FINAL BIOLOGICAL EVALUATION FOR THE GENERAL NPDES PERMIT FOR OFFSHORE SEAFOOD PROCESSORS IN ALASKA

Permit No. AK-G52-4000

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ACRONYMS

AAC	Alaska Administrative Code
ACMP	Alaska Coastal Management Program
ADEC	Alaska Department of Environmental Conservation
AI	Aleutian Islands
BAT	Best available pollution control technology economically achievable
BCT	Best conventional pollution control technology
BOD	Biochemical oxygen demand
BPT	Best practicable control technology
BPJ	Best professional judgement
BS	Bering Sea
CFR	Code of Federal Regulations
CMP	Coastal Management Plan
COD	Chemical oxygen demand
CWA	Clean Water Act
CZMP	Coastal Zone Management Program
DO	Dissolved oxygen
DPS	Distinct Population Segment
EFH	Essential Fish Habitat
ELG	Effluent limitations guidelines
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ESU	Evolutionary Significant Unit
FC	Fecal coliform
GC/MS	Gas chromatography/mass spectrometry
GOA	Gulf of Alaska
HPC	Habitat of Particular Concern
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter
MLLW	Mean lower low water
MMPA	Marine Mammal Protection Act
MSA	Magnuson-Stevens Act
nm	Nautical mile
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
NSPS	New Source Performance Standards
ODCE	Ocean Discharge Criteria Evaluation
ppm	Parts per million
ppt	Parts per thousand
TSS	Total suspended solids
TMDL	Total Maximum Daily Load
USFWS	U.S. Fish and Wildlife Service
ZOD	Zone of Deposit

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1.0. BACKGROUND

1.1 PROJECT HISTORY

The U.S. Environmental Protection Agency's (EPA) is proposing to issue the National Pollutant Discharge Elimination System (NPDES) general permit (Permit No. AK-G52-4000) for the discharge of seafood processing wastes by offshore seafood processors in Alaska pursuant to the provisions of the Clean Water Act, 33 U.S.C. 1251. The Seafood General Permit expired July 27, 2006 and has been administratively extended. EPA proposes that the general permit be reissued with the modification that offshore seafood processors will be covered in a separate permit than onshore seafood processors. EPA previously consulted with the services on the last NPDES General Permit for Seafood Processors in Alaska (AK-G52-0000) which was approved in 2001.

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 a National Pollutant Discharge Elimination System (NPDES) permit. EPA's regulations authorize the issuance of general NPDES permits, as opposed to individual NPDES permits, to categories of discharges when a number of point source discharges:

- Involve the same or substantially similar types of operations;
- Discharge the same types of wastes;
- Are located within a geographic area;
- Require the same effluent limitations;
- Require the same operating conditions;
- Require the same or similar monitoring requirements; and
- In the opinion of EPA, are more appropriately controlled under a general permit than under individual permits (40 CFR 122.28).

EPA has determined that the owners and operators of offshore seafood processing facilities described in Part 1 of NPDES permit AK-G52-4000 are authorized to discharge seafood processing wastes and the concomitant wastes set out in Part II of the permit to waters of the United States as described in Part III of the permit, in accordance with effluent limitations, monitoring requirements and other conditions set forth in the permit under the provisions of a general permit (EPA 2009).

1.2 FEDERAL ACTION HISTORY

This section summarizes exchanges between EPA, the National Marine Fisheries Services (NMFS) and U.S. Fish and Wildlife Service (USFWS) ("Services"), and DEC concerning the NPDES general permit for offshore seafood processors in Alaska (AK-G52-4000).

EPA has previously consulted with the Services on the NPDES General Permit for Seafood Processors (AK-G52-0000) under the Endangered Species Act or the Magnuson-Stevens Act.

Mar 6, 2008 Teleconference with NMFS and USFWS to begin informal consultation on proposed permit

June 23, 2008 Submit proposed permit, Fact Sheet, Biological Evaluation and Essential Fish Habitat Evaluation to NMFS and USFWS for review

Oct 31, 2008 EPA approves the State of Alaska program for NPDES permits

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 biological evaluation is EPA's approval of the NPDES General Permit for Offshore Seafood Processors in Alaska (AK-G52-4000). 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 any applicable regulatory changes, changes to water quality standards, or changes deemed acceptable by EPA.

On October 31, 2008, the U.S. Environmental Protection Agency (EPA) approved the State of Alaska's application to take over issuing and enforcing permits for wastewater discharges issued under the Clean Water Act. Following this approval, the NPDES permit for AK offshore seafood processors was separated into two actions. The federal NPDES permit (AK-G52-4000) which will cover the mobile seafood processors located in federal waters 3nm or more from shore. The State of Alaska will be issueing the permit for onshore and nearshore seafood processors located in state waters within 3 nm from shore.

For more information on the state delegation of the NPDES program, see the State of Alaska APDES program page at http://www.dec.state.ak.us/water/npdes/index.htm.

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 U.S. Fish and Wildlife Service (US FWS) and NOAA Fisheries (NMFS)(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 Service 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)). (emphasis added)

A biological evaluation 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 biological evaluation has been prepared to assist the U.S. Environmental Protection Agency, Region 10 (EPA or Agency) 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 NPDES General Permit for Offshore Seafood Processors in Alaska. 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.) authorized the U.S. to manage its fishery resources in an area extending from a State's territorial sea (to 3 nm from shore) to 200 nm (4.8 km to 320 km) off its coast (termed the Exclusive Economic Zone or EEZ). The management of these marine resources is vested in the Secretary and in regional Fishery Management Councils. In the Alaska Region, the Council 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 wastes generated in Alaska vary due to the types 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. Target species of commercial fishing operations in Alaska include groundfish (e.g. pollock, Pacific cod, sablefish, rockfish, Pacific halibut, and other species of flatfish), five species of salmon, herring, crab (Dungeness and species of king and Tanner crab), shrimp, clams, scallops, abalone, sea urchins, and sea cucumbers (EPA 1994b). The commercial fisheries in Alaska are discussed in more detail in Section 2.5.2. This section describes the typical processing of salmon, groundfish, herring and shellfish products

2.2.1.1 *Seafood Processing*

Seafood processing facilities use a variety of techniques and equipment to produce marketable seafood products ranging from the packaging of whole fresh or frozen seafood for shipment, which produces relatively little solid or liquid waste, to mechanical filleting or deboning processes that produce much higher concentrations and loads of contaminants. For example, the butchering process contributes most of the biochemical oxygen demand (BOD), nitrogen content, total settleable solids, and up to 60% of oil and grease residues due to the high blood and slime content in the wastewater streams. The material remaining after processing (e.g. heads, tail fins, guts) is typically ground and discharged as solid and liquid waste (EPA 1994b, NovaTec Consultants 1994a).

The following provides an overview of typical seafood processing operations (NovaTec Consultants 1994a, NovaTec Consultants 1994b):

<u>Vessel Unloading</u>

Vessel unloading is common to all fish processing. It can be done with wet or dry pumps or with buckets or baskets if only a small quantity of fish needs to be moved. Dry pumps result in rough handling of the fish and are generally only used for groundfish due to the relatively low commercial value of the fish. Wet pumps are gentler and typically used for freshly caught salmon, which are kept in water inside the holds of fishing boats and fish packer vessels during transport. The pumps use large diameter hoses to pump water and whole fish out of the vessels' holds, which are then discharged onto grating to allow the separation of fish and water. Conveyors pick up the fish after their separation from the vessel hold water and transport then to grading stations, where the fish are manually sorted according to their species. After sorting, fish are kept in chilled water or ice for intermediate storage until they can be further processed.

<u>Salmon Processing</u>

Salmon products include fresh, frozen, and canned salmon, as well as salmon roe and milt. Dressing (butchering) salmon for freezing involves removing the head and gutting the fish. Dressing can be done manually or with semiautomatic dressing lines utilizing iron butcher machines, which cut off heads, collar bones, tails, and fins. The fish are cleaned with suction hoses or with spoons attached to small water hoses.

Dressing for canning is generally done solely with an iron butcher machine. Gutting and washing machines further clean the fish while constantly running water hoses rinse off any offal (non-edible fish parts) and blood. The wash water, mixed with guts and blood, drains out the bottom of the gutting machines. The fish are inspected after the gutting process and are further manually cleaned if necessary. Typically, each manual cleaning station is equipped with a small, constantly running, water hose to rinse off any offal and/or blood (Figures 2.1 and 2.2).

The roe of the female fish may be removed for further processing, and the milt of the male fish may also be removed at this stage. The roe is processed by washing and curing in a concentrated brine solution in agitated circular tubs. Milt processing involves washing the milt in water and freezing prior to shipment.

To further process salmon for canning, the fish are fed into cutting machines which cut the fish into sections of appropriate size for the cans. Canning machines press the salmon sections into cans which are sealed in seamers which operate under vacuum. Following sealing, the cans are washed and pressure cooked in large retorts. After the cooking process the cans are cooled with water (Figure 2.2).

After live-hauling to a processing facility, the fish are removed from the water with a wet pump, cut behind the gill arch on one side of the head and placed in water-filled totes for bleeding. Further processing consists of eviscerating, cleaning, and washing, which may be done manually or with vacuum suction.

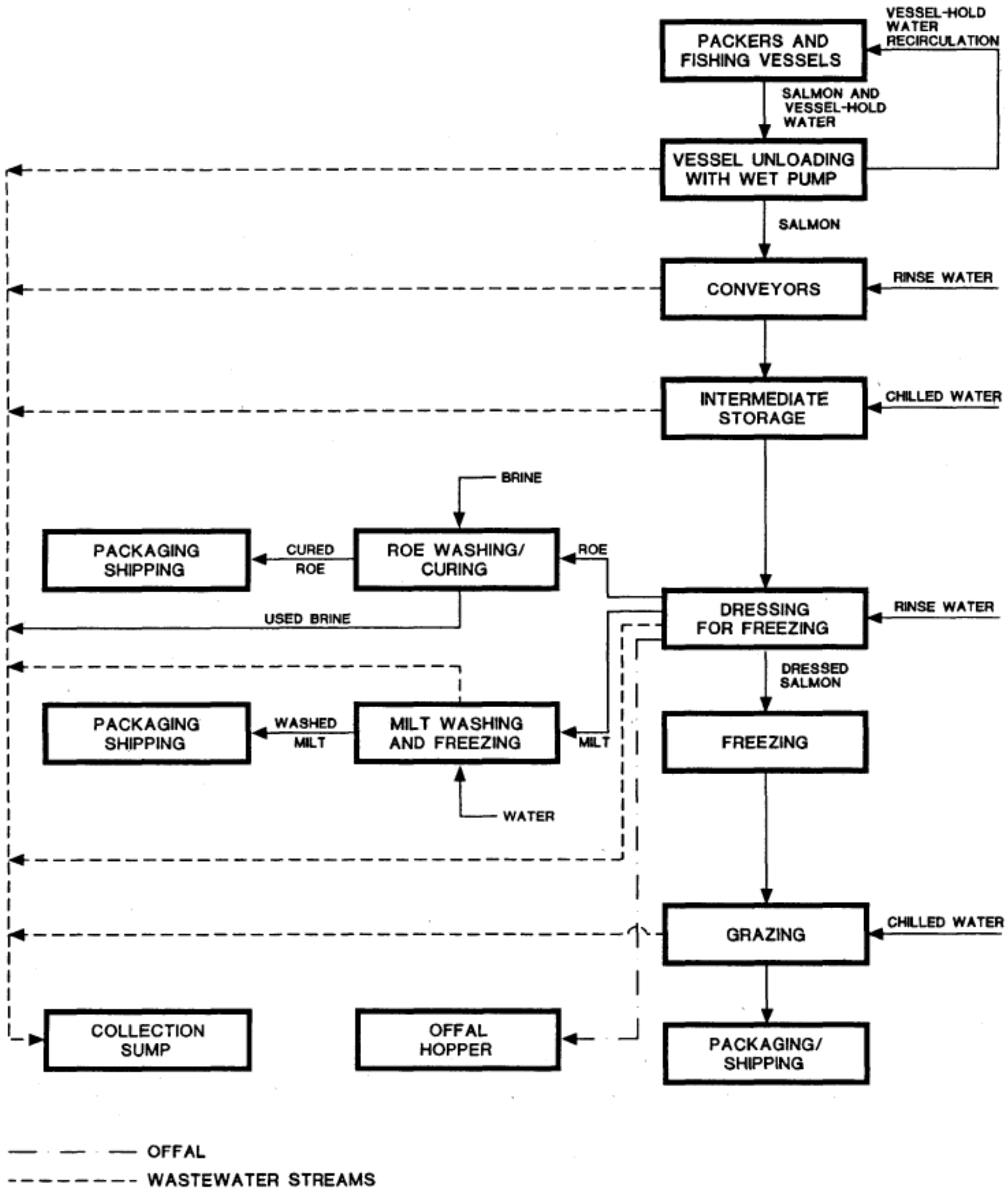

Figure 2.1: Typical processing procedure and waste streams for frozen salmon production. *Source: NovaTec Consultants 1994a.*

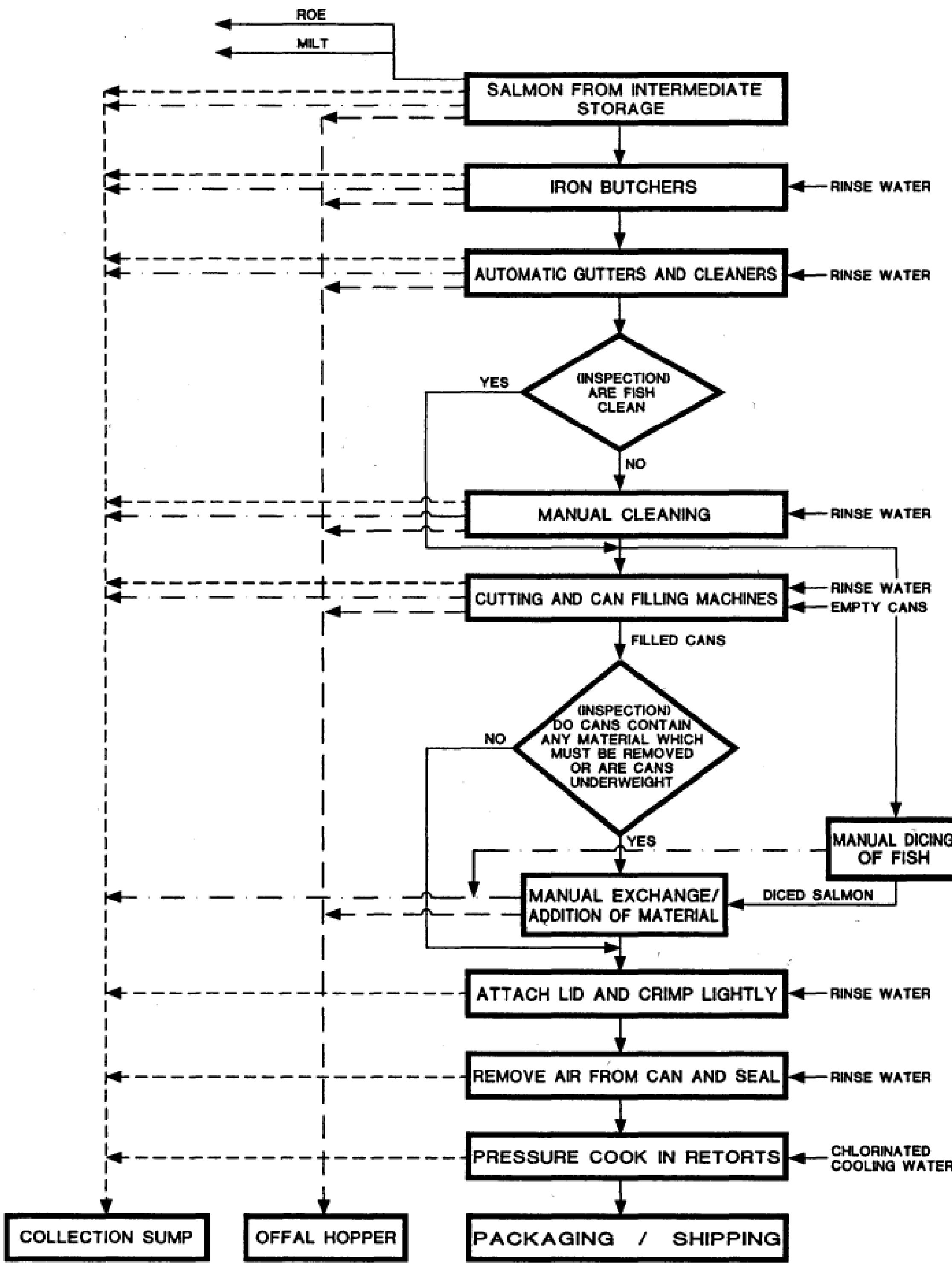

Figure 2.2: Typical processing procedure and waste streams for canned salmon production.
Source: NovaTec Consultants 1994a.

Groundfish Processing

Groundish are typically processed for frozen fillets. Halibut is also processed for whole frozen fish or fletches (skinless, boneless pieces). Generally, the fish are either stored whole on the ship or are eviscerated prior to storage, the viscera and blood being washed overboard. In small plants, the fish are processed by hand. The fillets are cut on a board, washed and immediately iced in boxes for distribution. However, most plants process fillets using mechanized equipment. The fish are first washed in large wash tanks or by water sprays. Next, the fish pass to filleting machines or hand filleting tables. The skin is removed from fillet by hand or machines. The skinned fillets are transported by conveyor belt through a washing tank. After inspection and candling (shining a light through the fillets for the detection of parasites) the fillets are packed into containers by hand or are frozen and then packed (Figure 2.3).

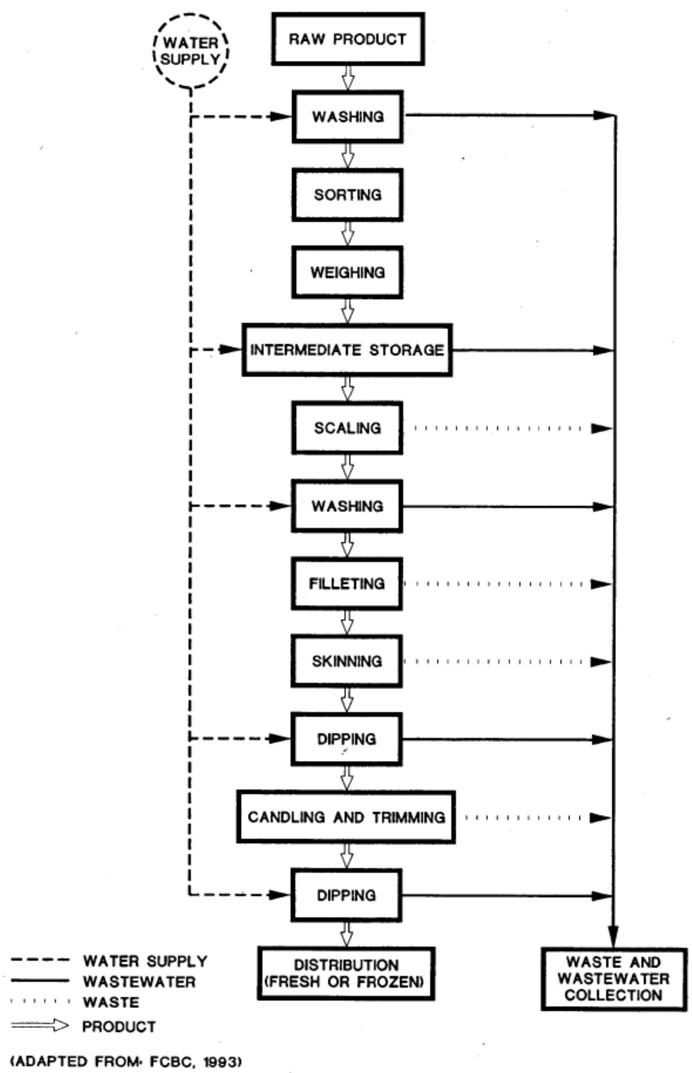

Figure 2.3: Typical processing procedure and waste streams from groundfish.
Source: NovaTec Consultants 1994a.

Herring Processing

Herring is processed for a number of products, including fillets and herring roe. Processing for fillets is similar to the procedure for groundfish. Herring roe processing generally involves freezing the herring for later thawing and processing in order to retain the quality of the roe. Roe removal may be by hand or with automatic roe popping (removal) machines. The roe is then washed and cured with brine solutions.

Shellfish Processing

Shrimp processing:
Shrimp can be processed for freezing or canning. To process shrimp for freezing, the packing plant receives the shrimp either whole or deheaded, deheads them if necessary, and packs them in ice.

For further processing, frozen shrimp may be separated from ice and processed in a precooker, where steam is injected to provide optimum peeling and recovery of meat. The precooked shrimp falls onto oscillating rollers in a peeler, which pulls extraneous parts from the meat. Water sprays loosen and wash away waste, which is flumed to floor drains. From the peeler the shrimp fall into the first of several flumes, which lead to cleaning and separating steps. After mechanical cleaning operations, the shrimp are flumed onto a table or “picking belt” where workers may hand sort and further clean the shrimp. Shrimp meat is then salted by spraying it with a salt solution or immersing it in a salt tank. Shrimp meat is often hand-packed into cans, vacuum-sealed, and refrigerated or frozen (Figure 2.4).

Crab processing:
The crabs are loaded into baskets, briefly rinsed with tap water and then loaded into cookers and steamed. After cooling, the backs and claws are removed and remaining viscera washed away. The crabmeat in then manually or mechanically picked. Claws may be canned whole or the meat extracted and canned as described for salmon canning. Figure 2.5 illustrates the crab processing procedure.

Clam processing:
After the clams are shucked, the meat is washed, minced and packaged for distribution or canned as above.

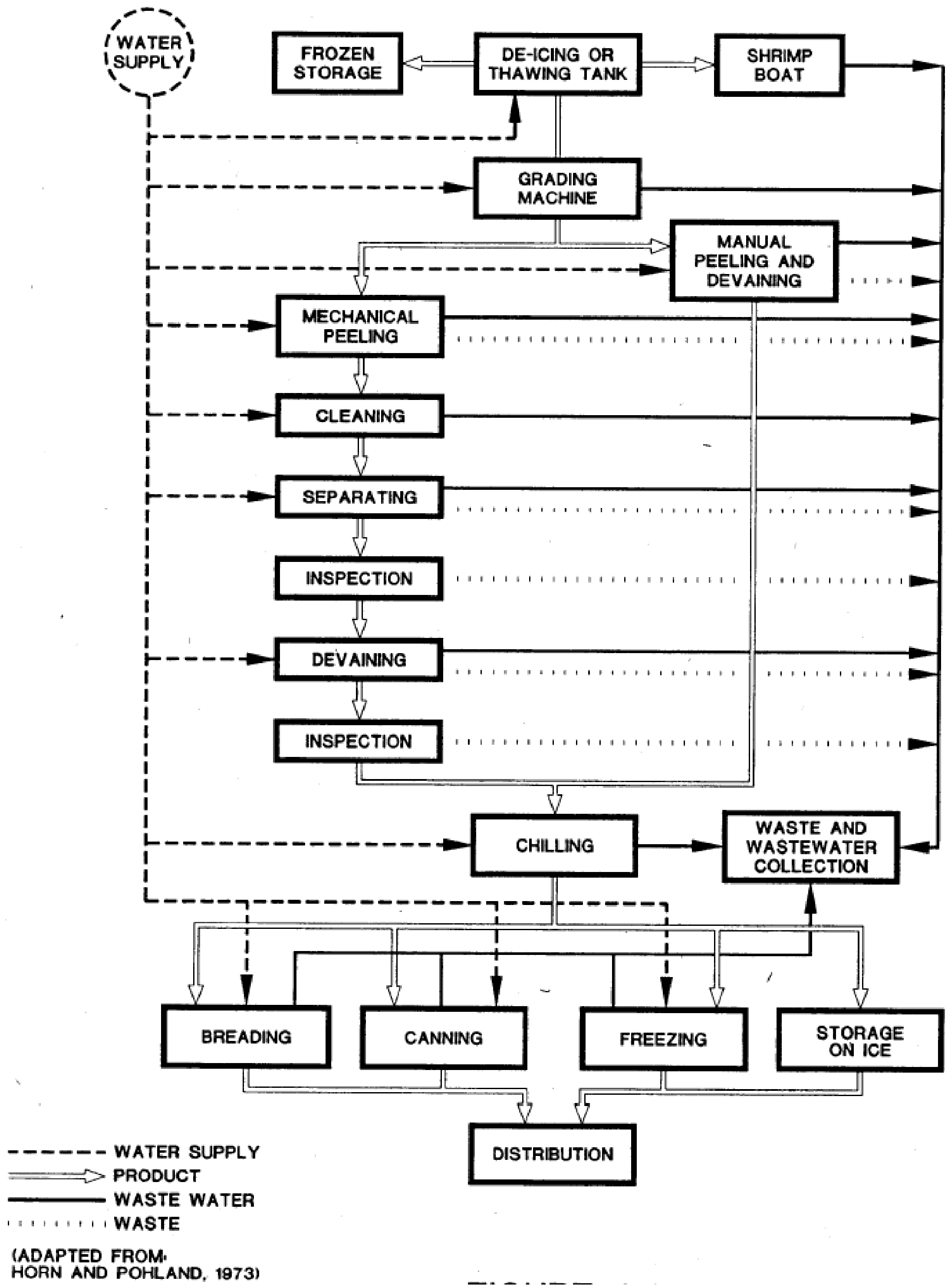

Figure 2.4: Typical processing procedure and waste streams for shrimp. *Source: NovaTec Consultants 1994a.*

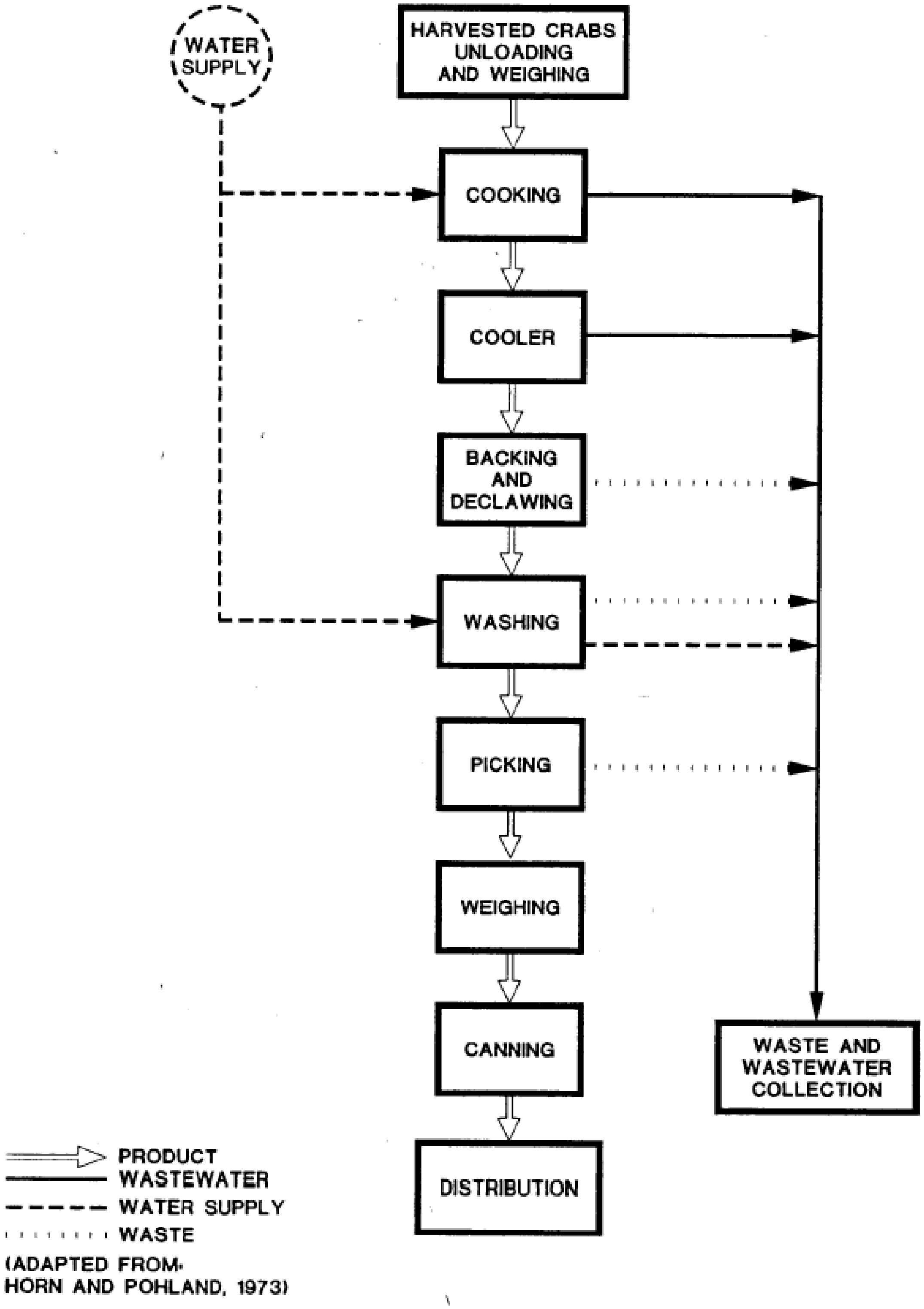

Figure 2.5: Typical processing procedure and waste streams for crab. *Source: NovaTec Consultants 1994a.*

2.2.1.2 *Seafood Processing Discharge Characterization*

Discharges from seafood processing facilities may be solid or dissolved wastes. Solid wastes consist primarily of unused portions of fish and shellfish that have been processed. The unused portions of processed raw fish and shellfish can include heads, skin, scales, viscera, fins, and shells discarded during cleaning and butchering operations (offal). Dissolved wastes can include soluble organic matter and nutrients leached from blood and fish and shellfish tissues during processing. The wastes are primarily organic matter that is, except for the bones and shells, highly biodegradable (EPA 1994a, EPA 1994b, Islam et al. 2004).

