH

As shown in Figure 9.3, the entire action area is part of Pacific salmon EFH. Salmon spend the middle part of their life cycle in the ocean, arriving as juveniles after rearing in freshwater. They spend a few weeks to months maturing in estuaries and nearshore waters, then move offshore to migrate at sea. After 1-6 years at sea, they return to the freshwater habitat of their birth to spawn and subsequently die. Therefore, the marine portion of salmon EFH is necessary specifically for feeding and growth to maturity.

Salmon lay eggs in fresh water, so there is no danger of suffocation of eggs or larvae due to accumulation of waste on the seafloor.

Localized areas of increased turbidity, increased particle suspension, and lower dissolved oxygen content are likely to occur within salmon EFH, particularly in shallower areas with less tidal flushing. In addition to potential direct impacts caused by poor water quality, salmon could be indirectly affected if the abundance and health of their prey is affected by seafood processing waste discharge. However, the Draft Permit only allows discharge in the open ocean where dilution is high, and prohibits discharge year-round over the Heceta/Stonewall Bank complex, and in waters shallower than 100 meters during the summer upwelling season. In addition, the EPA proposes that vessels must be moving while discharging.

9.2.3 Potential Effects of Action on Coastal Pelagic Species EFH

As explained in Section 9.1.3, the exact boundaries of EFH for Pacific coastal pelagic species depend on the year as well as the time of year. Except during cold winters, the 10° C isotherm is likely to be sufficiently far north that the entire proposed action area is part of CPS EFH.

The four finfish CPS lay eggs that remain at or near the surface of the ocean. Female market squids, however, attach eggs to the seafloor (PFMC, 1998a). As a result, these eggs could be at risk of smothering due to burial by anoxic decomposing waste piles from offshore seafood processing discharges.

Localized areas of increased turbidity, increased particle suspension, and lower dissolved oxygen content are likely to occur within CPS EFH, particularly in shallower areas with less tidal flushing. In addition to potential direct impacts caused by poor water quality, CPS could be indirectly affected if the abundance and health of their prey is affected by seafood processing waste discharge. However, the Draft Permit only allows discharge in the open ocean, and prohibits discharge year-round over the Heceta/Stonewall Bank complex, and in waters shallower than 100 meters during the summer upwelling season. In addition, the EPA proposes that vessels must be moving while discharging.

9.2.4 Potential Effects of Action on EFH for Highly Migratory Species

As explained in Section 9.1.4, EFH for seven HMS (common thresher, bigeye thresher, shortfin mako, blue shark, albacore tuna, northern bluefin tuna, and broadbill swordfish) intersects within the Draft Permit action area at some or all life stages.

No HMS have EFH in the action area for the egg to larva life stage, and no HMS lay demersal eggs, so potential suffocation of eggs beneath anoxic deposits of seafood processing discharge is unlikely.

Localized areas of increased turbidity, increased particle suspension, and lower dissolved oxygen content are likely to occur within this EFH, particularly in shallower areas with less tidal flushing. However, the Draft Permit only allows discharge in the open ocean, and prohibits discharge year-round over the Heceta/Stonewall Bank complex, and in waters shallower than 100 meters during the summer upwelling season. In addition, the EPA proposes that vessels must be moving while discharging.

9.3 EFH CONSERVATION MEASURES

As described in Section 9.2, EPA's proposed action is not likely to adversely affect essential fish habitat for groundfish, salmon, coastal pelagic species, and certain highly migratory species.

The EPA submitted a Biological Evaluation (BE) dated August 2015 to the NMFS, including the EPA's EFH assessment. On December 18, 2015, the NMFS communicated to the EPA that the proposed action could adversely affect EFH because of impacts to water quality (via pollutant loading and decreased dissolved oxygen) and to benthic conditions (because of laying of discharged fish processing waste on the sea floor). The NMFS provided the following conservation recommendations to avoid, mitigate, or offset the impact of the proposed action on EFH:

1) To minimize water quality impacts from nutrient loading that spurs algal growth, no discharge shall occur in or within 250 feet of a visible algal bloom;

2) To minimize impacts to Habitat Areas of Particular Concern, no discharge shall occur over or within 250 feet of rocky reefs;

3) To minimize water quality impacts from nutrient loading that increase demand for dissolved oxygen, no discharge shall occur in or within 250 feet of an identified hypoxic zone; and

4) To ensure that dispersal of discharged material is sufficient to reduce impacts to both water quality and benthic conditions, vessels shall maintain, so long as safety permits, a minimum vessel speed of 5 knots during discharge to minimize density of effluent.

The EPA has worked with the NMFS and subject matter experts, and has made significant improvements to the Draft Permit. The EPA has responded to these conservation recommendations via letter, concurrent with this second public notice period.

9.4 CONCLUSIONS

Several specific mechanisms by which offshore seafood processors could potentially impact aspects of EFH have been described in Section 9.2. Impacts from accumulated processing wastes can alter benthic habitat, reduce locally associated invertebrate populations, increase turbidity, increase particle suspension, and lower dissolved oxygen levels in overlying waters. This could result in reduced prey availability or loss of habitat for some of the FMP managed species.

EPA expects that these effects, while possible, are likely to be limited in extent for several reasons. First, the spatial scale of impacts to EFH would be limited given the large geographic ranges of species' habitat and the limited aggregate area of offshore seafood processor discharges. In addition, some EFH species may have the ability to avoid areas where seafood processing discharges occur. Discharge is unlikely to accumulate in any given area since processing vessels are in motion at all times and discharges will be at least 3 nm from shore, where it is expected that strong currents and high tidal ranges will cause the waste to disperse rapidly.

As described in the EPA's response to the NMFS, the EPA has taken the following actions to address the NMFS' EFH concerns:

1. The EPA considered prohibiting discharge over the Juan de Fuca Eddy, a known harmful algal bloom initiation site, but found that there currently is no evidence to suggest that nutrient inputs from fish processing will be sufficient to cause toxic algal blooms (Trainer, personal communication, 2016). Heceta Bank is also a HAB hotspot (Trainer, personal communication, 2016), and the EPA proposes to prohibit discharge year-round over the Heceta/Stonewall Banks complex. See Section 4.5.3 and Figure 2.3.3c for more detail.
2. The EPA is proposing to prohibit discharge year-round over the Heceta/Stonewall Banks rocky reef complex, which is known to be retentive/sluggish, and prone to hypoxia. See Section 4.5.2 and Figure 2.3.3c for more detail.
3. The EPA is proposing to prohibit discharge in waters shallower than 100 meters during the summer upwelling season, when hypoxia is likely to occur at the seafloor. See Section 4.5.2 and Figure 2.3.3b for more detail.
4. The EPA is proposing a new provision that vessels must be moving while discharging, unless doing so would compromise the safety of the vessel.

In light of these improvements to the re-proposed Draft General Permit to address NMFS's conservation recommendations, and because of the reasons articulated by the NMFS in its concurrence that this General Permit is not likely to adversely affect ESA-listed species (see Section 5.6), EPA has determined that approval of the Draft Permit **is unlikely to adversely affect** EFH for groundfish, salmon, coastal pelagic species, and highly migratory species.

9.5 ESSENTIAL FISH HABITAT REFERENCES

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