Major pollutants in the discharge consist of total suspended solids (TSS), settleable solids, biochemical oxygen demand (BOD), non-petroleum oil and grease and nitrogen (EPA 1994a, EPA 1994b, and Islam et al. 2004). Additionally, smaller amounts of ammonia, which is present in blood and slime of most fish and shellfish species, as well as chlorine/chlorides and other disinfectants used to maintain sanitary conditions, may be present in the discharge. There may also be traces of fecal coliforms in the discharge resulting from masses of seabirds attracted to the outfall. However, there is no indication in the literature that fecal coliforms occur in fish offal (NPAART 2003).

Liquid Wastes

Wastewater is generated at seafood processing facilities from a variety of processes, such as vessel unloading, intermediate fish storage, fish cleaning, fish transport (e.g. in wet pumps), fish freezing, fish thawing, preparation of brines, equipment sprays, offal transport, cooling water from the canning process, and equipment and floor cleaning (NovaTec Consultants 1994b).

Water is used to remove fish processing wastes from work areas and processing equipment. Permanently installed water sprays are used to keep automated processing equipment clean, reduce bacterial loading on contact surfaces, for lubrication, and to flush away offal (Carawan et al. 1979). Disinfectants and detergents may be added to these waters to facilitate the removal of wastes and to maintain sanitary standards during production. The disinfectants that may be used to sanitize seafood processing areas include hypochlorite solutions (chlorine-based), iodophor solutions (iodine-based), and quaternary ammonium chloride solutions (chlorine- and ammonium-based) (EPA 1994b).

In addition to added disinfectants, wastewater carries soluble organic wastes such as blood and other soluble fats, proteins, and carbohydrates. The amount of soluble organic wastes dissolved in the washdown waters depends on 1) the amount of processing which damages the fish tissue and releases soluble wastes and 2) the contact time of the water with the tissue (EPA 1994b); thus those processes that involve butchering result in higher contaminant loads.

Solid Wastes

Solid waste is generated from vessel unloading, fish dressing and cleaning which vary depending upon the seafood processing procedure. For some types of seafood, solid waste accounts for a large proportion of landed weight and a sizeable solid waste stream. For example, crab processing can result in 75 to 80% of landed weight being discharged as solid waste (ACAP 1999).

In general, yields (the proportion of landed weight resulting in usable product) for finfish processing may range across a low of 25% - 50% (boneless and skinless filleting), 60% - 70%

(canning) to nearly 100% (whole or dressed fish) (EPA 1994b, Crapo 1993). One study found that salmon processing had an average yield of 76% and halibut 60% (Carawan et al. 1979).

Yields from shellfish depend on if the meat is separated from the shell. For example, the preparation of whole crabs or whole cooked shrimp results in yields of approximately 90%. However, the separation of cooked meat from the shell may result in yields as low as 30% - 38% for shrimp and 17% - 25% for crabs (Carawan et al. 1979). The recovery of marketable products from clams, abalone, and scallops is generally also very low (typically less than 60%) because the heavy shells are usually discarded. However, shell wastes from these species are not typically ground and discharged through the waste handling system of the processing facility. Shell wastes are typically disposed of in landfills or returned to the shellfish beds (EPA 1994b).

2.2.2 *Distribution and Discharge of Permitted Facilities*

This section provides a summary of available data on the character and quantity of discharge by facilities operating under the Alaska Seafood Processors General NPDES Permit. Processors are categorized as offshore facilities that discharge at distances greater than 3 nm from shore as delineated by mean lower low water (MLLW).

2.2.2.1 *Distribution of Permitted Facilities*

Currently there are approximately 98 offshore processing facilities administratively extended under the general NPDES permit for seafood processors in Alaska (EPA facility list provided January 2007) that would qualify for coverage in the NPDES general permit for offshore seafood processors in Alaska (AK-G52-4000). Offshore processors covered under this permit may be found only in offshore federal waters (greater than 3m from shore) across much the same range with a few vessels as far north as Norton Sound. While facilities completed annual reports for 2006 (ADEC 2006a), it is difficult to provide succinct locations for each offshore processor as these vessels are mobile and can discharge in multiple locations within the action area.

2.2.2.2 *Discharge Characterization for Permitted Facilities*

<u>Vessels</u>

The annual waste discharges from the offshore/nearshore vessels submitting 2006 annual reports ranged from 153,104 to 112,000,000 pounds. Like the shore-based processors, the frequency distribution of vessels is also positively skewed with 77 percent of the facilities discharging less than 10 million pounds. The median annual waste discharge for vessels was 3,262,214 pounds. Total discharge for all offshore and nearshore vessels reporting in 2006 was 1,085,369,321 pounds.

Of the facilities submitting 2006 annual reports, vessels discharge is recorded by month, not by location. It is estimated, based on probable vessel location at various times of the year, that the vessels discharged approximately 1,034,075,080 pounds in the Bering Sea/Aleutian Islands area, 40,496,677 pounds in the Gulf of Alaska area, and 1,051,977 pounds in SE Alaska. Vessels do not provide a breakdown of the species caught in their annual report, however it is estimated that the majority of seafood processed on vessels was groundfish (approximately 93%). Of the groundfish processed, pollock constituted approximately 58% and Pacific cod approximately 11%; species caught also included sablefish, arrowtooth flounder, Pacific hake, jack mackerel, Pacific Ocean perch, rockfish (canary, chilipepper, darkblotched, shortraker, widow and yellowtail), sculpin, spiny dogfish shark, skate, sole (butter, flathead, rex, rock and yellowfin), and Greenland turbot (ADEC 2006a).

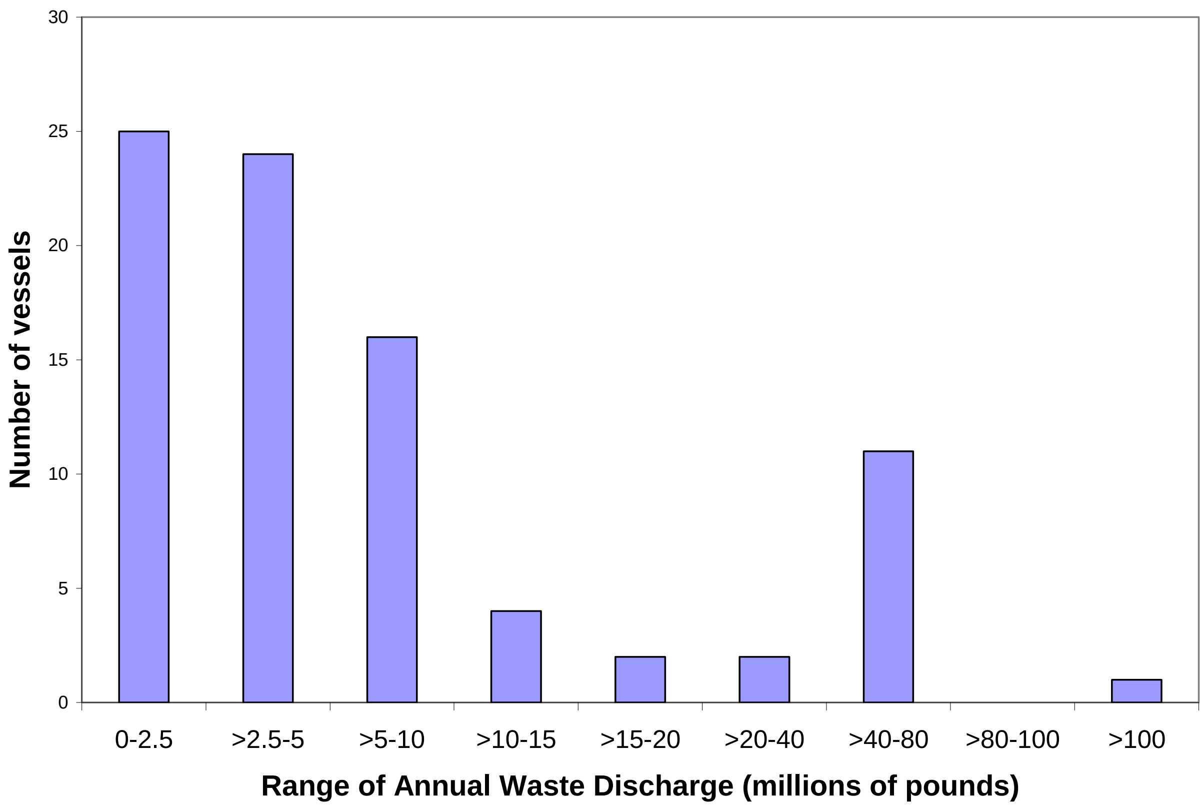

Figure 2.6: Frequency distributions of annual seafood waste disposal for seafood processors covered under NPDES General Permit AK-G52-5000 filing annual reports for the year 2006. Source Data: ADEC Data Submittal to EPA Regarding the Ocean Discharge Criteria Evaluation for the NPDES General Permit for Alaskan Seafood Processors (2006a).

2.3. PERMIT DESCRIPTION

EPA's Region 10 proposes to issue the NPDES General Permit for Offshore Seafood Processors in Alaska (Permit No. AK-G52-4000). Offshore seafood processing facilities covered under this permit are those facilities discharging seafood waste at distances greater than 3 nm from shore.

2.3.1 *Facilities*

2.3.1.1 *Authorized Facilities*

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

1. Operators of off-shore vessels, operating and discharging "seafood processing waste" greater than 3 nautical mile (NM) from shore as delineated by mean lower low water (MLLW), 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.

2.3.1.2 *Unauthorized Facilities*

1. All discharges occurring less than 3.0 nm from shore.

2.3.2. Pollutants

2.3.2.1 *Covered Pollutants*

This Permit authorizes 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 grind solid seafood processing wastes to 0.5 inch or smaller in any dimension 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.

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

      Total pounds of by-catch and prohibited species discharged, per day, and daily location must be reported in the Annual Discharge Report per VI.B.2.f of this permit.

2. Wash-down water, which include EPA-approved 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 [33 CFR Part 159] through a certified and operable Type I or Type II Marine Sanitation Device prior to discharge.

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 current permit does not authorize any pollutants, which are not expressly authorized in the permit. These pollutants include, but are not limited to, petroleum hydrocarbons and toxic pollutants listed in 40 CFR 401.15 (EPA 2009).

2.3.2.2 *Unauthorized discharges*

1. The discharge of pollutants not specifically set out in this Part is not authorized under this Permit.

2. This general NPDES permit does not authorize any discharges from facilities that (1) have not submitted a Notice of Intent and received written authorization to discharge under this Permit from EPA or (2) have not been notified in writing by EPA that they are covered under this Permit as provided for in the 40 CFR 122.28(b)(2)(vi).

3. 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., is prohibited under 33 U.S.C.A. 1321(b)(3). Any person in charge of an offshore vessel must, as soon as (s)he has knowledge of any discharge of oil or a hazardous substances from such vessel, immediately notify the U.S. Coast Guard's Command Center (1-800-478-5555).

2.3.3 Areas Excluded from Authorization under this General NPDES Permit

The Permit does not authorize the discharge of pollutants in the following circumstances:

A. Protected water resources, critical habitats and special areas:

1. Waters within one (1) nautical mile of the boundary of a National Park, Monument, or Preserve (Figure 2.7), any bay, fjord, or harbor enclosed by a National Park, Monument, or Preserve are excluded from coverage by the current permit.

   Congressional mandates and Presidential proclamations have provided that federal parks, monuments, and preserves be maintained to provide the scenic beauty and quality of landscapes in their natural state, to protect environmental integrity and habitat for and populations of fish and wildlife, including marine mammals, seabirds, and waterfowl, and to provide continued opportunities for wilderness recreational activities (16 U.S.C. 1 et. seq.). Of the national parks, monuments, and preserves in Alaska, only four coastal units (Aniakchak, Glacier Bay, Katmai Fjord, and Kenai Fjord) are proximal to commercial fisheries (EPA 2001a).

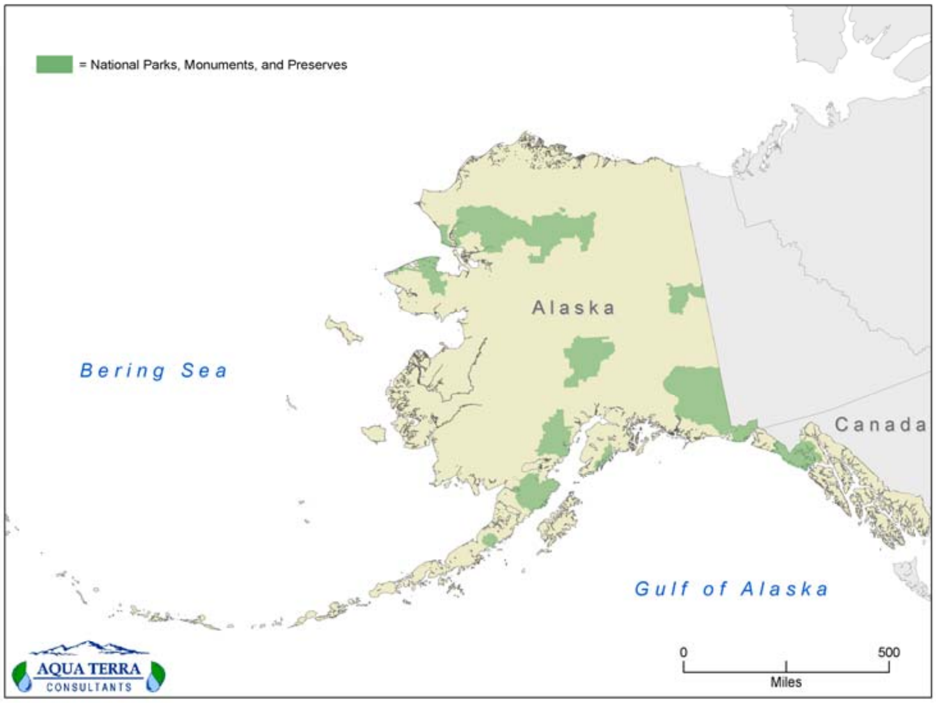

Figure 2.7: National parks, monuments, and preserves. *Sources: National Parks Service and ESRI.*

2. Waters within one (1) nautical mile of the boundary of a National Wildlife Refuge (Figure 2.8) are excluded from coverage under the current permit.

   National Wildlife Refuges are maintained to protect environmental integrity and populations of fish and wildlife and their habitats, as well as to provide the scenic beauty and quality of landscapes in their natural state and opportunities for wilderness recreational activities (16 U.S.C. 661 et seq.). Of the national wildlife refuges in Alaska, six coastal units (Alaska Maritime, Alaska Peninsula, Kenai, Kodiak, Togiak, and Yukon Delta) are proximal to commercial fisheries (EPA 2001a).

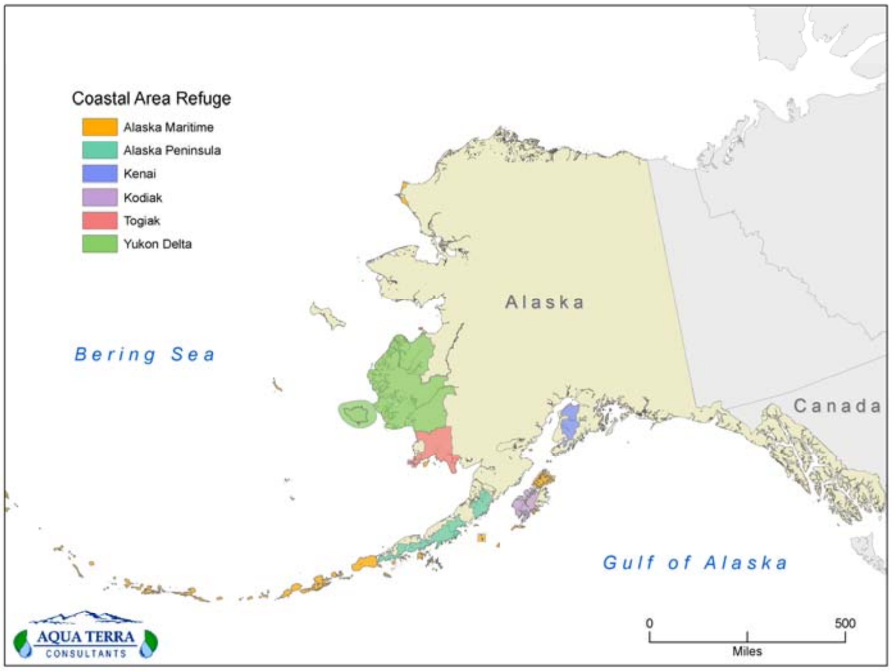

Figure 2.8: National wildlife refuges. *Sources: U.S. Fish and Wildlife Service and ESRI.*

3. Waters within one (1) nautical mile of a National Wilderness Area

There are 48 designated Wilderness Areas in Alaska. The largest is the Wrangell-Saint Elias Wilderness and the smallest is the Hazy Islands Wilderness. The discharge of pollutants is not authorized within one (1) nm of a National Wilderness Area. The managing agencies in Alaska are U.S. Fish and Wildlife Service, Forest Service and the National Park Service. All the Alaskan Wilderness Areas are listed as follows:

1. Aleutian Islands Wilderness
2. Andreafsky Wilderness
3. Becharof Wilderness
4. Bering Sea Wilderness
5. Bogoslof Wilderness
6. Chamisso Wilderness
7. Chuck River Wilderness
8. Coronation Island Wilderness
9. Denali Wilderness
10. Endicott River Wilderness
11. Forrester Island Wilderness
12. Gates of the Arctic Wilderness
13. Glacier Bay Wilderness
14. Hazy Islands Wilderness
15. Innoko Wilderness
16. Izembek Wilderness
17. Karta River Wilderness
18. Katmai Wilderness
19. Kenai Wilderness
20. Kobuk Valley Wilderness
21. Kootznoowoo Wilderness
22. Koyukuk Wilderness
23. Kuiu Wilderness
24. Lake Clark Wilderness
25. Maurille Islands Wilderness
26. Misty Fjords National Monument Wilderness
27. Mollie Beattie Wilderness
28. Noatak Wilderness
29. Nunivak Wilderness
30. Petersburg Creek-Duncan Salt Chuck Wilderness
31. Pleasant/Lemusurier/Inian Islands Wilderness
32. Russell Fjord Wilderness
33. Saint Lazaria Wilderness
34. Selawik Wilderness
35. Semidi Wilderness
36. Simeonof Wilderness
37. South Baranof Wilderness
38. South Etolin Wilderness
39. South Prince of Wales Wilderness
40. Stikine-LeConte Wilderness
41. Tebenkof Bay Wilderness
42. Togiak Wilderness
43. Tracy Arm-Fords Terror Wilderness
44. Tuxedni Wilderness
45. Unimak Wilderness
46. Warren Island Wilderness
47. West Chichagof-Yakobi Wilderness
48. Wrangell-Saint Elias Wilderness

4. Waters within one (1) nautical mile of the boundary of a State Game Sanctuary, Game Refuge, Park, Marine Park or Critical Habitat (Figure 2.7) are excluded from coverage by the current permit.

The Alaska State Legislature has classified certain areas, designated as a sanctuary, refuge, or critical habitat, as being essential to the protection of fish and wildlife habitat (5 ACC Part 95). The three State sanctuaries are Walrus Islands, McNeil River, and Stan Price. The twelve State refuges include Cape Newenham, Izembek, Trading Bay, Susitna Flats, Anchorage Coastal, Goose Bay, Palmer Hay Flats, Minto Flats, Cramer's Filed, Yakataga, Mendenhall Wetlands, and McNeil River. The sixteen State critical habitat areas include Egegik, Pilot Point, Cinder River, Port Heiden, Port Moller, Tugidak Island, Kalgin Island, Redoubt Bay, Willow Mountain, Clam Gulch, Anchor River and Fritz Creek, Fox River Flats, Kachemak Bay, Copper River Delta, Dude Creek, and Chilkat River (ADFG 1991).

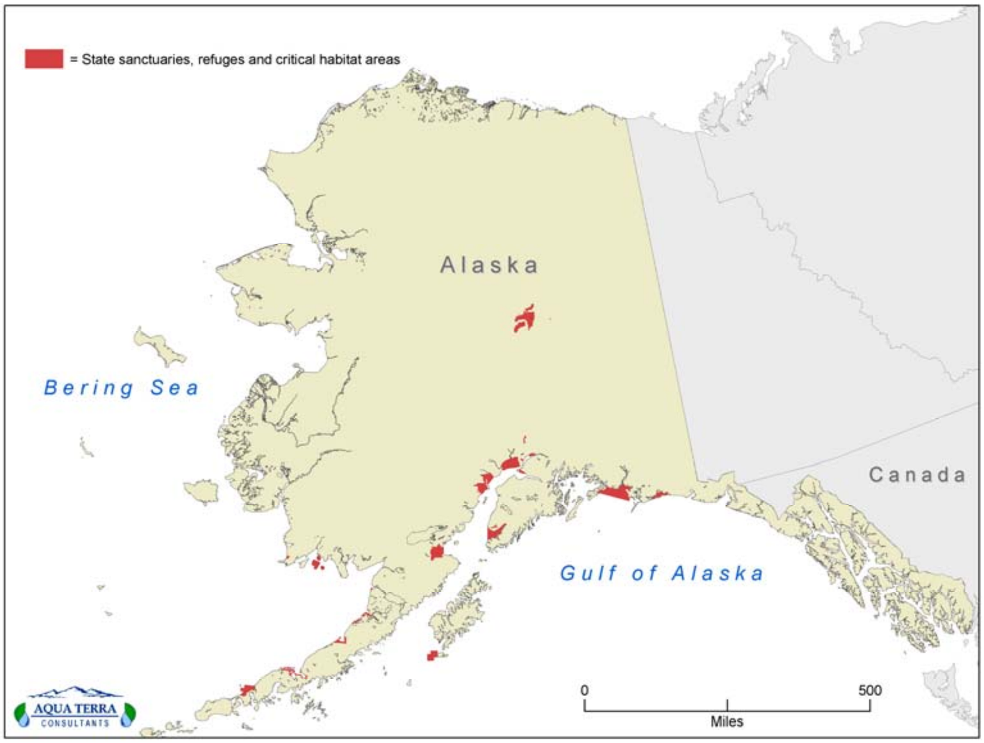

Figure 2.9: State sanctuaries, refuges and critical habitat areas (Legislatively Designated Areas). *Sources: Alaska Dept of Fish and Game, ESRI.*

5. Waters within three (3) nautical miles of a rookery or major haulout of the Steller sea lion are excluded from coverage by the current permit. In 1997, the Steller sea lion population was split into a western distinct population segment (DPS) and an eastern DPS based on demographic and genetic dissimilarities (FR 62(86):24345-24356). These National Marine Fisheries Service (NMFS) designated critical habitat for the eastern DPS Steller sea lion, a "threatened species", as waters withink three nautical miles of a rookery or major haulout of the Steller sea lion pursuant to the Endangered Species Act (ESA, 16 U.S.C. 1531 et. seq.). Critical habitat for the western DPS Steller sea lion, an "endangered" species, is designated as waters within 20 nm of each major rookery and major haulout in Alaska that is west of longitude 144°W.

Pinniped rookeries and haulouts are vulnerable to disturbance and degradation by seafood processor discharges (EPA 2001b) and should be protected (Marine Mammal Protection Act, 16 U.S.C. 1361 et seq; 50 CFR 226).

For regulatory purposes, the waterway boundary of rookeries and haulouts has been defined as MLLW. However, biologically, the boundaries are not easily delineated, for the surrounding nearshore waters are an integral component of these habitats, especially for foraging by post-parturient females and by young animals which are developing swimming and hunting behaviors. Conservation of rookeries, haulouts, and foraging areas are essential to the maintenance of pinniped populations in general and to the recovery of the "threatened" population of Steller sea lions in particular (EPA 2001a). Rookeries and major haulouts and adjacent marine waters to a minimum of three (3) nautical miles offshore have been designated as critical habitat for eastern DPS Steller sea lions while Rookeries and major haulouts and adjacent marine waters to a minimum of twenty nautical miles offshore have been designated as critical habitat for western DPS Steller sea lions (FR 58 (165): 45269-45285; 50 CRF Part 226 and 227.12).

6. Waters within one (1) nautical mile of designated critical habitat for the Steller's eider or spectacled eider, including nesting, molting and wintering units. During breeding season (May through August) Steller's and spectacled eider nesting critical habitat units are located on the Yukon-Kuskokwim Delta and North Slope. Molting habitat (July through October) for Steller's eiders includes Izembek Lagoon, Nelson Lagoon and Seal Islands. Molting habitat for spectacled eider includes Ledyard Bay and Norton Sound. Wintering habitat (October through March) for Steller's eider includes Nelson Lagoon, Izembek Lagoon, Cold Bay, Chignik Lagoon and several other locations along the Aleutian Islands. Wintering habitat for spectacled eider is in the Bering Sea between St. Lawrence and St. Matthews Islands. For complete lists and maps of Steller's eider and spectacled eider critical habitat see Appendices A and B.

7. "Living substrates", such as submerged aquatic vegetation, kelp and eelgrass in shallow coastal waters (generally less than minus 60 ft. depth MLLW).

B. At risk resources and waterbodies.

This Permit does not authorize the discharge of pollutants in the following at-risk water resources and waterbodies:

1. A discharge to less than 60 feet MLLW, with inadequate flushing.

Areas with poor or inadequate flushing may include but are not limited to sheltered waterbodies such as bays, harbors, inlets, coves, lagoons, and semi-enclosed water basins bordered by sills. For the purposes of this section, "poor flushing," means average currents of less than 0.33 of a knot at any point in the receiving water within 300 feet of the outfall. It is the responsibility of the permitee to prove adequate flushing in all cases where the discharge is less than 60 feet MLLW.

C. Areas covered by other NPDES permits.

1. This Permit does not authorize the discharge of pollutants to receiving waters covered by other general or individual NPDES permits.

2.3.4 *Effluent Limitations*

Sections 101, 301(b), 304, 308, 401, and 402 of the Clean Water Act (CWA) provide the basis for the effluent limitations and conditions of the permit. EPA first determines which technology-based limits apply to the discharges in accordance with the national effluent guidelines and standards (30 CFR 408). 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 effluent limitation established by EPA. CWA initially focused on the control of “traditional” pollutants (conventional pollutants and some metals) through the use of Best Practicable Control Technology Currently Available (BPT). Permits issued after March 31, 1989, must include any conditions necessary to ensure that the BPT level of control is achieved. BPT limitations are based on effluent guidelines developed by EPA for specific industries. 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).

Section 301(b)(2) of the CWA also requires further technology-based controls on effluents. After March 31, 1989, all permits are required by CWA 301(b)(2) and 301(b)(3) to contain effluent limitations for all categories and classes of point sources which: (1) control toxic pollutants and nonconventional pollutants through the use of Best Available Technology Economically Achievable (BAT), and (2) represent Best Conventional Pollutant Control Technology (BCT). BCT effluent limitations apply to conventional pollutants (pH, BOD, oil and grease, suspended solids, and fecal coliform). BAT applies to toxic and nonconventional pollutants. Toxic pollutants are those listed in 40 CFR 401.15. Nonconventional pollutants include all pollutants not included in the toxic and conventional pollutant categories. In any case BCT or BAT may not be less stringent than BPT. Like BPT requirements, BAT and BCT permit conditions must be established using BPJ procedures in the absence of effluent limitations guidelines for a particular industry.

1. Process and process-associated wastes

   Offshore Alaska seafood processors of fresh, frozen, canned and cured fish and shellfish are covered by the effluent guidelines and described in 40 CFR Part 408 for “remote” Alaskan locations. EPA evaluated seafood processors across the nation in the early 1970s in order to establish technology-based effluent limitation guidelines (EPA 1975). In consideration of the expense and logistical difficulties associated with much of Alaska, the technology-based limitations for Alaskan seafood processors in remote locations were limited to the requirement that no pollutants may be discharged which exceed 0.5 inch (1.27 cm) in any dimension.

2. Sanitary wastewaters

   The permit requires that sanitary wastewaters shall be treated in wastewater treatment systems that comply with 33 CFR 159 for Marine Sanitation Devices.

2.3.4.2 *Water Quality Based Limitations*

Section 301(b)(1) of the CWA requires the establishment of limitations in permits necessary to meet water quality standards by July 1, 1977. All discharges to state waters must comply with state and local coastal management plans as well as with state water quality standards, including the state's anti-degradation policy.

Discharges to state waters must also comply with limitations imposed by the state as part of its coastal management program consistency determination and of its certification of NPDES permits under CWA § 401.

Alaska State Water Quality Standards (18 AAC Part 70) marine and estuarine receiving waters as Classes (II)(A)(i-iii), (II)(B)(i-ii), (II)(C) and (II)(D) for use in aquaculture, seafood processing, water recreation, the growth and propagation of fish, shellfish, aquatic life and wildlife, and the harvesting for consumption of raw mollusks and other raw aquatic life. Marine and estuarine waters are designated for all beneficial uses and the most stringent of the water quality standards for these uses must be met.

2.4 ACTION AREA

Alaska is the largest state in the United States with a total area of 1,593,438 square kilometers (km^2), including 70,849 km^2 of coastal waters and approximately 690,000 km^2 of wetlands with more than 8,000 km^2 of estuarine wetlands (low-wave energy environments), approximately 190 km^2 of marine wetlands (high-energy wave environments), and 15,000 identified anadromous waterbodies. Alaska's major offshore marine fisheries include the Bering Sea, Aleutian Islands and Gulf of Alaska (NMFS 2005).

2.4.1 *Gulf of Alaska*

The Gulf of Alaska (GOA) has approximately 160,000 km^2 of continental shelf and a relatively open marine system with landmasses to the east and the north. The fish fauna of the GOA consists of a mix of temperate and subarctic species, resulting in a large gradient in species composition along the shelf from the eastern to the western GOA (Mueter and Norcross 2002) and at least 384 fish species have been reported (Mueter 2004).

Commercial species are more diverse in the GOA than in the Bering Sea, but less diverse than in the Washington-California region. The most diverse set of species in the GOA is the rockfish group; 30 species have been identified in this area (NMFS 2005). GOA also supports other commercially important fisheries including pollock, salmon, Pacific halibut, Pacific herring, crab and shrimp (Mueter 2004). Additionally, at least 18 species of marine mammals and 38 species of marine birds use the shelf and offshore habitats of the GOA (Hunt et al. 2000).

The dominant circulation in GOA (Musgrave et al. 1992) is characterized by the cyclonic flow of the Alaska gyre. The circulation consists of the eastward-flowing Subarctic Current system at approximately 50º N and the Alaska Coastal Current (Alaska Stream) system along the northern GOA. Large seasonal variations in the wind-stress curl in the GOA affect the meanders of the Alaska Stream and nearshore eddies. The variations in these nearshore flows and eddies affect much of the region's biological variability (NMFS 2005).

2.4.2 *Bering Sea*

The Bering Sea (BS) is a semi-enclosed, high-latitude sea. Of its total area of 2.3 million km^2, 44% is continental shelf, 13% is continental slope, and 43% is deep-water basin. Its broad continental shelf is one of the most biologically productive areas of the world. The BS contains approximately 300 species of fish, 150 species of crustaceans and mollusks, 50 species of seabirds, and 26 species of marine mammals (Livingston and Tjelmeland 2000). However, commercial fish species diversity is lower in the BS than in the GOA (NMFS 2005).

A special feature of the BS is the pack ice that covers most of its eastern and northern continental shelf during winter and spring. The dominant circulation of the water begins with the passage of North Pacific water (the Alaska Stream) into the BS through the major passes in the Aleutian Islands (Favorite et al. 1976). There is net water transport eastward along the north side of the Aleutian Islands and a turn northward at the continental shelf break and at the eastern perimeter of Bristol Bay. Eventually BS water exits northward or westward and south along the Russian coast, entering the western North Pacific via the Kamchatka Strait. Some resident water joins new North Pacific water entering Near Strait, which sustains a permanent cyclonic gyre around the deep basin in the central BS (NMFS 2005).

Three fronts, the outer, mid-, and inner shelves, follow along the 200, 100, and 50m bathymetric contours, respectively; thus, four separate oceanographic domains appear as bands along the broad BS shelf. The oceanographic domains are the deep water (more than 200m), the outer shelf (200–100m), the mid-shelf (100–50m), and the inner shelf (less than 50m). The vertical physical system also regulates the biological processes that lead to separate cycles of nutrient regeneration. The source of nutrients for the outer shelf is the deep oceanic water; for the mid-shelf, it is the shelf-bottom water. Starting in winter, surface waters across the shelf are high in nutrients. Spring surface heating stabilizes the water column; then the spring bloom begins and consumes the nutrients. Steep seasonal thermoclines over the deep BS (30–50m), the outer shelf (20–50m), and the mid-shelf (10–50m) restrict vertical mixing of water between the upper and lower layers. Below these seasonal thermoclines, nutrient concentrations in the outer shelf water invariably are higher than those in the deep BS water with the same salinity. Winter values for nitrate-N/phosphate-P are similar to the summer ratios, which suggests that, even in winter, the mixing of water between the mid-shelf and the outer shelf domains is substantially restricted (Hattori and Goering 1986).

Important water column properties over the BS include temperature, salinity, and density. These properties remain constant with depth in the near-surface mixed-layer, which varies from approximately 10 to 30 m in summer to approximately 30 to 60 m in winter (Reed 1984). The inner shelf (less than 50 m) is one layer and is well mixed most of the time. On the middle shelf (50 to 100 m), a two-layer temperature and salinity structure exists because of downward mixing of wind and upward mixing due to relatively strong tidal currents (Kinder and Schumacher 1981). On the outer shelf (100 to 200 m), a three-layer temperature and salinity structure exists due to downward mixing by wind, horizontal mixing with oceanic water, and upward mixing from the bottom friction due to relatively strong tidal currents (NMFS 2005).

2.4.3 *Aleutian Islands*

The Aleutian Islands (AI) lie in an arc that forms a partial geographic barrier to the exchange of northern Pacific marine waters with BS waters. The AI continental shelf is narrow compared with the BS shelf, ranging in width on the north and south sides of the islands from about 4 km or less to 42 to 46 km. The AI comprises approximately 150 islands and extends about 2,260 km in length (NMFS 2005).

The patterns of water density, salinity, and temperature are very similar to the GOA. Along the edge of the shelf in the Alaska Stream, a low salinity (less than 32.0 ppt) tongue-like feature protrudes westward. On the south side of the central AI, nearshore surface salinities can reach as high as 33.3 ppt, as the higher salinity BS surface water occasionally mixes southward through the AI. Proceeding southward, a minimum of approximately 32.2 ppt is usually present over the slope in the Alaska Stream; values then rise to above 32.6 ppt in the oceanic water offshore. Whereas, surface salinity increases toward the west as the source of fresh water from the land decreases, salinity values near 1,500 m decrease very slightly. Temperature values at all depths decrease toward the west (NMFS 2005).

2.4.4 *Anadromous Fisheries Waters*

There are 16,000 streams, rivers or lakes in Alaska that have been specified as being important for the spawning, rearing, or migration of anadromous fish. It is estimated that at least 20,000 or more anadromous water bodies have not yet been identified (ADFG 2006). Identified waters are outlined in The Alaska Department of Fish and Game's *Catalog of Waters Important for Spawning, Rearing or Migration of Anadromous Fishes* (Johnson and Weiss 2006a - 2006f). Anadromous species in Alaska include forms of Pacific trout and salmon of the genus *Oncorhynchus* (rainbow and cutthroat trout and Chinook, coho, sockeye, chum and pink salmon), artic char, Dolly Varden, sheefish, smelts, lamprey, whitefish, and sturgeon (ADFG 2006).

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 is based on the biological health of that species. The status determination is either threatened or endangered. 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 that have not yet been proposed because of higher listing priorities (USFWS 2006a).

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.

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).Table 3.1 lists the 18 species (or populations) located in Alaska that are currently listed as endangered, threatened, or candidate species under the ESA.

Table 3.1: Endangered, Threatened and Candidate species in Alaska pursuant to the Endangered Species Act

SPECIES AND STATUS		RANGE IN ALASKA
Endangered		
Short-tailed albatross	(*Phoebastria albatrus*)	U.S. Territorial waters, Gulf of Alaska, Aleutian Islands, Bering Sea Coast,
Steller sea lion (west of 144°)	(*Eumetopias jubatus*)	Bering Sea, N. Pacific
Blue whale	(*Balaenoptera musculus*)	Bering Sea, Gulf of Alaska, N. Pacific
Bowhead whale	(*Balaena mysticetus*)	Chukchi Sea, Beaufort Sea
Fin whale	(*Balaenoptera physalus*)	Chukchi Sea, Bering Sea, Gulf of Alaska, N. Pacific
Humpback whale	(*Megaptera novaeangliae*)	Bering Sea, Gulf of Alaska, N. Pacific
North Pacific right whale	(*Eubalaena japonica*)	Bering Sea, Gulf of Alaska, N. Pacific
Sei whale	(*Balaenoptera borealis*)	Gulf of Alaska, N. Pacific
Sperm whale	(*Physeter macrocephalus*)	Bering Sea, Gulf of Alaska, N. Pacific
Cook Inlet beluga whale	(*Delphinapterus leucas*)	Cook Inlet
Leatherback sea turtle	(*Dermochelys coriacea*)	Gulf of Alaska
Threatened		
Spectacled eider	(*Somateria fischeri*)	Western and Northern coastal Alaska
Steller's eider	(*Polysticta stelleri*)	Southwestern, Western and Northern Alaska
Polar bear	(*Ursus maritimus*)	Beaufort, Chukchi and Bering Sea
Northern sea otter (Southwest Alaska Population)	(*Enhydra lutris kenyoni*)	Aleutian Islands, Alaska Peninsula, Kodiak Island
Steller sea lion (east of 144°)	(*Eumetopias jubatus*)	Bering Sea, Gulf of Alaska, N. Pacific
Loggerhead sea turtle	(*Caretta caretta*)	Gulf of Alaska
Green sea turtle	(*Chelonia mydas* incl. *agassizi*)	Gulf of Alaska
Candidate		
Kittletz's murrelet	(*Brachyramphus brevirostris*)	Southern and northwestern coastal Alaska
Pacific herring	(*Clupea pallasi*)	Southeast Alaska

3.1 FISH

West Coast salmon species currently listed under ESA originate in freshwater habitat in Washington, Oregon, Idaho, and California. No stocks of Pacific salmon or steelhead originating from freshwater habitat in Alaska are listed under ESA. However, some of the listed species migrate as adults into marine waters off Alaska (NMFS 2005).

ESA-listed West Coast salmon and steelhead species are summarized in Table 3.2 and are categorized by Evolutionarily Significant Units (ESUs), which are distinct population segments (DPS) that are reproductively isolated and contribute to the ecological or genetic diversity of the species (Waples 1991). The ESA defines a “species” to include any distinct population segment of any species. For Pacific salmon, NOAA considers an ESU, a “species” under the ESA.

Those ESUs that are most likely to migrate into marine waters off Alaska include Chinook salmon, sockeye salmon, or steelhead from rivers in Washington and Oregon (NMFS 2005). These may include the Chinook salmon Snake River fall run ESU; and the steelhead Upper Columbia River, Snake River Basin, and Lower Columbia River run ESUs (NMFS 2005).

Table 3.2: Endangered Species Act Status of West Coast Salmon and Steelhead

SPECIES		EVOLUTIONARILY SIGNIFICANT UNIT	STATUS
Chinook salmon	(*Oncorhynchus tshawytscha*)	Sacramento River Winter-Run	Endangered
		Snake River Fall	Threatened
		Snake River Spring/Summer	Threatened
		Puget Sound	Threatened
		Lower Columbia River	Threatened
		Upper Willamette River	Threatened
		Upper Columbia River Spring	Endangered
		Central Valley Spring	Threatened
		California coastal	Threatened
Chum salmon	(*O. keta*)	Hood Canal Summer-Run	Threatened
		Columbia River	Threatened
Coho salmon	(*O. kisutch*)	Central California Coast	Endangered
		S. Oregon/ N. California Coast	Threatened
		Lower Columbia River	Threatened
Sockeye salmon	*(O. nerka)*	**Snake River**	Endangered

Table 3.2: Endangered Species Act Status of West Coast Salmon and Steelhead

SPECIES		EVOLUTIONARILY SIGNIFICANT UNIT	STATUS
Steelhead	(*O. mykiss*)	Southern California	Endangered
		South-Central California	Threatened
		Central California Coast	Threatened
		Upper Columbia River	Threatened
		Snake River Basin	Threatened
		Lower Columbia River	Threatened
		Central Valley California	Threatened
		Upper Willamette River	Threatened
		Middle Columbia River	Threatened
		Northern California	Threatened
		Puget Sound	Proposed Threatened

[1] The ESA defines "species" to include any distinct population segment of any species of vertebrate fish or wildlife. For Pacific salmon, NOAA Fisheries considers an Evolutionarily Significant Unit (ESU) a "species" under the ESA. For Pacific steelhead, NOAA Fisheries has delineated Distinct Population Segments (DPSs) for consideration as "species" under the ESA.

3.1.1 *Chinook Salmon*

The Snake River fall run of Chinook salmon (*Oncorhynchus tshawytscha)* has been designated as threatened since April 22, 1992 (FR 57 (78): 14653-14664).

<u>Species range</u>

In the U.S., Chinook salmon are found from the Bering Strait area off Alaska south to Southern California.

<u>Critical habitat</u>

The critical habitat for the Snake River fall Chinook salmon was listed on December 28, 1993 (FR 58 (247): 68543-68555). The designated critical habitat does not include any waters within the state of Alaska.

<u>Life history and ecology</u>

Chinook salmon are anadromous and semelparous meaning that as adults, they migrate from a marine environment into the fresh water streams and rivers of their birth where they spawn and die (NMFS 2009a). Two distinct races have evolved among Chinook salmon. The stream-type race of Chinook salmon is found most commonly in headwater streams. Stream-type Chinook salmon have a longer fresh water residency, and demonstrate extensive offshore migrations into the North Pacific before returning to their natal streams in the spring or summer months (NMFS 2009a; Healy 1991). The ocean-type Chinook, including the Snake River fall-run Chinook salmon ESU, are commonly found in coastal streams in North America. Ocean-type

Chinook migrate to sea where they tend to spend their ocean life in coastal waters within about 1,000km from their natal river (NMFS 2009a; Healy 1991).

Ocean-type Chinook salmon return to their natal streams or rivers in spring, winter, fall, summer, and late-fall runs; however, summer and fall runs predominate (EPA 2005b). 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 (NMFS 2009a).

Adult female Chinook will prepare a redd (or nest) in a stream area with suitable gravel type composition, water depth, and velocity. The adult female Chinook may deposit eggs in 4-5 "nesting pockets" within a single redd. Spawning sites have larger gravel and more water flow up through the gravel than the sites used by other Pacific salmon. After laying eggs in a redd, adult Chinook will guard the redd from just a few days to nearly a month before dying. Chinook salmon eggs will hatch, depending upon water temperatures, 3-5 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. Salmon feed on terrestrial and aquatic insects, amphipods, and other crustaceans while young and primarily on other fishes when older (NMFS 2009a).

<u>Population trends and risks</u>

Almost all historical Snake River fall-run Chinook salmon spawning habitat in the Snake River Basin has been blocked by the Hells Canyon Dam complex or other habitat blockages in the Columbia River tributaries. The ESU's range has also been affected by agricultural water withdrawals, grazing, and vegetation management within the Columbia and Snake River Basins. The continued straying by nonnative hatchery fish into natural production areas is an additional source of risk (EPA 2005b)

The historical population of Snake River fall-run Chinook salmon is difficult to estimate. Irving and Bjornn (1981) estimated a population of 72,000 for the period of 1938-1949 that declined to 29,000 during the 1950s (EPA 2005b). Numbers declined further following completion of the Hells Canyon Dam complex. The Snake River component of the fall-run Chinook has been increasing during the past few years as a result of hatchery and supplementation efforts in the Snake and Clearwater River Basins. In 2002, more than 15,200 fall-run Chinook were counted past the two lower dams on the Snake River, with about 12,400 counted above Lower Granite Dam. For the Snake River fall-run Chinook salmon ESU, NOAA Fisheries estimates that the median population growth rate over a base period from 1980 through 1998 ranges from 0.94-0.86. The decrease in growth rate reflects the increased effectiveness of hatchery fish spawning in the wild compared with that of fish of wild origin (McClure et al. 2000).

3.1.2 *Steelhead*

The Upper Columbia river fall run ESU of steelhead trout (common name for anadromous form of *Oncorhynchus mykiss*) *was* designated as endangered on August 18, 1997 (FR 62 (159): 43937-43955), and upgraded to threatened January 5, 2006 (FR 71 (3): 834-864). The Snake River run ESU was designated as threatened August 18, 1997 (FR 62 (159): 43937-43955) and the Lower Columbia River run ESU was designated as threatened March 19, 1998 (63 FR (53) 13347-13372).

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 (NMFS2009b).

Critical habitat

Critical habitat for the Upper Columbia River ESU, the Snake River ESU, and the Lower Columbia River ESU was designated September 2, 2005 (FR 70 (170): 52630-52860). The designated critical habitat does not include any waters within the state of Alaska.

Life history and ecology

Adults migrate from a marine environment into the freshwater streams and rivers of their birth in order to mate (called anadromy). Unlike other Pacific salmonids, they can spawn more than one time (called iteroparity) (NMFS2009b).

Steelhead can be divided into two basic reproductive types, stream- or ocean-maturing, based on the state of sexual maturity at the time of river entry and duration of spawning migration. The stream-maturing type (summer-run 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 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 (NMFS 2009b).

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 4-5 "nesting pockets" within a single redd. The eggs hatch in 3 to 4 weeks. 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) (NMFS 2009b).

Population trends and risks

Long term trends of the Snake River ESA and Lower Columbia River ESU have remained negative, with the population growth rates less than one (Good et al. 2005). However, returns of steelhead to the upper Columbia River have increased in recent years. From 1997-2001, the average return was approximately 12,900, while the average for the previous 5 years (1991-1996) was 7,800 fish (Good et al. 2005). Threats include habitat alternation and direct mortality associated with water storage, withdrawal, conveyance, and hydropower, as well as stream bed alteration, increased predator populations due the introduction of non-native species and modification in habitat (NMFS 2009b).

3.1.3 Southeast Alaska DPS Pacific Herring

The Southeast Alaska DPS of Pacific herring (*Clupea pallasi*) was designated a candidate species on April 11, 2008 (FR 73(71): 19824-19825).

Species Range

The Southeast Alaska DPS of Pacific herring extends from Dixon Entrance northward to Cape Fairweather and Icy Point and includes all Pacific herring stocks in Southeast Alaska. Pacific herring are located in distinctly varying environments during different times of the year.

Life History and Ecology

Herring have a blue-green upper body with silvery sides without markings. Pacific herring may grow up to 18 inches in length, although 9-inche fish are considered large. Pacific herring generally spawn during the spring and can spawn every year following sexual maturity at 3 or 4 years of age (ADFG 2008). In Alaska, spawning is first observed in the southeastern archipelago during mid-March, in Prince William Sound in April and May, and in the Bering Sea during May and June (ADFG 2008). Spawning is confined to shallow, vegetated areas in the intertidal and subtidal zones (ADFG 2008). Herring eggs are adhesive and eggs which stick to intertidal vegetation have higher survival rates than those that fall to the bottom. The eggs hatch in approximately two weeks, depending on the temperature of the water. Mortality of eggs is high. Young larvae drift and swim with the ocean currents and are preyed upon extensively by other vertebrate and invertebrate predators (ADFG 2008). During development in the juvenile stage, herring rear in sheltered bays and inlets and appear to remain segregated from adult populations until they are mature (ADFG 2008). After spawning, most adults leave inshore waters and move offshore to feed primarily on zooplankton such as copepods and other crustaceans (ADFG 2008). Herring schools often follow a diel vertical migration pattern, spending daylight hours near the bottom and moving upward during the evening to feed (ADFG 2008).

Population Trends and Risks

The Southeast Alaska DPS of Pacific herring is currently undergoing a status review to determine if this species warrants listing under the Endangered Species Act. While the Pacific herring fisheries have undergone decline in the 1980's and 1990's, specific trends and risks of this species are still under investigation.

3.2 BIRDS

3.2.1 *Short-tailed Albatross*

The short-tailed albatross (*Phoebastria albatrus)* was federally listed as endangered throughout its range on July 31, 2000 (65 FR 147:46643-46654).

Species range

The short-tailed albatross once ranged throughout most of the North Pacific Ocean and Bering Sea. Exploitation by feather hunters around the start of the 20th century created a population decline. Short-tailed albatrosses require remote islands for breeding habitat and nest in open areas with low or no vegetation. Breeding colonies of the short-tailed albatross are currently known on two islands in the western North Pacific and East China Sea. Five months after hatching, chicks leave the nest to wander across the North Pacific. Adults spend their non-breeding seasons at sea as well feeding on squid, fish, flying fish eggs, shrimp, and other crustaceans (USFWS 2000).

Outside of the breeding season, short-tailed albatrosses are distributed throughout most of the North Pacific (USFWS 2000) (Figure 3.1). They have been observed most frequently along the continental shelves in Gulf of Alaska, the Aleutians, and the Bering Sea between the Alaska Peninsula and St. Matthew Island as they require nutrient rich areas of ocean upwelling for their foraging habitat (USFWS 2005a).

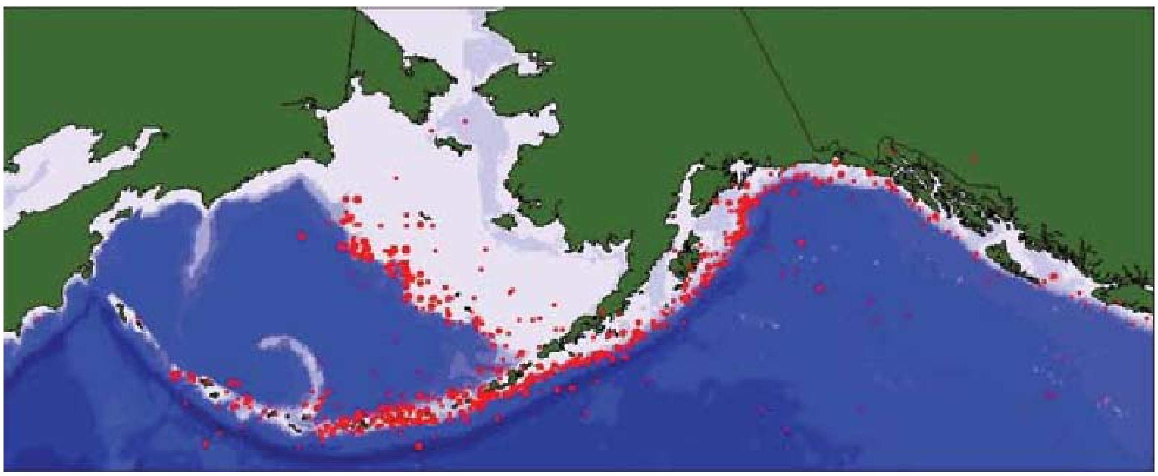

Figure 3.1: Short-tailed albatross distribution mapped predominately from Alaskan fishing vessels from 1940-2003. *Source: USFWS 2005a.*

<u>Critical habitat</u>

Designation of critical habitat was not considered necessary due to lack of habitat-related threats to the species (USFWS 2005a).

<u>Population trends and risks</u>

Presently fewer than 2000 short-tailed albatrosses are known to exist (USFWS 2005a). Their primary threats include habitat loss and alternation due to volcanic activity and monsoon rains near nesting sites, ocean regime shift due to climate change, commercial fishing, exposure to contaminants, and disease (USFWS 2005a).

3.2.2 *Steller's Eider*

The Alaska-breeding population of the Steller's eider (*Polysticta stelleri*) was listed as threatened on June 11, 1997, based on the contraction in the species' breeding range in Alaska and the resulting increased vulnerability of the remaining breeding population to extirpation (FR 62 (112): 31748-31757) (USFWS 2002a).

Species range

Three breeding populations of Steller's eiders are recognized - two in Arctic Russia and one in Alaska. The Alaska-breeding population nests primarily on the Arctic Coastal Plain, although a very small subpopulation remains on the Yukon-Kuskokwin Delta (USFWS 2002a) (Figure 3.2).

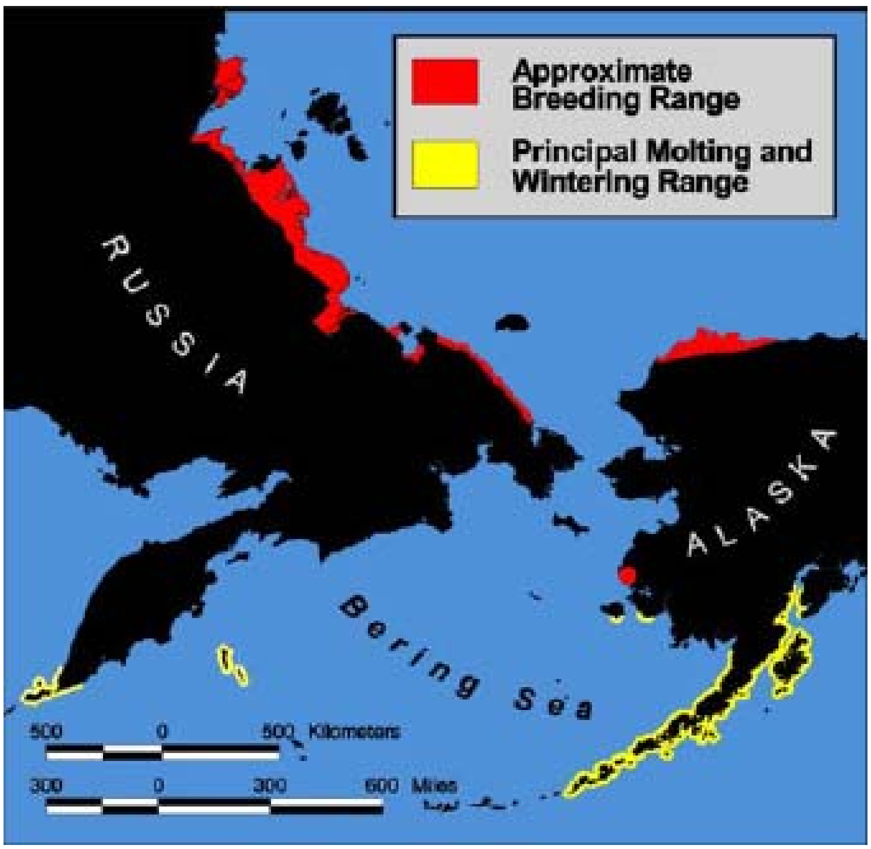

Figure 3.2: Distribution of the Pacific Population of Steller's Eider. *Source: USFWS 2002a.*

Critical habitat

Critical habitat was designated for the Steller's eider in 2001 (FR 66 (23): 8849-8884), which includes breeding habitat on the Yukon-Kuskokwim Delta, and four units in southwest Alaska marine waters, including the Kuskokwim Shoals in northwest Kuskokwim Bay, Seal Islands, Nelson Lagoon, and Izembek Lagoon on the north side of the Alaska Peninsula. Critical Habitat in the State of Alaska for Steller's eiders is indicated in Figure 3.3

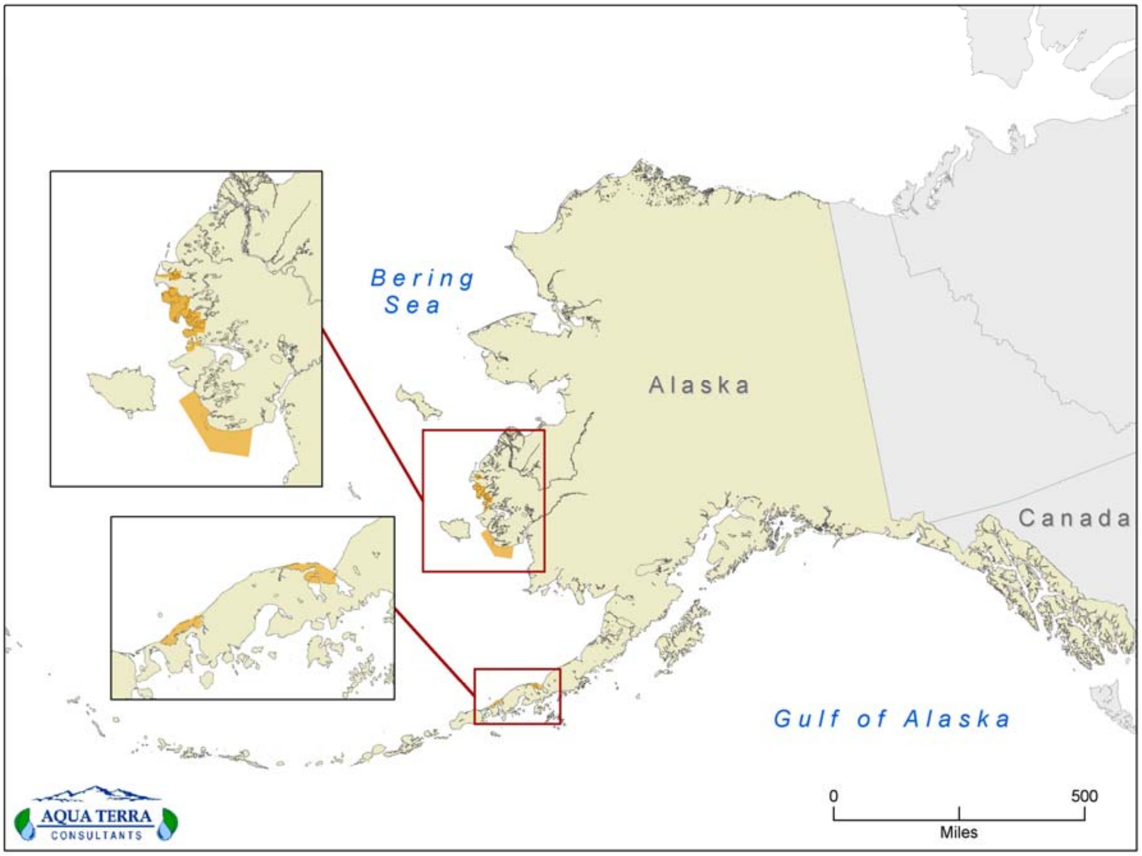

Figure 3.3: Critical habitat for the Steller's eider. *Source: National Marine Fisheries Service, ESRI.*

Life history and ecology

Steller's eiders nest in terrestrial environment but spend majority of the year in shallow, near-shore marine waters. After nesting, Alaska's Steller's eiders migrate south in the fall. These ducks move into the nearshore marine waters of southwest Alaska where they mix with the much more numerous Russian Pacific populations (USFWS 2002a). Adults undergo a flightless molt in autumn. Steller's eiders remain flightless for about three weeks, but the overall period of flight feather molt for the species is from late July to late October (Peterson 1981). Steller's eiders molt in a number of locations in southwest Alaska, but the largest numbers concentrate in four areas along the north side of the Alaska Peninsula - Izembek Lagoon, Nelson Lagoon, Port Heiden, and Seal Islands (Gill et al. 1981, Peterson 1981, Metzner 1993). Molting areas where large numbers concentrate tend to be characterized by extensive shallow areas with eelgrass beds, intertidal sand flats, and mudflats where Steller's eiders forage on marine invertebrates such as mollusks and crustaceans (Metzner 1993).

After molting many Steller's eiders disperse to the Aleutian Islands, the south side of the Alaska Peninsula, Kodiak Island, or as far east as Cook Inlet; however, thousands may remain in the lagoons used for molting unless freezing conditions force them to move to warmer areas (USFWS 2002a). Wintering eiders usually occur in waters less than 10m deep and are usually found within 400m of shore. Prior to spring migration, thousands to tens of thousands of

Steller's eiders stage in estuaries along the north side of the Alaska Peninsula, including several areas used during molt and winter. From there, they cross Bristol Bay. It is speculated that majority of the entire Alaska-wintering adult population spends days or weeks feeding and resting in northern Kuskokwim Bay and in smaller bays along its perimeter before continuing northward to nesting areas (USFWS 2002a).

Population trends and risks

The Alaska-breeding populations of Steller's eiders occur in two disjunct regions - western and northern Alaska. The status of the subpopulations occupying these regions is inadequately understood due to lack of precise population size estimates and limited historical information for comparison with current estimates.

Aerial surveys currently provide the only available means of estimating population size and distribution. Population size point estimates, based on annual waterfowl breeding pair surveys from 1989-2000, range from 176-2,543 (Mallek 2002). The observations indicate that Steller's eiders occur over a vast area with a greater density near Barrow, the northernmost point in Alaska, which is thought to be the core of the Steller's eiders breeding distribution (USFWS 2002a).

Threats include predation, hunting, ingestion of spent lead shot in wetlands, changes in marine environment, as well as exposure to oil or contaminants near fish processing facilities in southwest Alaska (USFWS 2002a).

3.2.3 *Spectacled Eider*

The spectacled eider (*Somateria fascheri)* was designated as threatened on May 10, 1993 (FR 58 (88): 27474-27480) due to their rapid, continual decline on the Yukon-Kuskokwim Delta breeding grounds. Additionally, there are indications that the population is declining on Alaska's North Slope (USFWS 1996).

Species range

Historically, spectacled eiders nested along much of the coast of Alaska, from Nushagak Peninsula in the southwest, north to Barrow, and east near the Canadian border. Today, spectacled eiders breed in three primary locations - the Yukon-Kuskokwim Delta, the North Slope, and Arctic Russia. Limited nesting may also occur on St. Lawrence Island and the Seward Peninsula in Alaska (USFWS 1996).

On the Yukon-Kuskokwim Delta, spectacles eiders breed mostly within 15km of the coast from Kigigak Island north to Kokechik Bay, with smaller numbers nesting south of Kigigak Island to Kwigillingok and north of Kokechik Bay to the mouth of Uwik Slough. The coastal fringe of the Yukon-Kuskokwim Delta is the only subarctic breeding habitat where spectacled eiders occur at high density. On Alaska's North Slope, the majority of spectacled eiders breed between Icy Cape and and Shaviovik River and generally at low densities (Larned and Balogh 1997). Figure 3.4 provides spectacled eiders breeding distribution.

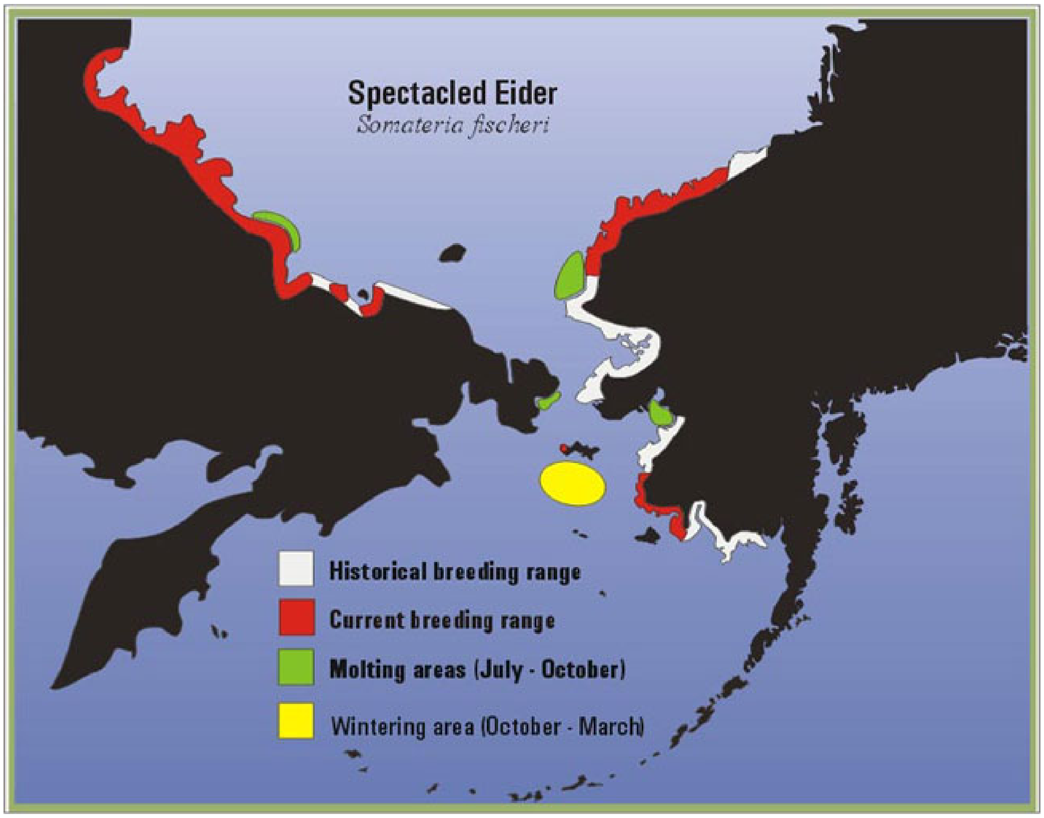

Figure 3.4: Distribution of breeding pairs of spectacled eiders. Current breeding range indicated areas where surveys have confirmed breeding pair occurrence. Low-density breeding may still occur outside these areas. *Source: USFWS 2006b.*

Important late summer and fall molting areas have been identified in eastern Norton Sound and Ledyard Bay (USFWS 1996). Wintering flocks of spectacled eiders have been observed in the Bering Sea between St. Lawrence and St. Matthew Islands (USFWS 2006b) where they congregate in large and dense flocks in pack ice openings (Larned et al. 1995).

<u>Critical habitat</u>

Critical habitat for the spectacled eider was designated in 2001(FR 66 (25): 9146-9187), and includes areas on the Yukon-Kuskokwim Delta, Norton Sound, Ledyard Bay, and the Bering Sea between St. Lawrence and St. Matthews Islands. Critical Habitat in the State of Alaska for Steller's eiders is indicated in Figure 3.5.

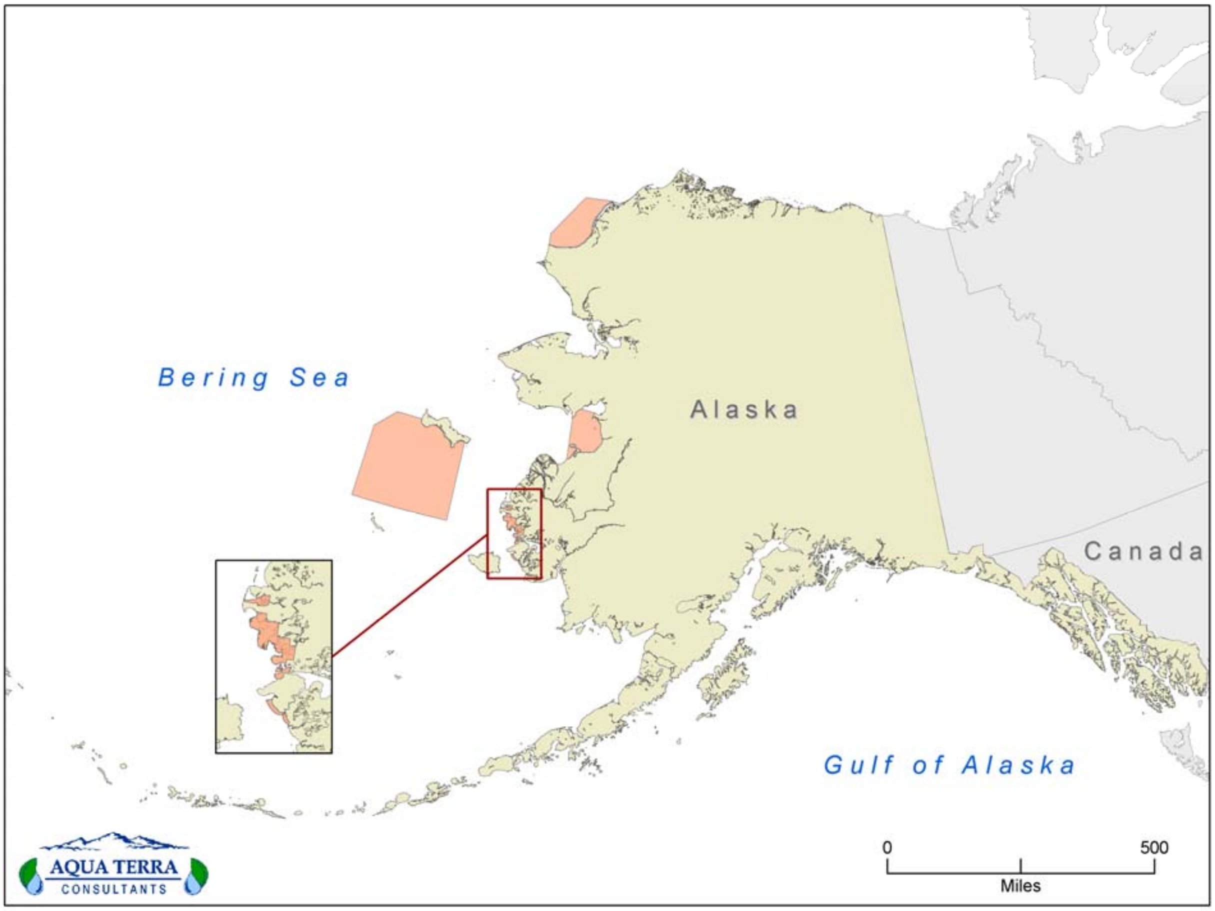

Figure 3.5: Critical habitat for the spectacled eider. *Source: National Marine Fisheries Service and ESRI.*

Life history and ecology

Spectacled eiders are diving ducks that spend most of the year in marine waters where they typically feed on bottom-dwelling molluscs and crustaceans. Around spring break-up, breeding pairs move to nesting areas on wet coastal tundra. During this season they feed by diving and dabbling in ponds and wetlands, eating aquatic insects, crustaceans, and vegetation. Shortly after eggs are laid, males leave the nesting grounds for offshore molting areas, usually by the end of June. Females whose nests failed leave the nesting area to molt at sea by mid-August. Breeding females and their young remain on the nesting grounds until early September. Molting flocks gather in relatively shallow coastal water (less than 36m deep). While moving between nesting and molting areas, spectacled eiders travel along the coast up to 50km offshore. From October through March, they move far offshore to waters up to 65m deep where they sometimes gather in dense flocks in openings of nearly continuous sea ice (USFWS 2006b).

Population trends and risks

The spectacled eider was listed as threatened primarily because the number of nesting pairs on the Yukon-Kuskokwim Delta had declined from approximately 48,000 pairs in the early 1970s to 1,721 by 1992 (Stehn et al. 1993). Historical data for other nesting areas in scarce ; it is estimated that 3000-4000 pairs currently nest on Alaska's North Slope and approximately 40,000 pairs nest in arctic Russia (USFWS 2006b). Potential population threats include lead poisoning, excessive subsistence take, changes in predator pressure, and disturbance to nesting grounds (USFWS 1996).

3.2.4 *Kittlitz's Murrelet*

Kittlitz's murrelet (*Brachyramphus brevirostris*) was designated a candidate species on May 4, 2004 (FR 69 (86): 24875-24904).

Species range

The Kittlitz's murrelet ranges in Alaska from Point Lay in the north to Glacier Bay and nearby southeast Alaska. Its centers of abundance appear to be Prince William Sound and Glacier Bay. The Kittlitz's murrelet is generally found in association with marine tidewater glaciers and glacially influenced waters, often in protected fjords or among islands. When within the range of tidewater glaciers, the species is associated with waters containing icebergs and brash ice (i.e. ice cover of 5-15%) and avoids areas that contain heavy ice cover (Day et al. 1999, Day et al. 2000). Elsewhere, Kittlitz's murrelets are found along coasts with waters influenced by glacial outwash (USFWS 2005b).

During the breeding season, Kittlitz's murrelets appear to favor waters less than 200m from shore (Day et al. 2000). During non-breeding season, the marine distribution is farther offshore. However, in winter, Kittlitz's murrelets occur in the protected waters of Prince William Sound, Kenai Fjords, Kachemak Bay, and Sitka Sound (Day et al. 1999).

Population trends and risks

The Alaska population of Kittlitz's murrelets currently is approximately 17,000 (USFWS 2004), but is declining at a rate of up to 18% per year (Kuletz et al. 2003, USFWS 2004). Significant downward trends have been reported from Prince William Sound, where the Kittlitz's murrelet population has declined 84% over 11 years. At this rate, extirpation of Kittlitz's murrelets in Prince William Sound is predicted to take approximately 30 years (Kuletz et al. 2005). Populations have also declined along the coast of Kenai Fjords (Van Pelt and Piatt 2003), Lower Cook Inlet (Speckman et al. 2005), Glacier Bay (Robards et al. 2003) and the Malasping Forelands (Kissling et al. 2005).

Threats include exposure to oil contaminants, entanglement in gillnets, disturbance from commercial and recreational cruise ships, and the effect of climate change on the stability of tidewater glaciers (USFWS 2005b).

3.3 MARINE MAMMALS

3.3.1 *Polar Bear*

The polar bear (*Ursus maritimus*) was designated at threatened on May 15, 2008 (73FR 28212-28303). The following information is summarized from the species description provided in the final listing in the Federal Register as well as the Polar Bear Recovery Plan.

Species range

Polar bears evolved to utilize the Arctic sea ice niche and are distributed throughout most ice-covered seas of the Northern Hemisphere. The occur throughout the East Siberian, Laptev, Kara, and Barents Seas of Russia; Fram strait (the narrow strait between northern Greenland and Svalbard), Greenland Sea and Barents Sea of northern Europe (Norway and Greenland (Denmark)); Baffin Bay, which separates Canada and Greenland, through most of the Canadian Arctic archipelago and the Canadian Beaufort Sea. In Alaska, polar bears are found in the Chukchi and Beaufort Seas located west and north of Alaska.

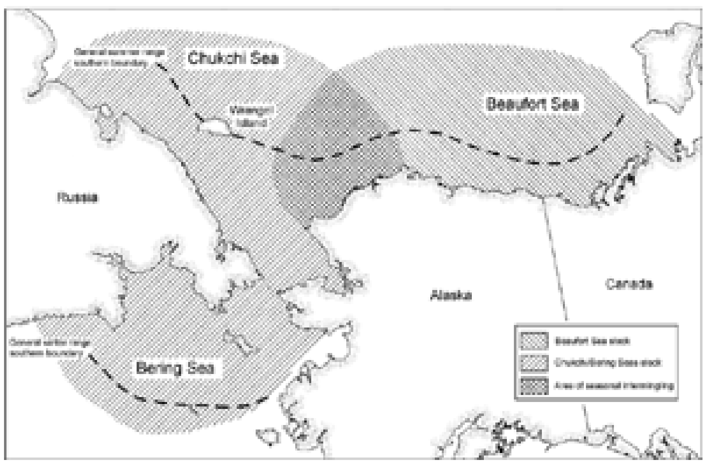

Fig 3.6: Distribution of polar bears in Alaskan waters.
Source: USFWS 2008.

Critical habitat

Critical habitat has not been designated for the polar bear at this time. Arctic sea ice provides a platform for critical life-history functions, including hunting, feeding, travel, and nurturing cubs. That habitat is projected to be significantly reduced within the next 45 years. A careful assessment of the designation of marine areas as critical habitat will require additional time to fully evaluate physical and biological features essential to the conservation of the polar bear and how those features are likely to change over the foreseeable future. In addition, near-shore and terrestrial habitats that may qualify for designation as critical habitat will require a similar thorough assessment and evaluation in light of projected climate change and other threats. The USFWS finds that critical habitat is undeterminable at this time because they are unable to identify the physical and biological features essential to the conservation of this population segment (USFWS 2008).

Life history and ecology

Polar bears are the largest of the living bear species (DeMaster and Stirling 1980, Stirling and Derocher 1990). They are characterized by large body size, stocky form, and fur color that varies from white to yellow. Females weigh 400 to 700 pounds (lbs) and males up to 1,440 lbs. Polar bears have a longer neck a proportionally smaller head than other members of the bear family and are missing the distinct shoulder hump common to grizzly bears. The nose, lips and skin of polar bears are black (DeMaster and Stirling 1981, Amstrup 2003).

Polar bears evolved in sea ice habitats and as a result are evolutionarily adapted to this habitat. Over most of their range, polar bears remain on the sea ice year-round or spend only short periods on land. However, some polar bear populations occur in seasonally ice-free environs and use land habitats for varying portions of the year. In the Chukchi Sea and Beaufort Sea areas of Alaska and northwestern Canada, for example, less than 10 percent of the polar bear locations obtained via radio telemetry were on land (Amstrup 2000). Although polar bears are generally limited to areas where the sea is ice-covered for much of the year, they are not evenly distributed throughout their range on sea ice. They show a preference for certain sea ice characteristics, concentrations and specific sea ice features (Sterling et al. 1993; Arthur et al. 1996, Ferguson et al. 2000a, Ferguson et al. 2000b, Mauritzen et al. 2001, Durner et al. 2006, Durner et al. 2007). Polar bears show a preference for sea ice located over and near the continental shelf (Derocher et al. 2004, Durner et al. 2004, Durner et al. 2007) likely due to higher biological productivity in these areas (Dunton et al. 2005) and greater accessibility to prey in near shore zones and polynyas compared to deep-water regions in the central polar basin (Stirling 1997).

Polar bears in Alaska feed primarily on ringed seals (*Phoca hispida*) and to a lesser extent, on bearded seals (*Erignathus barbatus*) (Stirling and McEwan 1975; Stirling and Archibald 1977; Stirling and Latour 1978) and spotted seals (*Phoca largha*) (USFWS 1994). Bears may also prey on hooded seals (*Cystophora cristata*) (Stirling and Archibald 1977), walruses (*Odobenus rosmarus*) (Kiliaan and Stirling 1978), and beluga whales (*Delpinapterus leucas*) (Freeman 1973; Heyland and Hay 1976; Lowry et al. 1987). They scavenge on the carcasses of whales and walruses. They occasionally prey on other polar bears (Russell 1975; Lunn and Stenhouse 1985; Taylor et al. 1985). When other food is not available, polar bears may eat small mammals, birds, eggs and vegetation, but these foods are not an important component of the diet.

Polar bears clearly prefer the blubber of ringed seals (Stirling and Archibald 1977). The high energy demand of polar bears, associated with metabolic thermoregulation and the energy cost of walking and hunting, contributes to the selective use of seal blubber. Availability of seals varies seasonally and regionally; therefore, the replenishment of fat deposits is important to polar bears to maintain an insulating layer to reduce heat losses and provide a reserve source of energy when food is scarce. Pregnant females remain in their dens without feeding for approximately 3 months after giving birth and depend on pre-denning body condition to meet energy requirements during this period.

Female polar bears reach maturity at 4 or 5 years of age (Stirling and Smith 1975). In the Beaufort Sea, the age of first reproduction is typically 6 years of age (Stirling and Smith 1975, Lentfer et al. 1980). Polar bears typically mate on sea ice from late March through May (Lono 1970), although implantation does not occur until September (Stirling et al. 1984). Pregnant females seek out denning areas in late October and November and form maternity dens, typically in drifted snow (Harington 1968, Jonkel et al. 1972, Lentfer and Hensel 1980). Cubs are born in December and January (Lentfer 1982). Estimates of average litter size differ for different locations and vary between 1.52 and 2.0 (Lono 1970, Ramsay and Stirling 1982). In most areas, females with cubs emerge from dens in late March and early April and stay near their den sites for several days or as long as a month (Harington 1968, Stirling et al. 1984) before moving off in search of food. In most areas of the Arctic, female polar bears keep their cubs until they are about 2.5 years old (Stirling and Smith 1975, Lentfer et al. 1980, Stirling et al. 1980). For females that successfully wean litters, the average reproductive interval is about 4 years (Lentfer et al. 1980).

Population trends and risks

The total number of polar bears worldwide is estimated to be 20,000-25,000 (Aars et al. 2006). Polar bears are not evenly distributed throughout the Arctic, nor do they comprise a single nomadic cosmopolitan population, but rather occur in 19 relatively discrete populations or distinct population segments (Aars et al. 2006). Boundaries of the 19 polar bear populations have evolved over time and are based on intensive study of movement patterns, tag returns from harvested animals and genetic analysis (Aars et al. 2006). There is considerable overlap in areas occupied by members of these groups and boundaries separating the groups are adjusted as new data is collected (Amstrup et al. 2004, Amstrup et al. 2005). These boundaries, however, are thought to be ecologically meaningful and the 19 units they describe are managed as populations, with the exception of the Arctic Basin population where few bears are believed to be year-round residents. The Chukchi sea population is estimated to comprise 2,000 animals, based on extrapolation of aerial den surveys. Status and trend have not yet been determined for this population. The Southern Beaufort Sea population is currently comprised of 1,500 animals based on a recent population inventory which demonstrated the population declining from estimated population sizes ranging from 2,500 to 1,800 in the late 1980's (Amstrup et al. 1986, Amstrup 2000, Amstrup et al. 2001). Based on this information, the predicted trend is declining (Aars et al. 2006) and the status is designated as reduced.

Because of their specialized habitats and life history constraints (Amstrup 2003), polar bears have many qualities that make their populations susceptible to the potential negative impacts of sea ice loss resulting from climate change. The Southern Beaufort Sea population has been subject to dramatic changes in the sea ice environment, beginning in the winter of 1989-1990 (Regehr et al. 2006). Sea ice is an essential platform that allows polar bears to access prey and reductions in sea ice alters ringed seal distribution, abundance and availability for polar bears. Such reductions will, in turn, decrease polar bear body condition (Derocher et al. 2004). Declines in ringed and bearded seal numbers and productivity have resulted in marked declines in polar bear populations (Stirling 1980, Stirling and Oritsland 1995, Stirling 2002). In addition, declines in fat reserves during critical times in the polar bear life cycle detrimentally affect populations through delay in the age of first reproduction, decrease denning success, decline in litter sizes with more single cub litters and fewer cubs, and lower cub body weights and lower survival rates (Atkinson and Ramsay 1995, Derocher et al. 2004). The importance of sea ice to polar bear foraging is supported by studies documenting the relationship between the duration and extent of the sea ice and polar bear condition, reproduction and survival across decades despite likely fluctuations in ringed seal abundance during that same timeframe (Stirling et al. 1999, Regehr et al. 2007a, Regehr et al. 2007b, Rode et al. 2007).

3.3.2 *Northern Sea Otter (Southwest Alaska Population)*

The northern sea otter (Southwest Alaska population) (*Enhydra lutris kenyoni)* was designated threatened on September 8, 2005 (FR 70 (152): 46365-46386). This designation was due to a 55-67% decline in this population segment since the mid-1980s.

Species range

The northern sea otter has a range that extends from the Aleutian Islands, southwestern Alaska to the coast of the State of Washington (Figure 3.7) and contain two subspecies (*E. l. kenyoni* and *E. l. lutris*). These species are separated by an expanse of open water that stretches approximately 200 miles between Near Islands of the U.S. and Commander Islands in Russia where wide deepwater passes serve as a barrier to sea otter movement (Kenyon 1969).

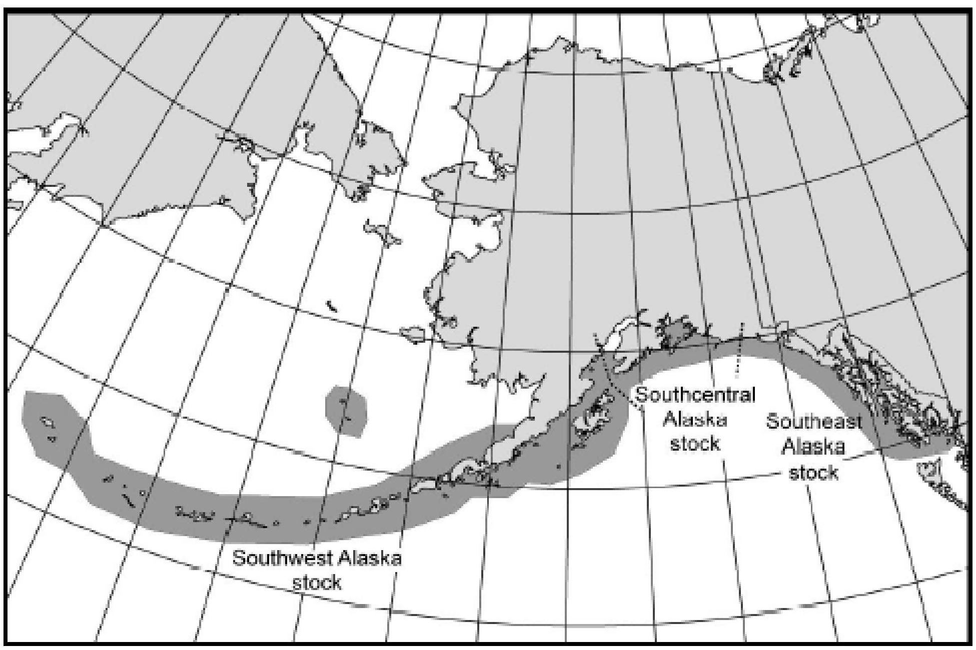

Figure 3.7: Approximate distribution of northern sea otters in Alaskan waters.
Source: USFWS 2002b.

The southwest Alaska population ranges from Attu Island at the western end of Near Islands in the Aleutians and east to Kamishak Bay on the western side of lower Cook Inlet. The southwest Alaska population includes waters adjacent to the Aleutian Islands, Alaska Peninsula, Kodiak archipelago, and the Barren Islands (USFWS 2005c). Sea otters typically are located in shallow water areas near the shoreline or further offshore in areas where a shelf of shallow water extends along several miles from shore such as in Bristol Bay or along the north side of the Alaska Peninsula (USFWS 2005c).

Critical habitat

Critical habitat has been proposed for the Southwest Alaska DPS of the northern sea otter (73 FR 76454) and encompases five critical habitat areas along the Aleutian Islands and the Alaska

Penninsula.

Life history and ecology

Sea otters are considered a keystone species; strongly influencing the species composition and diversity of the nearshore marine environment they inhabit (Estes 1990). Sea otters mate at all times of the year and their young can be born in any season. However, in Alaska, most pups are born in late spring. Sea otters are not migratory and generally do not disperse over long distances. They are gregarious and can become concentrated in an area, sometimes resting in pods of fewer than 10 to more than 1,000 animals (USFWS 2005c).

Sea otters have a relatively high rate of metabolism as compared to land mammals of similar size and therefore eat large amounts of food (estimated at 23-33% of their body weight per day (Estes 1990)). Sea otters are carnivores and primarily eat a wide variety of benthic invertebrates, such as sea urchins, crabs, clams, mussels, and octopuses. In some parts of Alaska, sea otters eat epibenthic fishes as well (Estes 1990).

Population trends and risks

Prior to commercial exploitation, the range-wide estimate for the species was 150,000-300,000 individuals (Kenyon 1969). Commercial hunting of sea otters began in the mid 1700s and over the next 170 years sea otters were hunted to the brink of extinction first by Russians, then by American fur hunters. Sea otters became protected from commercial harvests under the International Fur Seal Treaty of 1911; at that time the entire population was approximately 1,000-2,000. Population regrowth began following legal protection and sea otters have since recolonized much of their historic range in Alaska (USFWS 2002b). By the 1980s, sea otters were present in all the island groups of the Aleutians (Estes 1990). However, by 1992 the population declined to approximately 8,000 sea otters and by 2000 sea otter abundance had declined in the Aleutians to 2000-2,442 (USFWS 2002b).

Potential threats to sea otter populations include natural fluctuations, such as disease or predation, and indirect effects of human activities including pollutant contamination. One theory for the population decline indicates that they are the result of increased predation by transient killer whales (USFWS 2002b).

3.3.3 *Steller Sea Lion (Eastern and Western Stocks)*

The Steller sea lion (Eastern and Western Stocks) (*Eumetopias jubatus*) was listed as a threatened species on April 5, 1990 (FR 55 (227): 49294-49332) due to substantial declines in the western portion of the range. In contrast, the eastern portion of the range (southeastern Alaska and Canada) was increasing at 3% annually prior to 1990. In 1997, the Steller sea lion population was split into a western DPS and an eastern DPS based on demographic and genetic dissimilarities (FR 62 (86): 24345-24356). Due to the persistent decline, the western DPS was reclassified as endangered, while the increasing eastern DPS remained classified as threatened.

Species range

The Steller sea lion ranges along the North Pacific Ocean rim from northern Japan to California (Loughlin et al. 1992), with centers of abundance and distribution in Gulf of Alaska (GOA) and Aleutian Islands (AI), respectively. The northernmost breeding colony in the EBS is on Walrus Island near the Pribilof Islands and in the GOA on Seal Rocks in Prince William Sound (Kenyon and Rice 1961). The geographic center of their distribution is considered to be the AI and the GOA. The center of abundance for the species is considered to extend from Kenai to Kiska Island (NMFS 2006a).

Critical habitat

Critical habitat for Steller sea lion was designated on August 27, 1993 (FR 58 (165): 45269-45286) from information available about rookery areas, haulouts, and marine areas required by the species for survival in the wild. Habitat includes marine waters, terrestrial rookeries (breeding sites) and haulouts (resting sites). Rookeries are areas used by adult males and females for pupping, nursing, and mating during the mating season (late May to early July). Haulouts are used by both males and females of all size classes but generally are not sites where reproduction occurs. Critical habitat for Steller sea lions are indicated in Figures 3.8 and 3.9 and include the following:

(a) Alaska rookeries, haulouts, and associated areas. In Alaska, all major Steller sea lion rookeries identified in 50 CFR, part 226.202, Table 1, and major haulouts identified in 50 CFR, part 226.202, Table 2, as well as associated terrestrial, air, and aquatic zones, have been designated as critical habitat for the Steller sea lion. Critical habitat includes a terrestrial zone that extends 3,000 feet (0.9 km) landward from the baseline or base point of each major rookery and major haulout in Alaska. Critical habitat includes an air zone that extends 3,000 feet (0.9km) above the terrestrial zone of each major rookery and major haulout in Alaska, measured vertically from sea level. Critical habitat includes an aquatic zone that extends 3,000 feet (0.9km) seaward in state and federally managed waters from the baseline or basepoint of each major haulout in Alaska that is east of longitude 144ºW. Critical habitat includes an aquatic zone that extends 20nm (37km) seaward in state and federally managed waters from the baseline or basepoint of each major rookery and major haulout in Alaska that is west of longitude 144ºW.

(b) Three special aquatic foraging areas in Alaska, including the Shelikof Strait area, the southeastern BS, and the Seguam Pass area (NMFS 2005).

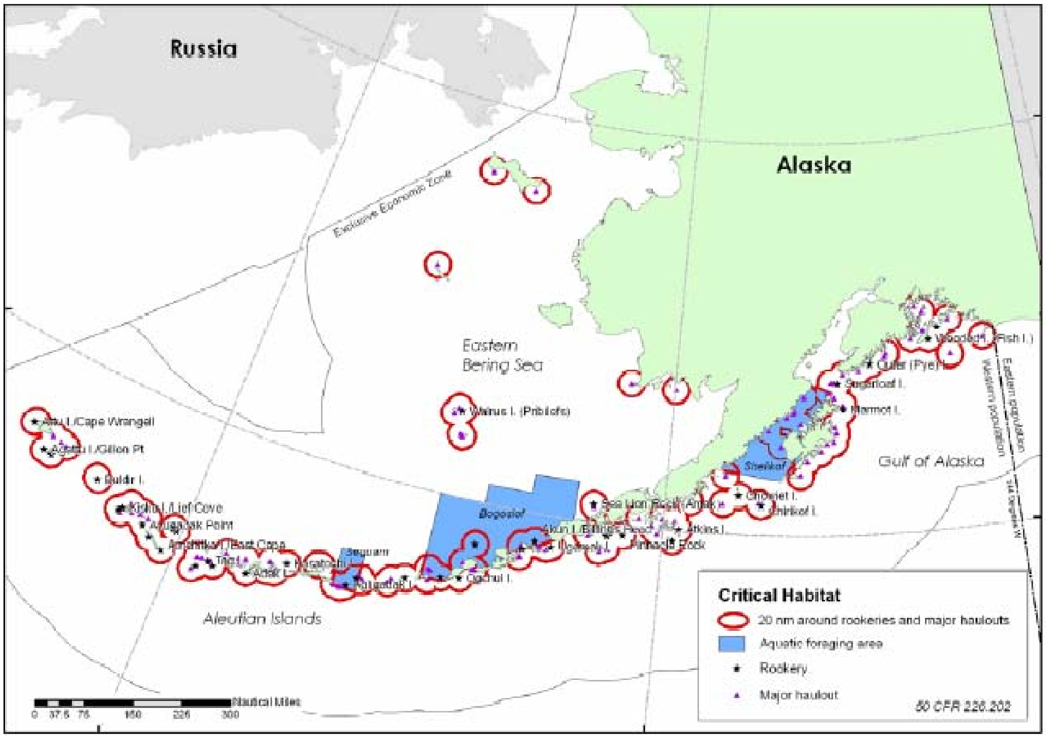

Figure 3.8: Designated critical habitat for the western DPS of Steller sea lion in Alaska (50 CFR 226.202). *Source: NMFS 2006a.*

Figure 3.9: Designated critical habitat for the eastern DPS of Steller sea lion (50 CFR 226.202). *Source: NMFS 2006a.*

Life history and ecology

Steller sea lions spend the majority of their time at rookeries or haulouts. Habitat types that typically serve as rookeries or haulouts include rock shelves, ledges, slopes, and boulder/ cobble/gravel, and sand beaches. When foraging in marine habitats, Steller sea lions typically occupy surface and midwater ranges in coastal regions. Some animals may also follow prey into river and inlet systems. Steller sea lions gather on well defined, traditionally used rookeries to pup and breed. Males defend individual territories from approximately mid-May through mid-July. They mate with females after birth then come into estrus in their territory. Females give birth to a single pup anytime from mid-May to July (Calkins 1994).

As marine carnivores, Steller sea lions eat a wide variety of fish such as pollock, flounder, herring, capelin, Pacific cod, salmon, rockfish, sculpins, and invertebrates such as squid and octopus in the intertidal to continental shelf zone. However, the majority of Steller sea lion diet consists of pollock and mackerel. The sea lions generally leave haulouts and rookeries to feed for periods of time varying from hours to months. They often return to the same haulout or rookery even after long absences (Calkins 1994).

Population trends and risks

Estimates of Steller sea lion historical abundance are crude and not well documented. It is estimated that there were over 300,000 Steller sea lions in the world in the late 1970s. Since then, the Alaskan sea lion population has declined. The western population declined approximately 70% between the late 1970s and 1990. They reached a peak of approximately 15% per year decline during 1985-1989. During this period, mortaility incidental to commercial fishing was thought to contribute to as much as 25% of the observed decline (NMFS 2006a).

Throughout the 1990s the western DPS continued to decline; however, between 2000 and 2004 the population increased approximately 3% per year. This was the first recorded population increase since the 1970s. Currently the western DPS is approximately 44,800 animals and could be increasing due to higher juvenile and adult survival. The eastern DPS currently ranges from 45,000 to 51,000 animals and has been increasing at 3% per year for 30 years (NMFS 2006a).

Several factors have been proposed (NMFS 2006a) as contributors to sea lion decline. Potential causes for the decline may include direct mortality through incidental take in fisheries, commercial harvests, or illegal shooting. Additional possibilities are a reduced or modified prey based resulting from commercial fisheries, a major regime shift in the mid-1970s, or predation by killer whales (NMFS 2006a). Current threats to the western DPS include subsistence harvest, illegal shooting, entanglement in marine debris, disease, disturbance from vessel traffic, and scientific research (NMFS 2006a).

3.3.4 *North Pacific Right Whale*

The Northern right whale (*Eubalaena glacialis*) has been listed as endangered under the ESA since 1973. As of December 2006, the NMFS has determined that right whales in the northern hemisphere exist as two species (North Pacific and North Atlantic right whale). Additionally NMFS, proposed to list the North Pacific right whale (*Eubalaena japonica*) as a separate endangered species.

Species range

Three major populations of right whales exist - North Atlantic, North Pacific, and Southern Oceans. North Pacific right whales have been sighted 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. Right whales are also spotted at Sea of Okhotsk in the summer. A small group of right whales (up to 13 animals) has been seen consistently in the EBS since 1996 (Goddard and Rugh 1998, Tynan 1999, LeDuc et al. 2002) and with additional sighting south of Kodiak Island in GOA in July 1998 (Waite 1998).

Right whales primarily occur in coastal or shelf waters, but movements over deep waters are known. Migratory patterns of the North Pacific population are unknown; however, it is perceived that the whales spend the summer on high-latitude feeding grounds and migrate to more coastal and lower latitude waters during the winter when calving takes place.

Critical habitat

The critical habitat designation for North Pacific right whales was revised in June 2006 (FR 71 (129): 38277-38298). The revision included two specific areas in the North Pacific Ocean - Gulf of Alaska and Bering Sea.

Life history and ecology

Right whales are generally migratory, with at least a portion of the population moving between summer feeding grounds in temperate or high latitudes and winter calving areas in warmer waters (NMFS 2006b). All the identified calving grounds are near the coast generally in shallow bays, but there is insufficient information to determine right whales calve exclusively in such waters.

Right whales belong to the suborder Mysticeti and typically feed below the surface and near the bottom because they have a baleen, a comblike structure composed of a dense fringe of blade-shaped, horny plates that hangs down from the roof of the mouth and acts as a filter instead of teeth. Right whales feed from spring to fall and in winter in certain areas. Their primary food sources are zooplankton, including copepods, euphausiids, and cyprids (NMFS 2006b).

Population trends and risks

While the pre-exploitation size of this stock exceeded 11,000 animals, there are no reliable estimates of current abundance or trends for right whales in the North Pacific and it is anticipated that fewer animals are in the North Atlantic population (NMFS 2006b). The situation in the North Pacific differs greatly between the western and eastern populations. However, there are no data on trends in abundance for the eastern or western population.

For the western North Pacific, sighting survey estimates for the summer feeding ground an abundance of approximately 900 in the Sea of Okhotsk. It is clear that this population is significantly larger than that in the eastern North Pacific. Since 1967, most sightings in the eastern North Pacific have been of single whales. Over the last few years, though 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. Furthermore, the North Pacific animals are being subjected to large illegal Soviet catches in the early 1960s (NMFS 2006b).

In the North Pacific, ship strikes and entanglements potentially pose a threat to right whales. Due to their rare occurrence and scattered distribution, it is impossible to assess the threat of ship strikes or entanglement to North Pacific right whales at this time. Thus, the estimated annual rate of human-caused mortality and serious injury appears minimal. Reasons for the apparent lack of recovery for right whales in the North Pacific are unknown (NMFS 2006b).

3.3.5 *Bowhead Whale*

The bowhead whale (*Balaena mysteicetus)* has been listed as endangered since June 2, 1970 (FR 35 (106): 8491-8499).

Species range

The majority of these whales inhabit areas around Alaska as part of the Western Arctic stock. Five populations existed historically. Today, one population might be extinct and three others exist in low numbers. Bowhead whales live only in Arctic or subarctic waters and have adapted to living along the pack ice and do not travel to temperate waters to calve (Sheldon and Rugh 1995).

The western Arctic or Bering Sea stock, which is the only stock found in United States waters, follows a 3,600 mile (5800km) migration route. They winter in the Bering Sea in polynyas (areas of consistently open water within pack ice) and at the edge of the pack ice. From late March through April, bowheads move north through the Bering Strait as the pack ice retreats. Most bowheads follow leads or cracks in the ice through the Chukchi Sea along the Alaska coast to Point Barrow. They travel offshore across the Beaufort Sea and arrive in Canadian waters from mid-May through June. The bowheads spend the summer in the Canadian Beaufort Sea, then migrate west along the continental shelf of the Beaufort Sea to Point Barrow from August through October. Next, the whales cross the Chukchi Sea and travel south along the Russian coast passing through the Bering Strait by November (Carroll 1994). Studies of stable isotope ratios in bowhead baleen suggest that the Bering and Chukchi Seas are the preferred feeding habitats rather than Beaufort Sea (Lee and Schell 1999).

Critical habitat

Critical habitat has not been designated for the bowhead whale.

Life history and ecology

It is estimated that mating probably occurs during late winter and spring. The gestation period is 13-14 months. Most bowhead whales calve in April, May, or early June. After plunging from the internal body temperature of their mothers into near freezing water, the newborns must begin swimming north with the migrating herd almost immediately (Carroll 1994).

The bowhead feeding mechanism is most proficient at filtering a “thin soup” rather than gulping dense masses of prey. Instead of having grooved expandable throats similar to other baleen whales, bowheads have very large mouths to maximize the amount of water taken in and to hold captured food. Bowheads feed by swimming with their mouths open and straining zooplankton out of the water with their baleen. Bowheads feed at all depths, from the surface to the bottom. Their primary foods are copepods, euphausiids, and other invertebrates, typically 0.12-1.18 inches (3-30mm) long. Bowheads feed year-round in the Beaufort, Chukchi, and Bering Seas. They use a variety of strategies, including feeding under ice and swimming in groups in V-shaped formation, to increase feeding efficiency (Carroll 1994).

Population trends and risks

Before commercial whaling, there were over 50,000 bowhead whales worldwide. Between the 1600s and 1800s, the eastern arctic stocks of bowheads were reduced from over 50,000 animals to less than 1,000. The Bering Sea stock originally numbered about 18,000 whales and was reduced significantly in the 1800s and early 1900s. They remain severely depleted. However, the population had increased from 6,400 to 9,200 in 1992 (Carroll 1994).

3.3.6 *Sei Whale*

The sei whale (*Balaenoptera borealis*) has been designated as endangered since June 2, 1970 (FR 25 (106): 8491-8499).

Species range

Sei whales are located all across the temperate North Pacific north of 40ºN. In the North Pacific, the sei whale location is mainly south of the Aleutian Islands. Their southern range extends as far south as Baja California, Mexico, in the eastern Pacific, and to Japan and Korea in the west (Reeves et. al. 1998a).

Critical habitat

Critical habitat has not been designated for the sei whale.

Life history and ecology

This pelagic species generally does not inhabit inshore and coastal waters. Sei whales mainly feed on copepods and euphausiids; however, whales in the North Pacific also prey on pelagic squid and fish up to the size of an adult mackerel (Reeves et al. 1998a).

Population trends and risks

It is estimated that the pre-whaling abundance of sei whales was 58,000-62,000 in the North Pacific (NMFS 2003). Sei whale abundance in the eastern North Pacific waters is currently unknown. Although the population in the North Pacific is expected to have grown since given protected status in 1976, the possible effects of continued unauthorized take and incidental ship strikes and gill-net mortality make this uncertain (NMFS 2003). Current threats may affect sei whales, but do not result in significant takes compared with decimation caused by whaling. These threats may include collisions with ships, disturbance from vessels, entanglement in fishing gear, and aquatic pollution (Reeves et al. 1998a).

3.3.7 *Blue Whale*

The blue whale (*Balaenoptera musculus*) has been designated as endangered since June 2, 1970 (FR 25 (106): 8491-8499).

Species range

Blue whales inhabit every ocean of the world, from the equator to the poles, occurring primarily in the open ocean. However, observers have rarely spotted this pelagic species near the coast, except in Polar Regions.

Blue whales in the North Pacific Ocean presumably migrate between sub-polar feeding grounds in spring and summer and low latitudes in winter (Perry et al. 1999); however, there is evidence that some whales remain in low latitudes year-round (Reilly and Thayer 1980). Long-term acoustic monitoring has shown that blue whales are heard along the AI westward and in GOA from late summer through winter (Watkins et al. 2000, Stafford et al. 2001). Recent acoustic monitoring recorded blue whales off the western Aleutians from June to early January and from mid-July to mid-December in GOA (Stafford 2003). Blue whale range typically does not extend north of the AI, but on occasion extends to the far southeastern corner of the EBS (Rice 1998).

Critical habitat

Critical habitat has not been designated for the blue whale.

Life history and ecology

Near the poles, blue whales frequently follow the retreating ice edge as summer progresses. Blue whales faithfully return to feeding areas, but we know little about the breeding grounds of this animal. These animals appear to practice more selective behavior in feeding than other rorquals (baleen whales that possess external throat grooves that expand during gulp- feeding) and specialize in plankton feeding, particularly swarming euphausiids in the Antarctic. They preferentially take euphausiids even with abundant shoaling fish in the area. Copepods and decapods make up a small and rarely observed portion of the blue whale's diet (Reeves et al. 1998b).

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. 1998b)

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. 1998b).

3.3.8 *Fin Whale*

The fin whale (*Balaenoptera phyusalus)* has been designated as endangered since June 2, 1970, (FR 25 (106): 8491-8499).

<u>Species range</u>

Fin whales are found in offshore waters throughout the North Pacific from Baja California to the Chukchi Sea. High concentrations of these endangered animals inhabit the northern Gulf of Alaska and southeastern Bering Sea in the summer (Reeves et al. 1998a). With a complex migratory behavior, these whales can be located in any season at many different latitudes. Acoustic detections of fin whale calls indicate that whales aggregate near the Aleutian Islands in summer (Moore et al. 1998) and near the Hawaiian Islands in winter (McDonald 1999). Some whale calls continue to be detected in northern latitudes throughout the winter with no noticeable migratory movement south (Watkins et al. 2000).

<u>Critical habitat</u>

Critical habitat has not been designated for the fin whale.

<u>Life history and ecology</u>

Where fin whales breed is unknown but research indicates they are primarily solitary animals. They might infrequently congregate in groups of up to 15. However, the low-frequency vocalizations made by whales can travel some distance making it difficult to determine which species associate with one another (NMFS 2006c). In the North Pacific, fin whales prefer euphausiid shrimp and large copepods as prey, but they also consume schooling fish such as herring, walleye, pollock, and capelin (Reeves et al. 1998a).

<u>Population trends and risks</u>

Total North Pacific fin whale population before whaling was estimated at 42,000-45,000 with 8,000-11,000 being in the eastern North Pacific in the mid 1970s (Ohsumi and Wada 1974). An aerial survey of the former Akutan whaling grounds around the eastern Aleutians in 1984 produced no sightings of fin whale. The absence of sightings in high abundance of this area was interpreted as the local density of fin whales remained well below that of the early twentieth century population (NMFS 2006c). However, large numbers of fin whales were seen in the Gulf of Alaska on a humpback whale survey in 2004 (NMFS 2006c) and seabird surveys near the Pribilof Islands in the Bering Sea indicated a substantial increase in the local abundance of fin whales between 1975-1978 and 1987-1989 (Baretta and Hunt 1994).

Currently, the largest threats to fin whales include collisions with vessels, habitat destruction, entanglement in fishing gear, reduced prey abundance, and renewed interest in whaling by several countries (NMFS 2006c).

3.3.9 *Humpback Whale*

The humpback whale (*Megaptera novaeangliae)* has been designated as endangered since June 2, 1970 (FR 25 (106): 8491-8499).

Species range

Surveys indicate that humpbacks occupy habitats around the world, with three major, distinct populations - North Atlantic, North Pacific, and Southern oceans.

Although humpback whales can be seen in Alaska year round, most migrate during the fall to temperate or tropical wintering areas where reproduction and calving occur. During the spring, humpback whales migrate back to Alaska where food sources are abundant. While in Alaska, most humpbacks concentrate in southeast Alaska, Prince William Sound, the area near Kodiak, and the Barren Islands, the area between Semidi and Shumagin Islands, and the eastern Aleutian Islands and southern Bering Sea (NMFS 1991).

Critical habitat

Critical habitat has not been designated for the humpback whale.

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).

Population trends and risks

Current abundance estimate of humpback whales in the North Pacific is based on data collected by nine independent research groups that conducted photo-identification studies in three wintering areas (Mexico, Hawaii, and Japan). Current estimates indicate the population size of the North Pacific stock at 4,005 animals (NMFS 2001). Although data support an increasing population size for the central North Pacific stock, it is impossible to assess the rate of increase (NMFS 2001). The greatest threats to their survival are entanglement in fishing gear, collisions with ship traffic, and pollution of their coastal habitat by human settlements (NMFS 1991).

3.3.10 *Sperm Whale*

The sperm whale (*Physeter macrocephalus)* has been designated as endangered since June 2, 1970, (FR 25 (106): 8491-8499).

Species range

Sperm whales are widely distributed in the North Pacific Ocean and seasonally present throughout the Gulf of Alaska. In the Bering Sea, sperm whales are primarily found in areas from the Pribilof Islands to the west. Female and young sperm whales live primarily in tropical waters, while males are thought to summer in GOA and BS/AI and winter south of 40º. However, recent analyses of older tag data indicate their movement patterns are less clear (Angliss and Lodge 2002).

Sperm whales tend to inhabit areas with a water depth of 1968 feet (600m) or more and are uncommon in waters less than 984 feet (300m) deep. Female sperm whales are generally found in deep waters (at least 3280 feet or 1000m) 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 toward the poles between ages 4-21 years old. Older, larger males are generally found near the edge of pack ice in both hemispheres. On occasion these males will return to the warm water breeding area (NMFS 2009c).

<u>Critical habitat</u>

Critical habitat has not been designated for the sperm whale.

<u>Life history and ecology</u>

Sperm whales feed almost exclusively on cephalopods (squid and octopuses), but in Alaska and a few other places fish are a staple of the sperm whales' diet. Some fish species consumed are rays, sharks, lanternfish, cod, and redfish. Feeding occurs year round, usually at depths below 120m (approximately 400 feet) (NMFS 2009c).

<u>Population trends and risks</u>

Current and historic estimates for the abundance of sperm whales in the North Pacific are limited. However, over the past 2 centuries, commercial whalers took about 1,000,000 sperm whales. Despite the high level of take, the sperm whale remains the most abundant of the large whale species. The number of sperm whales of the North Pacific located within Alaska waters is unknown (NMFS 2009c) because there is not a good estimate for the total number of sperm whales worldwide. Currently, the best estimates for whales in Alaska, which is based on extrapolations from few areas that have useful estimates (NMFS 2009c), is there are between 200,000 and 1,500,000.

Potential threats include collisions with ships and entanglement in fishing gear (NMFS 2009c)

3.3.11 *Beluga Whale (Cook Inlet Stock)*

Beluga whales are divided into five stocks: Cook Inlet, Bristol Bay, eastern Bearing Sea, eastern Chukchi Sea, and Beaufort Sea (NMFS 2009g). The Cook Inlet stock of beluga whales was listed under the ESA as endangered in 2008 (73 FR 62919). The stock was also determined to be depleted under the Marine Mammal Protection Act (NMFS 2009g).

Species range

As a species, beluga whales are circumpolar in distribution and inhabiting subarctic and Arctic waters. In Alaska, the known range of beluga extends from Yakutat to the Alaska/Canada border in the Beaufort Sea. Beluga whales generally occur in shallow, coastal waters, often in water barely deep enough to cover their bodies (Ridgway and Harrison 1981). Some beluga whale populations make long range seasonal migrations (Richard et al. 2001; Suydam et al. 2001), while others remain in relatively small areas year round. The Cook Inlet beluga whale is geographically isolated and a genetically differentiated population of beluga whales. In Cook Inlet, belugas remain year-round (Hobbs et al. 2005),

Both scientific research and traditional knowledge from Native Alaskan hunters report beluga whale movements follow prey distribution. For instance, the movements of belugas within upper Cook Inlet coincide with anadromous fish migrations; they often aggregate near the mouths of rivers and streams where salmon runs occur. The data show that in summer and early fall, whales traveled back and forth between Knik Arm (Eagle River), Chickaloon Bay (Chickaloon River), and upper Turnagain Arm, although some whales also spent time offshore in the mid Inlet (Hobbs et al. 2005). In the fall, belugas began dispersing into the coastal areas of the mid Inlet as far as Trading, Tuxedni, and Chinitna Bays. In winter, belugas moved offshore with locations distributed throughout the upper and mid Inlet, including Knik and Turnagain Arms despite greater than 90 percent ice coverage (Hobbs et al. 2005).

The timing and location of eulachon and salmon runs have a strong influence on belugas’ spring and summer movements. Beluga whales are regularly sighted in the upper Inlet beginning in late April or early May, coinciding with eulachon runs in the Susitna River and Twenty Mile River in Turnagain Arm. In Knik Arm, beluga whales are generally observed arriving in May, but tend to concentrate near the Susitna Delta in summer, feeding on the various salmon runs. Belugas also use the smaller streams along the west side of the Inlet, following first the eulachon and king salmon runs and later in the summer the coho salmon runs. During late summer and fall belugas use the streams on the west side of Cook Inlet from the Susitna River delta south to Chinitna Bay (NMFS 2008).

More data is currently available regarding the fall and winter location of belugas in Cook Inlet. Intensive use of Knik Arm by belugas occurs in the fall coinciding with the coho salmon run. Beluga whales regularly gather in Eagle Bay andelsewhere on the east side of Knik Arm, and sometimes in Goose Bay on the weside of Knik Arm. Satellite data showed tagged whales used Knik and Turnagain Arm for much of the tracked time, venturing as far south as Redoubt Bay (October), Kalgin Island (January), and East Foreland (December-January) (Hobbs et al. 2005).

Critical habitat

Critical habitat has not been designated for the beluga whale.

Life history and ecology

Beluga whales are small, toothed whales with adults ranging in size from 12 to14 feet. Calves are born dark gray to brownish-gray with the color lightening to a yellow-white in adulthood. Reports of sexual maturity vary from 4 to 10 years for females and 8 to 15 years for males (NMFS 2008). Calves are born in late spring and early summer, usually in the summer concentration areas following a 14-month gestation period (NMFS 2008). Adult females typically produce offspring once every 3 years. Members of the Cook Inlet stock have been observed calving in the Kachemak Bay, off the mouths of the Beluga and Susitna Rivers, and in the Turnagin arm (NMFS 2008).

Belugas are social and are frequently observed in groups ranging in size from two to five to pods of more than 100 individuals. They are known to vocalize using grunts, clicks, chirps, and whistles to navigate, find prey and communicate. During summer months, they are often found in shallow waters and feed on schooling and anadromous fish including herring, capelin, eulachon, salmon and sculpins (NMFS 2008). They are also known to eat octopus, squid, crabs, shrimp clams, mussels and sandworms; belugas appear to have greater feeding success in areas with dense concentrations of prey (NMFS 2008).

<u>Population trends and risks</u>

NMFS stock assessment reports estimate the combined population of the five beluga whale stocks in U.S. waters at over 60,000 individuals (NMFS 2009g). NMFS reports that the population trends for the Beaufort Sea and Eastern Bering Sea stocks are 40,000 and 18,000 individuals, respectively; these two stocks account for over 90 percent of the estimated population of beluga whales in U.S. waters (NMFS 2009g). The population of the Eastern Chukchi stock consisting of 3,710 individuals shows no evidence of decline and NMFS considers the population of the Bristol Bay stock (1,600) to be stable to increasing (NMFS 2009g). On the basis of the range of numbers reported, NMFS estimates that the population in the mid-1980s was between 1,000 to 1,300 individuals. Population trend analyses conducted on the Cook Inlet stock between June 1994 and June 1998 showed a 47 percent decline in the population had occurred during the time period (NMFS 2008).

Subsequent investigations assessed natural and human-induced sources of potential impacts that included:
- Habitat capacity and environmental change
- Stranding events
- Predation
- Subsistence harvest
- Commercial fishing
- Oil and gas development

The investigations concluded that subsistence harvests presented the most immediate threat to the stock. Although NMFS found that other potential sources of impact could have some negative effect on recovery, subsistence harvest was considered the most significant factor for decline of the species (NMFS 2009g). Population surveys since the imposition of mandatory and voluntary restrictions on subsistence harvests in 1999 show no clear trend and no indication that the population is increasing (NMFS 2009g).

As a result, NMFS developed the *Conservation Plan for the Cook Inlet Beluga Whale (Delphinapterus leucas)* in 2008 to establish goals and objectives that can be achieved cooperatively to promote the recovery of the Cook Inlet beluga whale population. The goals and objectives apply to a range of potential sources of impacts including those identified above as well as shoreline development, vessel traffic, and noise.

3.4 AMPHIBIANS

3.4.1 *Leatherback Sea Turtle*

The leatherback sea turtle (*Dermochelys coriacea)* has been designated as endangered since June 2, 1970 (FR 25 (106): 8491-8499).

Species range

Leatherback turtles are widely distributed throughout the world's oceans (NMFS 2009d). In the Pacific Ocean, they range as far north as Alaska and as far south as Chile and New Zealand. In Alaska, leatherback turtles are found in the Copper River Delta (60°34'N, 145°38'W) and as far west as the Aleutian Islands (Hodge 1979, Stinson 1984). Leatherbacks are commonly known as pelagic animals that forage in coastal waters and the most migratory and wide ranging of sea turtle species (NMFS 2009d).

Critical habitat

Critical habitat for leatherback sea turtles does not include their Alaska range.

Life history and ecology

Adult leatherback turtles are the largest sea turtles in the world. They have a shell length of 1.6m and a mass of 700kg, and females reach sexual maturity at an estimated age of 13-14 years of age .They live for more than 30 years (Zug and Parham 1996). Leatherbacks must surface to breathe and can stay submerged for two hours and dive to 1,000m. Males do not leave the ocean, but females come ashore on open, sandy beaches to dig nests and lay eggs. Nestlings emerge from the sand at night and attempt to make their way to the sea. Minimal information is known about the distribution and natural history of these young turtles after they leave their natal beaches (EPA 2006).

Population trends and risks

The Pacific Ocean leatherback population is typically smaller than leatherbacks in the Atlantic Ocean. Due to adult female leatherbacks frequently nesting on different beaches, nesting population estimates and trends are difficult to monitor. In the Pacific, the World Conservation Union (WCN) 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 have become stable or are increasing (NMFS 2009d).

Leatherback turtles face threats on 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 (NMFS 2009d).

3.4.2 *Loggerhead Sea Turtle*

The loggerhead sea turtle (*Caretta caretta)* has been designated as threatened since July 28, 1978 (FR 43 (146): 32800-32812).

Species range

Loggerhead sea turtles are widely located throughout the world's oceans, inhabiting continental shelves, bays, estuaries, and lagoons in temperate, subtropical, and tropical waters (Dodd 1990). While they range as far north as Alaska and as far south as Chile in the Pacific, the only documented sighting from Alaskan waters was of a single stranded juvenile loggerhead turtle near Kodiak Island (Bane 1992). Loggerheads are rarely encountered in U.S. Pacific waters (EPA 2006).

Critical habitat

No critical habitat has been designated for loggerhead sea turtles.

Life history and ecology

Adult loggerhead sea turtles normally weigh between 220-330 pounds and have a shell length of approximately 3 feet. Females reach sexual maturity between 12-30 years of age. Males do not leave the ocean, but females come ashore on open, sandy beaches to dig nests and lay eggs. Nestlings emerge from the sand at night and attempt to make their way to the sea. Minimal information is known about the distribution and natural history of these young turtles after they leave their natal beaches (EPA 2006).

3.4.3 *Green Sea Turtle*

The green sea turtle (*Chelonia mydas))* has been designated as threatened since July 28, 1978 (FR 43 (146): 32800-32812).

Species range

Green sea turtles are found in warm seas worldwide. Individual sightings of green sea turtles have been reported from Ucluelet Inlet, British Columbia, and Homer, Alaska (NMFS and USFWS 1998, Stebbins 1966). In 1996, a live, cold-stunned east Pacific green sea turtle was recovered from Prince William Sound, Alaska (NMFS and USFWS 1998). No nesting is known to occur in U.S. Pacific waters.

Critical habitat

Critical habitat for green sea turtles does not include their Alaska range.

Life history and ecology

Green sea turtles primarily use three types of habitat: - oceanic beaches (for nesting), convergence zones in the open ocean, and benthic feeding grounds in coastal areas. Adult females migrate from foraging areas to mainland or island nesting beaches and may travel hundreds or thousands of kilometers each way. After emerging from the nest, hatchlings swim to offshore areas, where it is believed they live for several years, feeding close to the surface on a variety of pelagic plants and animals. Once the juveniles reach a certain age/size range, they leave the pelagic habitat and travel to nearshore foraging grounds. Once they move to these nearshore benthic habitats, adult green sea turtles are predominantly herbivores feeding on sea grasses and algae (NMFS 2009e).

Population trends and risks

The principal cause of the historical, worldwide decline of green sea turtles is long-term harvest of eggs and adults on nesting beaches as well as 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, primarily in gillnets, but also in trawls, traps, and pots, longlines, and dredges is a serious ongoing source of mortality that also adversely affects the species' recovery (NMFS 2009e).

4.0 ENVIRONMENTAL BASELINE

This section describes the relevant resources and baseline conditions present in the project area that would be affected by or might affect the proposed action (reissuance of a NPDES general permit).

4.1 WATER QUALITY

Because of Alaska's size, sparse population, and its remote character, the vast majority of Alaska's water resources are in pristine condition. More than 99.9% of Alaska's waters are considered unimpaired. With more than 3 million lakes, 714,004 miles of streams and rivers, 36,000 miles of coastline, and approximately 176,863,000 acres of freshwater and tidal wetlands, less than 0.1% of Alaska's vast water resources have been identified as impaired (ADEC 2006b).

This permit covers seafood processor facilities within federal waters 3nm or more from shore. These vessels will be discharging into waters at least 60 feet deep (MLLW) with adequate flushing in areas of high tidal activity. Since these waters are not listed as impaired, there will be no facilities discharging into impaired waters.

5.0. EFFECTS ANALYSIS

This section describes the potential impacts of discharges from offshore seafood processors in Alaska covered under general permit AK-G52-4000.

While EPA has assessed a wide range of resources, the focus is on water quality and impacts to threatened and endangered species because these resources are the most susceptible to being impacted by the proposed action.

The major components 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 biochemical oxygen demand (BOD), solids (sediments and residues), oil and grease, and nutrients. These major pollutants are all considered conventional and of a non-toxic nature. Smaller concentrations of chlorine and ammonia may also be present in seafood processor wastes. Potential adverse impacts on receiving water quality resulting from seafood processor wastes include reduction in water column dissolved oxygen (DO) due to the decay of particulate and soluble waste matter; the release of toxic levels of sulfide and ammonia from decaying waste; nutrient enrichment and stimulation of phytoplankton growth and alteration of the phytoplankton community; and the accumulation of waste solids and fish oils on the water surface, shorelines, and the bottom. All of these water quality impacts 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. In areas with strong currents and high tidal ranges, assimilation is high, waste materials disperse rapidly, and there is little impact on water quality. In areas of quieter waters, assimilation is lower, and waste materials can accumulate, resulting in solid waste piles, dissolved oxygen depressions, and associated aesthetic problems (EPA 1994a). Based on the analysis of the impact of BOD and sediments (the primary pollutants in seafood processing discharge) discussed in the following sections, EPA finds that offshore seafood processing discharge, occurring in waters more than 3 nm from shore, is unlikely to cause significant adverse effects to water quality in Alaska. The water quality impacts of individual pollutants from seafood processor wastes are discussed below.

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 seafood waste particulates (both direct and indirect effects). The following discussion briefly 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

Disposal of seafood waste solids will have the greatest impact on less mobile benthic organisms such as polychaetes and bivalves, and on demersal fish eggs that cannot move away from the accumulating waste. The following section discusses the nature of the solid waste deposition and potential impacts to benthos and demersal eggs.

Settling of seafood discharges on the seafloor occurs at varying rates according to the size of the particles. Once settled, these particles can form organic mats or thick waste piles that can smother the underlying substrate and benthic communities within it. Some waste piles have been recorded to rise 40 feet or more above the seafloor (ADEC, 1998). 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). In one study where salmon waste was widely distributed, the waste was completely absent within 33 days following discharge and no adverse effects on dissolved oxygen concentrations were noted (Stevens and Haaga 1994). The accumulation of these deposits in some areas indicates that the rate of discharge exceeds the assimilation capacity of some water bodies and more specifically, the assimilation capacity of the benthic community and other aquatic life that metabolize this material. Discharges covered under the proposed permit are for mobile offshore vessels in areas of good flushing which should limit the accumulation of seafood discharges on the seafloor. ADEC has assumed that if discharge limits are adhered to, the effects on aquatic biota should be minimal.

Seafood processing industry representatives met with ADEC and EPA and questioned the environmental benefit of the permit effluent limit requiring grind size of 0.5 inches in all dimensions. The effluent limit was established based on the EPA's national effluent limitation guidelines. ADEC initiated a research project to look at the impacts of discharge of seafood waste. One component of this research was to evaluate seafood solid waste impacts on the benthos (Germano and Associates, 2004).

The intent of this study was to see what the impacts are to the surrounding benthos and benthic community from seafood solid wastes deposited in a ZOD. The impacts were evaluated using a Sediment Profile Imaging (SPI) camera. The SPI camera takes an image of the top few inches of sediment. Aquatic life within the sediments was also collected for analysis using a Van Veen grab device. The SPI camera showed where seafood wastes made the sediments anoxic and methane producing with the presence of sulfur-producing bacteria, *Beggiatoa,* indicating anoxic conditions.

For two adjacent processors with relatively small, active discharges located approximately 600 feet apart, the visual ZODs were 0.34 and 0.21 acres. However, the area of *Beggiatoa* was approximately 6.0 to 7.4 acres. The presence of *Beggiatoa* indicates reduced oxygen in the sediments and an adverse effect to the benthos and benthic community outside of the ZOD. Other measures for adverse effects include numbers and kinds of species present.

Immediately adjacent to the smaller active piles are where both fish and crab forage. The diversity of benthic species was less within the first 200 feet of the periphery of the ZOD compared to the diversity observed in a distant control site. However, the few opportunistic species that existed in the vicinity of the ZOD occurred in great numbers. At approximately 500 feet or more from the periphery of the active piles more of the normal resident species were recorded and the overall abundance of the opportunistic species was less. The study determined that normal resident species population levels and diversity did not occur until 1,500 feet or more down-current of the periphery of the waste piles.

Two other seafood processors evaluated had larger discharges and inactive waste piles greater than 1 acre in size. Very little to no solid waste discharges had occurred for the 2 years preceeding the study. These discharges occurred approximately 1,000 feet apart. In this case, the *Beggiatoa* were observed in 2.8 and 0.5 acres around each waste pile respectively. The areas of reduced oxygen due to *Beggiatoa* were significantly smaller for the inactive waste piles than for the active waste piles. From these results, the authors of the study conclude that biota in sediments may revert to natural conditions within 5-10 years after the cessation of seafood waste disposal (Germano and Associates, 2004).

As stated above, seafood processing wastes can form organic mats within the ZOD, depending on the amount discharged and the biological, chemical, and physical factors affecting decomposition and dispersion of the waste. 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, including birds.

However, the discharges covered in this permit are for mobile offshore processors discharging at least 3 nm from shore and are unlikely to discharge in one location for extended periods. The discharges will occur in areas with good flushing which will disperse the seafood wastes. In addition, ZODs are not allowed in this permit. Therefore, it is expected that deposition of seafood deposits on the seafloor should be minimal and result in temporary effects to the aquatic biota.

5.1.2 Effects of Deposited Solids

Many benthic invertebrates are relatively sedentary and sensitive to environmental disturbance and pollutants. Short- and long-term effects of seafood waste on benthic invertebrates are expected to include temporary smothering of biota, especially by ground particulates in the area near the discharge. 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 and fish. The greatest impact would be expected down current along the plume's median axis.

Little information is presently available concerning the direct effects of various deposition depths on benthic communities. Most studies that have investigated deposition impacts on benthos have examined deposition of dredged materials (Hale 1972; Kranz 1974; Mauer et al. 1978; Oliver and Slattery 1973; Saila et al. 1972; Schafer 1972; Wilber 1992). These studies indicate that the response to deposition and survival following such an event is species-specific. Of the species examined, burial depths from which organisms were able to migrate to the surface ranged from 0.4 to 12.6 in (1 to 32 cm). If it is assumed that most benthos are not adversely affected by deposition of seafood waste less than 0.4 in (1 cm), benthos in the vicinity of the discharge receiving deposition in excess of this amount are likely to be adversely impacted. Seafood 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. As noted in Section 5.1.1, these effects have been observed in the water column beyond the boundaries of the ZOD. If it is assumed that solids deposition of greater than 0.4 in (1 cm) depth represents an "adverse impact" to benthos, solids deposition should be less than 1 cm (0.4 in) to avoid potential adverse impacts to benthic organisms.

However, as the discharges covered in this permit are for mobile offshore processors discharging at least 3 nm from shore and which discharge in areas with adequate flushing and depths of 60 feet (MLLW), it is expected that deposition of seafood deposits on the seafloor should be minimal and result in temporary effects to the aquatic biota.

5.1.3 Alteration of 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; impacts to benthic communities could also conceivably affect epibenthic and pelagic invertebrates, fish, 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 seafood waste discharges or municipal sewage effluent discharges) have been well documented (see Pearson and Rosenberg 1978 and 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 and those near the center of deposition areas associated with active stationary seafood processing waste discharges, only a relatively small number of species adapted to disturbed environments and/or high organic content may colonize the location. When the enrichment levels are optimal for those few species, they become extremely abundant, and overwhelmingly dominate the benthic community. Biomass generally decreases however, because 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, such as those that exist within active waste piles generated by seafood waste discharges, the sediments become anoxic and macrobenthic organisms may be entirely absent.

The absence of benthic organisms has been documented by divers on several seafood waste piles in Alaskan coastal waters during compliance diver surveys conducted by USEPA and others. In a study of a major seafood processor in Akutan, Alaska, USEPA (1984b) documented those anoxic conditions in the sediments producing severe impacts to benthic infaunal communities that were confined to areas under seafood waste piles. These results were mirrored in later studies conducted by Germano & Associates (2004). It is typical for areas extending outward around the actual waste pile deposits ranging from approximately five to a few hundred meters from the edge of the pile to experience lesser impacts. These results were based on sediment chemical composition, visual inspection, and sampling of the benthic infauna communities. Characteristics of the benthic community around the discharge pile included low species richness, and dominance by polychaetes typically associated with high organic inputs and bottom disturbance (USEPA 1984b and Germano & Associates, 2004).

The discharges covered in this permit are for mobile offshore processors discharging at least 3 nm from shore and which discharge in areas with adequate flushing that will allow for dispersion of seafood wastes and depths of 60 feet (MLLW). In addition, ZODs are not allowed in this permit. The dynamic environment and mobile facilities will make it unlikely that there will be significant deposition of seafood deposits on the seafloor. Therefore, waste piles should not accumulate and sediment alterations should be minimal.

5.1.4 Decay of Solid Wastes

As noted above, the decay of organic matter accumulations can effect chemical changes within the sediments and may lead to anoxic conditions within the 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 pile would be expected to be small and would be avoided or quickly passed through by mobile organisms.

Releases of potentially toxic decay byproducts like hydrogen sulfide and methane also have the potential to impact marine organisms in the vicinity of the waste pile. However, as with impacts related to depressed oxygen conditions, the potential for impacts in the water column is very slight due to the rapid mixing.

Judging from impacts observed in other areas, the magnitude of the observed impact from decaying organic wastes depends on the total area receiving organic waste deposits, the depth of deposition, the difference between native sediments and deposited waste, the degree to which the deposits are anaerobic, and the length of time during which detectable changes in sediment composition occur. Existing data summarized from other areas indicate that impacts may occur, but are likely to be localized. The greatest effect is expected in the area under the waste pile. It is unlikely that sediment alteration from seafood processors in offshore areas will significantly impact populations of benthos since these areas normally have high tidal activity that should disperse the discharges and are unlikely to develop waste piles. Any persistent waste pile is a violation of the permit.

Indirect impacts could also occur with respect to ecosystem interrelationships resulting from behavioral changes, but these would be difficult to observe and correlate with seafood 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.

The discharges covered in this permit are for mobile offshore processors discharging at least 3 nm from shore and which discharge in areas with adequate flushing that will

allow for dispersion of seafood wastes and depths of 60 feet (MLLW). In addition, ZODs are not allowed in this permit. The dynamic environment and mobile facilities will make it unlikely that there will be significant deposition of seafood deposits on the seafloor. Therefore, waste piles should not accumulate and the anoxic conditions that allow for toxic gas release should be minimized.

5.1.5 Cumulative Impacts of Solids Deposition

Impacts from any individual seafood processing facility discharging in compliance with the requirements of the proposed permit are likely to be localized. Although benthic organisms may be smothered or community composition altered in localized areas, these potential effects should be minimal as the permit requires that the seafood processor facilities be located in waters at least 60 feet deep (MLLW) with adequate flushing for dispersion of the seafood wastes. Therefore, the benthic communities in Alaskan coastal waters would not be expected to be significantly impacted. Additionally, this permit does not allow for ZODs. To further address the potential for cumulative impacts from numerous facilities, specific general permits have been developed for facilities operating in the Pribilof Islands and Kodiak Island.

Impacts from toxicity due to anoxic conditions and changes in community structure could occur but should be limited as disposal of seafood wastes in areas of good flushing should disperse wastes and minimize the potential for large waste piles. Although more complete knowledge 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 processors covered in the proposed permit would be expected to be in high tidal areas with adequate dispersion and dilution where the seafood discharges are not expected to significantly accumulate and effects should be minimal.

5.1.6 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 benthos 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 USEPA (1984a). The permit requires seafood processors to discharge wastes in areas that are 60 feet deep (MLLW) with adequate flushing to minimize accumulation of seafood wastes on the seafloor, minimizing the potential for smothering or toxicity to benthos. Therefore, the degree of food supply reduction caused by discharges of seafood waste would be minimal.

5.2 Exposure to Suspended Solids

Within this region, 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 have reduced productivity due to decreased light availability. However, such potential impacts may be offset in the farfield 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.

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. For example, depending on water currents, presence and severity of storms, and other factors, residue material, may wash up on nearby shorelines impairing aesthetic quality as well as creating an undesirable attraction of nuisance species and predators. 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 permit requires that seafood processors discharge waste at least 3 nm from shore in areas 60 feet deep (MLLW) with adequate flushing. In addition, seafood processors are prohibited from discharging waste within 1 mn of critical habitat of the listed eider species and 3 nm from rookeries or haulouts of Steller sea lions. Discharging wastes in areas away from critical habitat as well as in areas of high tidal activity to disperse the wastes and should minimize the potential for accumulation of seafood waste to become an attractant to listed species as well as minimize the potential for residues from seafood wastes to wash up on shore.

5.3 Liquid Seafood Process Wastes

Liquid seafood processing discharges includes 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. Liquid seafood processing wastes contain 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.

5.3.1 Biochemical Oxygen Demand/Dissolved Oxygen

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 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). Conversely, studies have found little impact of BOD in areas with highly dynamic water regimes (Gates et al. 1985).

In areas of high BOD loads and low flushing, it is possible to reach conditions where DO in the water is totally exhausted, resulting in anaerobic conditions and the production of undesirable gases such as hydrogen sulfide and methane (Ahumada et al. 2004). Emission of these gases has been observed in seafood processing centers (e.g., Dutch Harbor) in sufficient quantities to form bubbles and cause skin and eye irritation to divers (EPA 2005b). Water with high BOD also has the potential for increased bacterial concentrations that degrade water quality (EPA 2005b). High BOD loads coupled with low dispersive capability may cause low DO concentrations or the complete absence of DO, which can be lethal to marine organisms.

The proposed permit does not allow discharge in areas of low flushing and since offshore processor vessels are expected to be in highly dynamic water, it is expected the discharges covered under the proposed permit would have little impact on BOD. In general, the coastal waters of Alaska are well oxygenated and provide a considerable buffer for the assimilation of soluble organic wastes. In areas of restricted circulation or relatively low ambient dissolved oxygen concentrations resulting from natural processes, the potential for adverse effects on marine organisms from depletion of dissolved oxygen is increased. Nonetheless, modeling studies presented in the ODCE indicate that typical seafood discharges to well-oxygenated open coastal waters or semi-enclosed embayments will not likely result in impairment due to dissolved oxygen except as noted above at the interface of the sediment and the water column.

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. As stated above, nitrogen is a common pollutant found in seafood processing waste. Nitrogen 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 in Alaska and it is unknown what nutrient-related effects have occurred from seafood processing discharges. Seafood discharges from offshore vessels are expected to occur in areas adequate dispersion and dilution so that nutrient-related effects from seafood processing discharges should be minimal.

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 dissolved oxygen 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 B12 and chelating agents (Aubert 1990; 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 necessarily 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 Alaskan 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. Therefore, discharges to relatively well-flushed offshore areas, as required in this permit, have a 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 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). Concerns regarding toxic phytoplankton have been heightened in recent years due to suspicions that the frequency of toxic phytoplankton blooms has increased due to human activities, especially due to agricultural runoff and the discharge of municipal and industrial wastewater to marine coastal areas (Smayda 1990; Smayda and White 1990; United Nations 1990; Anderson 1989).

Although there have been several reports linking mortalities of relatively large numbers of marine mammals (e.g., O'Shea et al. 1991; Anderson and White 1989; Geraci 1989; Geraci et al. 1989; Gilmartin et al. 1980), fish and shellfish (e.g., Cosper et al. 1990; Harper and Guillen 1989; Smayda and Fofonoff 1989), and aquatic plants (e.g., Cosper et al. 1990) to the occurrence of toxic phytoplankton in other parts of the U.S., no such episodes have been reported for the coastal waters of Alaska. The occurrence of human intoxication due to PSP has been recorded at locations in southeast Alaska (Sundstrom et al. 1990). PSP is caused by the consumption of shellfish that have concentrated toxins from an algae of the species *Protogonyaulax* (Shimizu 1989); however, direct links between the occurrence of PSP and eutrophication have not been established (Anderson 1989). Therefore, the linkage between PSP and seafood processing discharges, while possible, is tenuous.

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. Similarly, while Paralytic Shellfish Poisoning has been documented in Southeast Alaska, there is currently no evidence suggesting a linkage with seafood processing discharges. Since this permit requires discharge of seafood wastes at least 3 nm from shore in areas with adequate flushing, the eutrophication which could potential lead to phytoplankton blooms should be minimal.

5.3.5 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 1980). Thatcher (1980) 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} was determined for coho salmon **(**32 μg/L). The State of Alaska has adopted chlorine standards for marine waters of 7.5 μg/L (chronic) and 13 μg/L (acute) (ADEC, 2003).

The reissued general permit retains the requirement to “not violate the Alaska Water Quality Standards at the edge of the mixing zone,” which includes the total residual chlorine standard of 7.5 μg/L for salmonids. The proposed permit does not require residual chlorine monitoring at the edge of the mixing zone or end-of-pipe. While the permit requires development a best management practice (BMP), it does not specifically require that the plan include measures to minimize the use of chlorine-based or other toxic disinfectants or otherwise limit potential contamination of the discharge. As a result, it is unknown if the discharged chlorine concentrations from seafood processing operations result in exceedances of the chlorine water quality criteria outside of the mixing zone.

5.4 Secondary Impacts Due To Seafood Processing Wastes

Although a number of potential secondary impacts to marine organisms are outlined below, limited studies have been conducted to determine whether the potential impacts of seafood processing waste discharges occur. Most of the discussion of the potential secondary impacts of seafood processing discharges relies on personal communications from scientists and regulatory agency personnel familiar with seafood processing activity in Alaska.

Potential secondary impacts of seafood waste discharges involve effects on marine mammals and birds due to their attraction to seafood waste discharges. Bacteria associated with the decaying seafood waste may also adversely impact marine mammals and birds. The potential indirect impacts resulting from eutrophication of marine waters have been previously discussed in Section 5.3.4.

Seafood processing wastes that are commingled with sanitary wastewater also present a potential risk to aquatic species that forage the waste piles including seagulls and other birds that land on the plume and consume the waste. The proposed offshore seafood processor general permit does not prohibit commingling of seafood waste and sanitary wastewater that has been treated only using an MSD. The proposed permit also does not require monitoring to verify proper operation and performance of the MSDs and ensure that bacteria loadings from human sources are minimized in the discharges. However, the permit covers facilities located at least 3 nm from shore in areas of adequate flushing prohibiting discharges near critical habitat for the listed species. Therefore, it is expected tha seafood discharges will be rapidly dispersed minimizing the potential for attraction by species and minimizing potential interactions with other contaminants in the area.

5.4.1 Attraction of Organisms to the Discharge

The attraction of marine mammals to seafood waste discharges may make them easier prey for predators. There is anecdotal information from NMFS indicating a very strong attraction to offshore seafood processor facilities by sea lions. NMFS personnel observed a possible linkage of sea lion observations with fishing activity and fish processing (Thorne et al. 2006). Loughlin and York (2000) further cited that discharges from offshore seafood processing facilities attract both Steller sea lions and killer whales. These authors indicate that this results in increased predation above natural levels, although actual increases in mortality cannot be accurately quantified.

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. It is evident that a large number of birds (e.g., gulls) are attracted to seafood processing waste discharges to feed on floating particulates in the discharge (ADEC 2007 pers. comm).

Artificial food sources such as seafood process wastes may increase the gull populations in Alaska by providing food throughout winter months when food is less abundant and survival is the most difficult. Large gulls (herring, glaucous, and glaucous-winged) and parasitic birds (jaegers and skuas) interfere with the reproductive success in waterfowl and in seabirds by preying on ducklings and chicks, displacing other species from nests, and harassing adult birds (Giger, M., 6 April 1994, personal communication). Several studies have documented gulls and other parasitic birds preying on waterfowl and seabirds (Anderson 1974; Tyler 1975; Nettleship 1977; Munro and Bedard 1977; Martin and Barry 1978; Mendenhall and Milne 1985; Barry and Barry 1990; Lloyd et al. 1991; Mendenhall 1993). Seafood waste discharges typically 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 both seafood processing and municipal wastewater discharges with increased predation by eagles. The proposed general permit retains the narrative standard that processing wastes "not create an attractive nuisance where fish or wildlife species are attracted to waste disposal or storage areas," which could be applied on a case by case basis if discharges were deemed to be creating a problem. Other than the anecdotal information described above, there is no conclusive information on potential marine mammal impacts.

Birds that are attracted to surface plumes of seafood waste (especially floating particulates) may potentially become oiled or their feathers fouled due to accumulation of waste fish oils on the water surface. While studies on the effects of oil spills have shown that birds may be adversely affected, fish oils are different in composition from petroleum products and the potential impacts may or may not be similar. 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. The reissued permit retains the prohibition on creating a sheen, film, emulsion or scum on the surface of the water (or shorelines). If a plant operator complies with this provision, oils associated with the discharges may not be a significant concern.

5.4.2 Bacteria from Decaying Onshore Waste Accumulations

Bacteria associated with the decaying seafood waste may potentially adversely impact marine mammals and birds. The potential for impact is hypothesized to be from animals eating, rubbing, or rolling in decaying seafood that has accumulated on the shoreline and has a strain of bacteria that may be harmful to the organism. There are no studies or known anecdotal information to suggest that this is a potential problem. In 2004, four Steller's eiders carcasses were found in Unalaska Bay, an area of higher fisheries productivity, and Alaska Sealife Center studied these eiders to determine if bacterial infection may have resulted in mortality. Bacteria were found in lesions in the oral cavity and around the site of the transmitter attachment sites. It is most likely the case that the seafood wastes attracted the Steller's eiders to an area with sewage treatment facility discharges which had higher levels of bacteria. While the birds were emaciated and had internal parasites, no direct link has been made between the mortality of the eiders and the bacteria in the effluent. It is important to note that this permit only covers facilities 3 nm or more from shore in areas of adequate flushing which should disperse the seafood wastes and minimize the attraction of animals to the seafood wastes. In addition, it is unlikely these wastes will occur in areas where they can comingle with bacterial wastes, therefore minimizing the potential contact with bacteria in the wastes.

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 the sediment texture, and chemical changes within the sediments as a result of decaying organic matter accumulations, are expected to be minimal due to the movement of vessels and limits of discharges to beyond 3 nautical miles from shore. The decay of accumulated solid waste may reduce concentrations of dissolved oxygen in the overlying water column and release potentially toxic decay byproducts like unionized ammonia and undissociated hydrogen sulfide. A recent study has shown that anoxic conditions in the sediment extend out several acres further than the known boundaries of the waste piles and can cause impacts to benthos outside of this area. Permitted discharges of seafood waste to oxygenated well-flushed areas at rates consistent with permit limitations for the proposed permit are not generally expected to result in waste piles or cause levels of dissolved oxygen or toxic substances that could have an adverse effect on marine organisms.

Eutrophication of coastal marine waters is not expected to occur in locations where water exchange is adequate to dilute nutrient inputs from seafood processing waste discharges. However, the degree of eutrophication is not known in areas where there is low flushing. Residual concentrations of chlorine disinfectants in the liquid waste stream, and additional oxidants produced by the reactions of chlorine with other compounds, should not accumulate to levels of concern for these species in areas of good flushing.

The attraction of marine mammals and birds to seafood processing waste discharges has the potential to create indirect impacts. At present the data regarding these effects are mostly circumstantial and anecdotal. Whether or not birds feeding on seafood waste that has commingled with sanitary waste discharges may result in an impact is being studied by the Alaska Sealife Center and discussed in more detail in Section 5.4.2. While results are inconclusive, there is concern that attraction of marine mammals and birds to areas with effluents containing high levels of bacteria may result in adverse effects. However, this permit covers seafood processing discharges 3 nm or more from shore in areas of adequate flushing and prohibits discharging of seafood wastes in areas of critical habitat for the listed species. This should minimize the attraction of marine mammals and birds to the seafood wastes. In addition, it is unlikely these wastes will occur in areas where they can comingle with bacterial wastes, therefore minimizing the potential contact with bacteria in the wastes.

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 Alaska, there is no known evidence to date to establish a link between the occurrence of toxic phytoplankton and seafood processing waste discharges.

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 species. Potential direct, indirect, interdependent and interrelated effects and effects to critical habitat are discussed in the following sections to assist in determining the effect conclusions for the listed species.

5.6.1 Fish

West Coast salmon species currently listed under the ESA originate in freshwater habitat in Washington, Oregon, Idaho and California, although they may migrate into Alaskan waters for a significant portion of their adult lives. No stocks originating in Alaska are listed under ESA, and none of the listed Evolutionarily Significant Units (ESUs), have critical habitat delineated in Alaskan waters. The species that originate in freshwater habitats in Washington, Oregon, Idaho and California may have the potential to migrate to Alaska waters but the sightings of these species are rare in Alaska. It is expected that offshore seafood processor discharge will have insignificant and discountable effects on west coast salmon species. Therefore, EPA has determined that approval of the offshore seafood processor general permit is **not likely to adversely affect** any of the listed west coast salmon species.

5.6.2 Birds

5.6.2.1 Short-tailed albatross

Although the short-tailed albatross can be found within several miles of shore during the non-breeding season, the albatross is primarily pelagic in distribution during this period. The albatross is not known to breed in Alaskan waters (USFWS 2005a). Therefore, it is unlikely that the bird would be exposed to seafood processing waste during breeding season. Outside of breeding season, these birds have been observed most frequently along the continental shelves in Gulf of Alaska, the Aleutians and the Bering Sea between the Alaska Peninsula and St. Matthew Island. Based on the number of birds that have been observed in Alaska and their locations within the state, effects to this species from offshore seafood processors should be minimal. Furthermore, the seafood processing wastes do not contain significant quantities of toxic pollutants that are prone to bioaccumulate in aquatic organisms. Based on the above information, offshore seafood processor discharges would result in insignificant and discountable effects to the short-tailed albatross. Therefore, EPA has determined that approval of the offshore seafood processor permit is **not likely to adversely affect** the short-tailed albatross.

5.6.2.2 Steller’s Eider

<u>Direct Effects</u>

Seafood processing discharge is not expected to impact Steller’s eider breeding grounds, as the Alaska breeding population nests primarily on the Arctic Coastal Plain where there is currently no seafood processing activity. While there is a smaller sub-population nesting in the Yukon-Kuskokwin Delta, offshore seafood processing activities there are currently limited and small in magnitude (USFWS 2002a). Additionally, the General Permit prohibits seafood processor discharge within one nautical mile of of critical habitat for Steller’s eiders.

During the rest of the year, Steller's eiders move south and prefer shallow, nearshore marine waters. Most Steller's eiders observed during southwestern Alaska shore-based surveys in the winter of 1999/2000 were foraging within 100 yards of the shore (LGL 2000 a,b). Eiders may be attracted to processing waste discharges from offshore seafood processing outfalls. Potential effects on Steller's eider from the discharge of seafood process wastes include possible increases in exposure to predatory or scavenger species or exposure to fish oil or non pertroleum oils and other byproducts of seafood processing that may adversely affect Steller's eiders. Seafood wastes may attract scavengers, such as gulls, which prey on Steller's eiders. However, because gulls primarily prey on Steller's eiders' eggs and young rather than adults, and because Steller's eiders do not breed in areas of high seafood processing activity, the potential effects on eider populations from increased predation by gulls would be negligible. As the offshore seafood processors will be located 3 nm or further from shore and eiders are known to stay in the nearshore areas, the seafood processor waste should be minimal in areas that Steller's eiders are known to inhabit. Adverse effects may occur due to the release of organic waste within foraging habitat that results in disruption of the benthic community and therefore the prey base of Steller's eiders. However, habitat that may undergo adverse modification due to direct effects of the offshore seafood processor permit due to organic waste discharge potentially altering the benthic community, used as a prey resource for the Steller's eiders, should be minimal as discharges are expected to occur further than 1 nm from critical habitat areas. Additionally, the proposed permit does not allow ZODs, which should further minimize potential impacts to Steller's eiders prey from potential accumulation of seafood wastes.

Indirect Effects

Indirect effects may occur as Steller's eiders may congregate near offshore seafood processor vessels and be harmed by vessels associated with the processor through disturbance or accidental release of petroleum products   Regulation of fuel-related activities at sea is not covered under this permit as fueling activities fall under the jurisdiction of the U.S. Coast Guard. Spilled petroleum can have adverse effects on Steller's eiders including impairment of a bird's ability to maintain homeostatic temperature mechanisms as well as potential exposure to toxic chemicals in petroleum through potential ingestion. Release of petroleum in Steller's eiders habitat also has the potential to contaminate prey and reduce its availability. The proposed permit requires offshore processors to be at least 1 nm from any area designated as Steller's eider critical habitat. This exclusion should minimize potential adverse effects from petroleum spills associated with seafood processors.

Interrelated and interdependent actions

Another concern with Steller's eiders is potential Steller's eider strikes from communication facilities towers and associated guy wires. As stated in 50 CFR Part 402 if the activity in question would occur regardless of the proposed action under consultation, then the activity is not interdependent or interrelated and would not be analyzed with the effects of the action under consultation. Therefore, since the communication towers may be used by the offshore seafood processing vessels, but the towers would exist whether used by the processor vessels or not, the effects from communication facilities are not analyzed further in the effects analysis.

Critical habitat

Critical habitat for Steller's eiders was designated to include breeding habitat on the Yukon-Kiskokwim Delta and four units in southwest Alaska marine waters, including the Kuskokwim shoals, Seal Islands, Nelson Lagoon and Izembek Lagoon (65 FR 13262). Habitat may undergo adverse modification due to direct effects of the offshore seafood processor permit due to organic waste discharge potentially altering the benthic community, which is a prey resource for the Steller's eiders. However effects should be minimal as discharges are expected to occur further than 3 nm from shore. In addition these discharges should occur in areas of high tidal activity which allows for dilution and dispersion of the seafood discharges so that waste piles which can smother benthic invertebrates should not occur. Habitat may also undergo adverse modification through accidental petroleum releases. Regulation of fuel-related activities at sea is not covered under this permit as this activity falls under the jurisdiction of the U.S. Coast Guard. The potential for accidental petroleum releases are impossible to predict or determine, however, they are not expected to adversely impact a significant proportion of Steller's eider critical habitat as the proposed general permit prohibits seafood processor discharge within one (1) nm of any critical habitat for Steller's eiders.

Based on the above information, discharges from offshore seafood processors would likely have insignificant and discountable effects on Steller's eiders. Therefore, EPA has determined that approval of the offshore seafood processor permit is **not likely to adversely affect** Steller's eider.

5.6.2.3 Spectacled Eider

<u>Direct Effects</u>

The primary spectacled eider breeding ground is the Yukon-Kuskokwim Delta, with lower densities of breeding eiders occuring on the North Slope (USFWS 2007). Seafood processing activity is currently limited in the Yukon-Kuskokwim Delta and the current general permit prohibits discharge within one (1) nautical mile of critical habitat for spectacled eiders. Therefore, seafood processing wastes are not expected to negatively impact spectacled eiders during breeding season.

While moving between nesting and molting areas, spectacled eiders travel along the coast up to 50 km offshore. From October through March, they move far offshore to waters up to 65 m deep where they sometimes gather in dense flocks in openings of sea ice (USFWS 2006b). Therefore, spectacled eiders occur within the action area of the offshore seafood processor permit. Spectacled eiders may be attracted to processing waste discharges from offshore seafood processing vessels. Potential effects on spectacled eiders from the discharge of seafood process wastes include possible increases in exposure to predatory or scavenger species or exposure to fish and non-petroleum oils and other byproducts of seafood processing that may adversely affect spectacled eiders. Seafood wastes may attract scavengers, such as gulls, which prey on spectacled eiders. However, because gulls primarily prey on spectacled eiders' eggs and young rather than adults, and because spectacled eiders do not breed in areas of high seafood processing activity, the potential effects on eider populations from increased predation by gulls would be negligible. The majority of offshore seafood processors will be located 3 nm or further from shore and have the potential to adversely affect spectacled eiders which are located in offshore areas. Adverse effects may occur due to the release of organic waste within foraging habitat that results in disruption of the benthic community and therefore the prey base of spectacled eiders. However, the location of offshore seafood processor vessels 3 nm or more from shore in high tidal areas should dilute and disperse the seafood processing waste fairly quickly creating less of an attraction for spectacled eiders. However, habitat that may undergo adverse modification due to direct effects of the offshore seafood processor permit due to organic waste discharge potentially altering the benthic community, used as a prey resource for the spectacled eiders, should be minimal as discharges are expected to occur further than 1 nm from critical habitat areas. Additionally, the proposed permit does not allow ZODs, which should further minimize potential impacts to spectacled eiders prey from potential accumulation of wastes.

Indirect Effects

Indirect effects may occur as spectacled eiders may congregate near offshore seafood processors and be harmed by vessels associated with the processor through disturbance or accidental release of petroleum products Regulation of fuel-related activities at sea is not covered under this permit as this activity falls under the jurisdiction of the U.S. Coast Guard. Spilled petroleum can have adverse effects on spectacled eiders including impairment of a bird's ability to maintain homeostatic temperature mechanisms as well as potential exposure to toxic chemicals in petroleum through potential ingestion. Release of petroleum in spectacled eiders habitat also has the potential to contaminate prey and reduce its availability. The proposed permit requires offshore processors to be at least 1 nm from any area designated as spectacled eider critical habitat. This exclusion should minimize potential adverse effects from petroleum spills associated with seafood processors.

Interrelated and interdependent actions

Another concern with spectacled eiders is potential spectacled eider strikes from communication facility towers and associated guy wires. As stated in 50 CFR Part 402, if the activity in question would occur regardless of the proposed action under consultation, then the activity is not interdependent or interrelated and would not be analyzed with the effects of the action under consultation. Therefore, since the communication towers may be used by the offshore seafood processing vessels, but the towers would exist whether used by the processor vessels or not, the effects from communication facilities are not analyzed further in the effects analysis.

Critical Habitat

Critical Habitat for the spectacled eider includes areas on the Yukon-Kuskokwim Delta, in Norton Sound, Ledyard Bay and the Bering Sea between St. Lawrence and St. Matthew Islands. However, habitat that may undergo adverse modification due to direct effects of the offshore seafood processor permit due to organic waste discharge potentially altering the benthic community, used as a prey resource for the spectacled eiders, should be minimal as discharges are expected to occur further than 3 nm from shore. In addition, the vessels are not allowed to stay in one location more than seven days so the constant movement along with discharges occuring in areas of high tidal activity will allows for dilution and dispersion of the seafood discharges so that accumulation of waste piles which can smother benthic invertebrates should not occur.

Habitat may also undergo adverse modification through accidental petroleum releases. Regulation of fuel-related activities at sea is not covered under this permit as this activity falls under the jurisdiction of the U.S. Coast Guard. The potential for accidental petroleum releases are impossible to predict or determine, however, they are not expected to adversely impact a significant proportion of spectacled eider critical habitat as the current general permit prohibits seafood processor discharge within one (1) nautical mile of critical habitat for the spectacled eiders.

Based on the above information, offshore seafood processing discharges would result in insignificant and discountable effects to the spectacled eider. Therefore, EPA has determined that approval of the offshore seafood processor permit is **not likely to adversely affect** spectacled eider.

5.6.3 Marine Mammals

5.6.3.1 Polar Bear

In Alaska, polar bears are found in the Chukchi and Beaufort Seas located west and north of Alaska. Critical habitat has not been designated for the polar bear at this time. Arctic sea ice provides a platform for critical life-history functions, including hunting, feeding, travel, and nurturing cubs.

At present, polar bear stocks in Alaska have no direct interaction with commercial fisheries activities (73 FR 28312). Therefore, the offshore seafood processors permit should have **no effect** on polar bears.

5.6.3.2 Northern Sea Otter (SW Alaska Population)

<u>Direct Effects</u>

The range of the southwest Alaska population of the northern sea otter extends from the Aleutain Islands through southcentral and southwestern Alaska coasts. The northern sea otter populations generally occur in shallow water areas near the shoreline (USFWS 2002b), and the offshore seafood processor vessels occur more than 3 nm from shore, so it is unlikely that they would have significant contact with seafood processing wastes from offshore seafood processors.

However, northern sea otters could potentially be attracted to the offshore seafood processor waste which could be used as a food source for this species. A study by Ballachey et al. (2002) looked at sea otter mortality in Orca Inlet, Alaska during the winter of 1995-1996. These sea otters were in poor body condition and had significant helminth parasite loads. Some fish species including salmon and herring are known to serve as intermediate host to these parasites and it was postulated that consumption of fish parts and seafood processor waste by sea otters could be serving as a source of these parasites. There are many speculated causes of death of these sea otters including unusually cold temperatures that winter and high population numbers leading to depleted prey resources which may have lead to starvation and made the fish parts a more attractive food source. The report did not definitively state the cause of the higher mortality rates of sea otters in Orca Inlet during the winter of 1995-1996 and there was no report of a continuing high mortality rate the following winter.

The current permit covers only those seafood processor facilities at distances greater than 3 nm from shore. The location of the offshore seafood discharges are in areas of high tidal activity and good flushing and should disperse the seafood discharge so that it is less of an attractant to northern sea otters. In areas with lower population densities, it is expected that abundant natural food sources would minimize the northern sea otters attraction and dependence on seafood discharges.

Seafood processing wastes have the potential to lead to adverse effects by altering the habitat for and potentially burying benthic prey species of the northern sea otter and potentially reducing the prey availability of these species. Offshore seafood processing wastes are required to be discharged in areas of high tidal activity from vessels that are moving which will allow for the dilution and dispersion of these wastes preventing large waste piles that have the potential to bury or alter habitat for prey species of the northern sea otter. The proposed permit does not allow ZODs. This should minimize potential impacts to northern sea otters from potential accumulation of wastes in a ZOD. Therefore, effects to prey of the northern sea otter should be minimal.

<u>Indirect Effects</u>

Indirect effects may occur as Northern sea otters may congregate near offshore seafood processors and be harmed by vessels associated with the processor through disturbance or accidental release of petroleum products Regulation of fuel-related activities at sea is not covered under this permit as this activity falls under the jurisdiction of the U.S. Coast Guard. Spilled petroleum can have adverse effects on Northern sea otters including impairment of a sea otter's ability to maintain homeostatic temperature mechanisms as well as potential exposure to toxic chemicals in petroleum through potential ingestion. Release of petroleum in Northern sea otter habitat also has the potential to contaminate prey and reduce its availability.

<u>Critical Habitat</u>

Critical habitat has not been designated for the southwest Alaska northern sea otter distinct population segment.

Based on the above discussion, the adverse long-term impacts to northern sea otter populations from seafood processing discharges should be insignificant and discountable. Therefore, EPA has determined that the offshore seafood processor permit is **not likely to adversely affect** the Northern sea otter.

5.6.3.3 Steller Sea Lion (Eastern and Western Stocks)

<u>Direct Effects</u>

Steller sea lions have an extensive foraging range and haulout in many coastal areas. There is some evidence that sea lions are attracted to seafood discharges, particularly unground fish wastes and livers (EPA 2005b). This may affect both the behavior of individual animals in proximity of the discharge outfalls and the overall Steller sea lion population. For example, the discharge of process wastes near sea lion foraging grounds could reduce visibility and individual foraging success. Offshore seafood processor vessels would be located 3 nm or more from shore in areas of high tidal activity and good flushing which should allow for dispersion and dilution of seafood discharges and minimize attraction of Steller sea lions to the discharges. In addition, the permit prohibits discharge within three (3) nautical miles of a rookery or major haulout of the Steller sea lion as designated by the National Marine Fisheries Service as critical habitat, which should help to minimize direct effects to Steller sea lions from offshore seafood processor discharges.

Seafood processing wastes have the potential to lead to adverse effects by altering the habitat for and potentially burying benthic prey species of the Steller sea lion and potentially reducing the prey availability of these species. Offshore seafood processing wastes are required to be discharged in areas of high tidal activity from vessels that are moving which will allow for the dilution and dispersion of these wastes preventing large waste piles that have the potential to bury or alter habitat for prey species of the northern sea otter. The proposed permit does not allow ZODs. The permit prohibits discharge within three (3) nautical miles of a rookery or major haulout of the Steller sea lion as designated by the National Marine Fisheries Service as critical habitat, which should help to minimize direct effects to Steller sea lions from offshore seafood processor discharges. Therefore, effects to prey of the northern sea otter should be minimal.

<u>Indirect Effects</u>

Indirect effects may occur as Steller sea lions may congregate near offshore seafood processors and be harmed by vessels associated with the processor through disturbance or accidental release of petroleum products Regulation of fuel-related activities at sea is not approved under this permit as this activity falls under the jurisdiction of the U.S. Coast Guard. Spilled petroleum can have adverse effects on Steller sea lions including impairment of a sea lion's ability to maintain homeostatic temperature mechanisms as well as potential exposure to toxic chemicals in petroleum through potential ingestion. Release of petroleum in Steller sea lion habitat also has the potential to contaminate prey and reduce its availability. However, the permit prohibits discharge within three (3) nautical miles of a rookery or major haulout of the Steller sea lion as designated by the National Marine Fisheries Service as critical habitat, which should minimize indirect effects to Steller sea lions from offshore seafood processor discharges.

<u>Critical Habitat</u>

Critical habitat for eastern stock of Steller sea lion was designated as 3 mn around each major rookery and major haulout whereas critical habitat for the western stock of Steller sea lions was designated as 20 nm around each major rookery and major haulout area west of longitude 144°W. The proposed permit prohibits discharge within three (3) nautical miles of a rookery or major haulout of the Steller sea lion. This exclusion outlined in the proposed permit should minimize effects to Steller sea lion critical habitat.

Based on the above discussions, the offshore seafood processing facilities should have insignificant and discountable effects on Steller sea lion. Therefore, EPA determined that the offshore seafood processing permit is **not likely to adversely affect** Steller sea lion populations.

5.6.3.4 North Pacific Right Whale

Critical habitat has been designated for the North Pacific right whale in the Pacific Ocean in the Gulf of Alaska and the Bering Sea. The diet of the North Pacific right whale consists of mostly smaller crustaceans including copepods and euphausiids. While historical information reports that the North Pacific right whale prefers offshore habitats, recent sightings demonstrate they have been seen in shallower coastal waters off Alaska (Tynan et al. 2001). North Pacific right whales are currently believed to prefer coastlines and sometimes large bays, spending the summer feeding in the north then migrate south to breed in the winter; preliminary analysis of data from recorders indicates that these whales stay in the southeastern Bering Sea at least through October (Angliss and Lodge 2003).

Some indirect effects to whales related to reduced prey availability or foraging success may be possible. Some temporary disturbance of whale activities may also occur due to increases in vessel traffic and noise. Offshore seafood processor vessels may cause adverse effects to cetaceans through ship strikes. However, there are only approximately 98 offshore seafood processor vessels and while the vessels could adversely impact the cetaceans, the potential aggregate area of all offshore seafood processors in Alaska coastal waters in the action area is unlikely to occupy more than a small portion of the whales habitat used for feeding and migration.

Based on the above information, offshore seafood processors will most likely result in insignificant effects to this species. Therefore, EPA has determined that the approval of the proposed permit for offshore seafood processors is **not likely to adversely affect** the North Pacific right whale.

5.6.3.5 Bowhead whale

Bowhead whales winter in the Bering Sea and migrate to the Chukchi and Beaufort Seas in the spring and summer. As the pack ice breaks up in the spring, bowhead whales migrate from the Bering Sea through the Bering Strait into the Chukchi Sea, and then follow the nearshore lead around Point Barrow to the Beaufort Sea. In the Alaskan Beaufort Sea, bowheads select for outer continental shelf and slope habitats(200-2000 m) during summer but in fall can shift to shallower inner/outer shelf habitat (<200m) with light ice conditions (Moore 2000). The diet of the bowhead whale consists of mostly smaller crustaceans including copepods and euphausiids (NMFS 2009f).

Some indirect effects to whales related to reduced prey availability or foraging success may be possible. Some temporary disturbance of whale activities may also occur due to increases in vessel traffic and noise. Offshore seafood processor vessels may cause adverse effects to cetaceans through ship strikes. However, there are only approximately 98 offshore seafood processor vessels and while the vessels could adversely impact the cetaceans, the potential aggregate area of all offshore seafood processors in Alaska coastal waters in the action area is unlikely to occupy more than a small portion of the whales habitat used for feeding and migration.

EPA believes that the potential for adverse effects to bowhead whales from EPA's approval of the proposed permit for offshore seafood processors will most likely result in insignificant effects to the species. Therefore, EPA has determined that the approval of the proposed permit for offshore seafood processors is **not likely to adversely affect** the bowhead whale.

5.6.3.6 Sei whale

The sei whale occurs mainly south of the Aleutian Islands in the North Pacific. In addition, the sei whale is a pelagic species and generally does not inhabit inshore and coastal waters; this species prefers deeper offshore waters with preferred habitat in offshore areas encompassing the continental shelf break (Gregr and Trites 2001). Some indirect effects to whales related to reduced prey availability or foraging success may be possible. Some temporary disturbance of whale activities may also occur due to increases in vessel traffic and noise. Offshore seafood processor vessels may cause adverse effects to cetaceans through ship strikes. However, there are only approximately 98 offshore seafood processor vessels and while the vessels could adversely impact the cetaceans, the potential aggregate area of all offshore seafood processors in Alaska coastal waters in the action area is unlikely to occupy more than a small portion of the whales habitat used for feeding and migration.

Based on the above information, offshore seafood processors will most likely result in insignificant effects to this species. Therefore, EPA has determined that EPA's proposed approval of the proposed permit for offshore seafood processors is **not likely to adversely affect** the sei whale.

5.6.3.7 Blue whale

Blue whales have rarely been observed in coastal waters of Alaska (Leatherwood et al. 1982, Forney and Brownell 1996). The blue whale prefers deeper offshore waters with preferred habitat in offshore areas encompassing the continental shelf break (Gregr and Trites 2001). Some indirect effects to whales related to reduced prey availability or foraging success may be possible. Some temporary disturbance of whale activities may also occur due to increases in vessel traffic and noise. Offshore seafood processor vessels may cause adverse effects to cetaceans through ship strikes. However, there are only approximately 98 offshore seafood processor vessels and while the vessels could adversely impact the blue whale, the potential aggregate area of all offshore seafood processors in Alaska coastal waters in the action area is unlikely to occupy more than a small portion of the whales habitat used for feeding and migration.

Based on the above information, effects from offshore seafood processors are expected to be insignificant and discountable. Therefore, EPA has determined that EPA's proposed approval of the proposed permit for offshore seafood processors is **not likely to adversely affect** the blue whale.

5.6.3.8 Fin whale

Fin whales are found in offshore waters throughout the North Pacific. The fin whale feeds preferentially in offshore waters, with preferred habitat encompassing areas including the continental shelf break and offshore waters (Gregr and Trites 2001).

Some indirect effects to whales related to reduced prey availability or foraging success may be possible. Some temporary disturbance of whale activities may also occur due to increases in vessel traffic and noise. Offshore seafood processor vessels may cause adverse effects to cetaceans through ship strikes. However, there are only approximately 98 offshore seafood processor vessels and while the vessels could adversely impact the blue whale, the potential aggregate area of all offshore seafood processors in Alaska coastal waters in the action area is unlikely to occupy more than a small portion of the whales habitat used for feeding and migration. Fin whales are a mobile species with habitat throughout the Pacific Ocean and will most likely consume prey and inhabit areas outside of areas where offshore seafood vessels are located.

Based on the above information, effects from offshore seafood processors are expected to be insignificant and discountable. Therefore, EPA has determined that EPA's proposed permit for offshore seafood processors is **not likely to adversely affect** the fin whale.

5.6.3.9 Humpback whale

Summer ranges of humpback whales are often relatively close to shore including major coastal embayments and channels. While in Alaska, humpback whales concentrate in Southeast Alaska, Prince William Sound and near Kodiak and the Barren Islands. The humpback whale can be observed relatively close to shore and feed preferentially over continental shelf waters (NMFS 2005b, Gregr and Trites 2001).

Some indirect effects to whales related to reduced prey availability or foraging success may be possible. Some temporary disturbance of whale activities may also occur due to increases in vessel traffic and noise. Offshore seafood processor vessels may cause adverse effects to cetaceans through ship strikes. However, there are only approximately 98 offshore seafood processor vessels and while the vessels could adversely impact the blue whale, the potential aggregate area of all offshore seafood processors in Alaska coastal waters in the action area is unlikely to occupy more than a small portion of the whales habitat used for feeding and migration. As offshore seafood processor vessels should occupy a small percentage of the habitat of humpback whales, it is expected that humpback whales would be able to avoid areas where offshore seafood processors are located.

Based on the above information, effects from offshore seafood processors are expected to be insignificant and discountable. Therefore, EPA has determined that EPA's proposed approval of the proposed permit for offshore seafood processors is **not likely to adversely affect** the humpback whale.

5.6.3.10 Sperm whales

Sperm whales rarely enter semi-enclosed areas and prefer oceanic habitat, rarely occurring in waters less than 300 feet deep. The diet of the sperm whale consists of mostly cephalopods (squid and octopuses), but can also include fish (USEPA 2002). Sperm whales prefer waters with surface temperatures higher than 15 degrees C and depths less than 656-3280 feet (Gregr and Trites 2001).

Some indirect effects to whales related to reduced prey availability or foraging success may be possible. Some temporary disturbance of whale activities may also occur due to increases in vessel traffic and noise. Offshore seafood processor vessels may cause adverse effects to cetaceans through ship strikes. However, there are only approximately 98 offshore seafood processor vessels and while the vessels could adversely impact the cetaceans, the potential aggregate area of all offshore seafood processors in Alaska coastal waters in the action area is unlikely to occupy more than a small portion of the whales habitat used for feeding and migration. As offshore seafood processor vessels should occupy a small percentage of the habitat of sperm whales, it is expected that sperm whales would be able to avoid areas where offshore seafood processors are located.

Based on the above information, effects from offshore seafood processors are expected to be insignificant and discountable. Therefore, EPA has determined that proposed permit for offshore seafood processors is **not likely to adversely affect** the sperm whale.

5.6.3.11. Beluga Whale (Cook Inlet Stock)

Depending on season and region, beluga whales may occur in both offshore and coastal waters, with concentrations in Cook Inlet, Bristol Bay, Norton Sound, Kasegaluk Lagoon, and the Mackenzie Delta (Hazard 1988). Beluga whales in U.S. waters range from living in openings within the pack ice in winter and migrating to shallow bays and estuaries in summer. The Cook Inlet beluga whale is geographically isolated and a genetically differentiated population of beluga whale. There are a number of sources of potential impacts to beluga whales including subsistence harvest, commercial fishing, predation, stranding events in addition to habitat capacity and environmental change due to commercial and industrial activities.

According to the 2003 stock assessment report “NMFS recognizes that municipal, commercial, and industrial activites may be of concern and may affect the water quality and substrate in Cook Inlet. This includes commercial fishing, oil and gas development, municipal discharges, noise for aircraft and ships, shipping traffic, and tourism (Moore et al. 2000). However, no indication currently exists that these activities have had a quantifiable adverse impact on the beluga whale population. The best available information indicates that these activities, alone or cumulatively, have not caused the stock to be in danger of extinction (65 FR 38778; 22 June 2000). In addition, the subsistence harvest, which may have been responsible for the majority of the decline in this stock, was prohibited in 1999 through an act of Congress. Following the prohibition of subsistence harvest, preliminary results indicate that the decline in the stock ceased (65 FR 38778; 22 June 2000, Hobbs et al. 2000a).

Based on vessel locations provided to ADEC (ADEC 2006a) no vessels providing reports in 2006 were located in Cook Inlet. Some indirect effects to whales related to reduced prey availability or foraging success may be possible. Some temporary disturbance of whale activities may also occur due to increases in vessel traffic and noise. Offshore seafood processor vessels cause adverse effects to cetaceans through ship strikes. However, there are only approximately 98 offshore seafood processor vessels and while the vessels could adversely impact the cetaceans, the potential aggregate area of all offshore seafood processors in Alaska coastal waters in the action area is unlikely to occupy more than a small portion of the whales habitat used for feeding and migration. As offshore seafood processor vessels should occupy a small percentage of the habitat of Cook Inlet beluga whales, it is expected that beluga whales would be able to avoid areas where offshore seafood processors are located.

Therefore, EPA believes that potential adverse effects to beluga whales from EPA's approval of the proposed offshore seafood processor permit are insignificant and discountable. Therefore, EPA has determined that the approval of the proposed offshore seafood permit is **not likely to adversely affect** the Cook Inlet beluga whale.

5.6.4. Amphibians

While the endangered leatherback, the loggerhead, and the green sea turtle may occasionally venture into Alaskan waters, neither their center of abundance nor their critical habitat occurs in Alaskan waters. Since it is expected these species of sea turtles would have little overlap with offshore seafood processors, EPA has determined that the offshore seafood processor permit will have **no effect** on the leatherback, loggerhead or green sea turtles.

5.7 EFFECTS ON CANDIDATE SPECIES

Southeast Alaska DPS Pacific Herring

The Southeast Alaska DPS of Pacific herring extends from Dixon Entrance northward to Cape Fairweather and Icy Point and includes all Pacific herring stocks in Southeast Alaska. Pacific herring are located in distinctly varying environments during different times of the year. The Southeast Alaska DPS of the Pacific herring is currently undergoing a status review to better understand trends in population and risks to the species. Offshore seafood processor discharges will take place in high tidal activity areas which should allow for dispersion and dilution of the discharges, minimizing effects on the Pacific herring prey sources and habitat. Since offshore seafood discharges should result in insignificant effects to this candidate species , EPA has determined that the approval of the proposed offshore seafood permit is **not likely to adversely affect** the Southeast Alaska DPS of Pacific herring.

Kittlitz's Murrelet

Kittlitz's murrelets can be found along coasts where waters are influenced by glacial outwash, such as the Malaspina Forelands, where glacial runoff seeps across miles of exposed coast before entering the ocean (Kozie 1993). Kittlitz's murrelets are also found around Kodiak Island, the Aleutian Islands, Bristol Bay, Seward Peninsula, Cape Lisburne, and Chukotka and Kamchatka peninsulas in Russia; areas not currently influenced by glaciers. Along the Aleutians, Kittlitz's murrelets are associated with larger islands containing deep bays and inlets. Several northern and peripheral populations in North America (Bristol Bay, Seward Peninsula, Cape Thompson, and Cape Lisburne) and Russia are found in waters not influenced by glaciers; likely reflecting historical glacial distribution (AKNHP 2004).

During the breeding-season, Kittlitz's murrelets appear to favor waters >200 m from shore (Day *et al*. 2000), although a recent study suggests oceanic topography, rather than distance to shoreline, may be a more biologically meaningful parameter (Kissling *et al*. 2005). This hypothesis is supported by data from Attu Island in the Aleutians, where the number of Kittlitz's murrelets observed during a summer survey were three-times more likely to be within the 1-5 km from shore strata (Piatt *et al.* 2005). Offshore bathymetry is not necessarily deep water, and it was noted that prominent shoals extend many kilometers from shore where high densities of Kittlitz's murrelets were observed around Attu Island (Piatt *et al.* 2005).

During the non-breeding season, the marine distribution of Kittlitz's murrelets is farther offshore. In winter, Kittlitz's murrelets occur in the waters of Prince William Sound, Kenai Fjords, Kachemak Bay and Sitka Sound (Day et al. 1999). Declining populations are also known to occur in Lower Cook Inlet (Speckman et al. 2005), Glacier Bay (Robards et al. 2003) and the Malaspina Forelands (Kissling et al. 2005).

The six known core population centers for Kittlitz's murrelet includes Kenai Fjords, Prince William Sound, Malaspina Forelands, Glacier Bay, Icy Bay and Lower Cook Inlet. The proposed permit has a number of exclusions of waterbodies, including waters within 1 NM of the boundary of a National Park, Monument, or Preserve or any bay, fjord or harbor enclosed by a National Park, Monument or Preserve. This exclusion includes Glacier Bay and Kenai Fjord, which are both designated National Parks. Malaspina Forelands and Icy Bay falls withing the Wragell-St. Elias National Park and preserve. These exclusions outlined in the permit should assist in protection of significant portions of habitat for this candidate species and thereby minimize potential effects from offshore seafood processors to Kittlitz's murrelet. Therefore, EPA has determined that the approval of the proposed permit for offshore seafood processors will have an insignificant effect on this population and therefore is **not likely to adversely affect** the Kittlitz's Murrelet.

5.8 EFFECT OF THE PROPOSED ACTION ON TRIBAL RESOURCES

"Subsistence fishing" is defined by Alaska state law as: "taking of fish, shellfish, or other fisheries resources by Alaska residents for subsistence uses" (AS 16.05.940[30]).

"Subsistence uses" of wild resources are defined as "noncommercial, customary, and traditional uses" for a variety of purposes. This includes direct personal or family consumption of wild resources as food, shelter, fuel, clothing, tools, or transportation for the making and selling of handicraft articles out of non-edible byproducts of fish and wildlife resources are taken for personal or family consumption, and for the customary trade, barter, or sharing of wild resources for personal or family consumption (AS 16.05.940[32]).

Under Alaska's subsistence statute, the Alaska Board of Fisheries must identify fish stocks that support subsistence fisheries and if there is a harvestable surplus of these stocks, adopt regulations that provide reasonable opportunities for these subsistence uses to take place. When harvests have to be restricted, subsistence fisheries have a preference over other uses of the stock (AS 16.05.258).

Most rural families in Alaska depend on subsistence fishing and hunting. According to State of Alaska's Department of Commerce Division of Community Advocacy, 92-100% of households use fish and 79-92% use wildlife. In general, harvest and use levels increase in communities that function a distance from urban population centers. (Alaska 2006a).

Subsistence fishing and hunting provide a significant part of the food supply in rural Alaska. It is estimated that approximately 43.7 million pounds of wild foods are harvested annually in rural Alaska (Wolfe and Utermohle 2000). Most of the wild food harvested is composed of fish (about 60% by weight) along with land mammals (20%), marine mammals (14%), birds (2%), shellfish (2%), and plants (2%) as depicted in Figure 2.11 (Wolfe 2000). Fish varieties include salmon, halibut, herring, and whitefish. Marine mammals comprise of seals, sea lion, walrus, beluga, and bowhead whale. Land mammals comprise of moose, caribou, deer, bear, Dall sheep, mountain goat, and beaver (Wolfe 2000).

Although subsistence harvests produce a major portion of the food supply, they represent a small portion (approximately 2%) of the annual harvest of wild resources in Alaska. Commercial fisheries comprise 97% of the wild resource harvest and sport fisheries and hunts comprise approximately 1% (ADFG 2005).

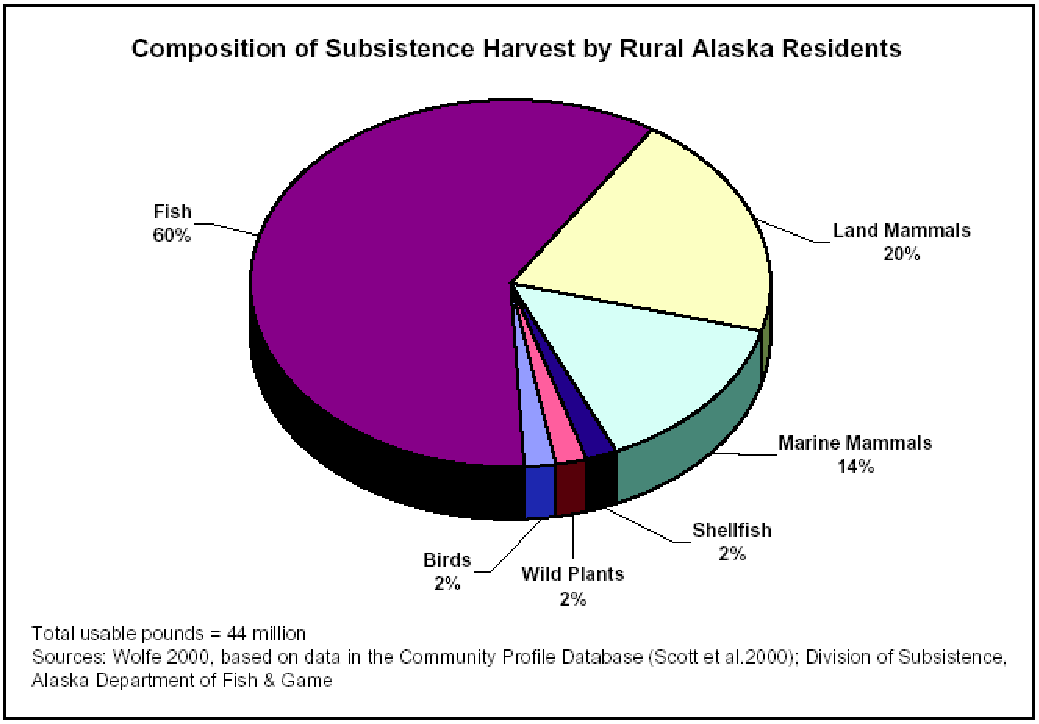

Figure 5.1: Composition of subsistence harvest by rural Alaska residents. *Source: Alaska Economic Performance Report 2005.*

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.

Some of the future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological evaluation include State-managed commercial fisheries, subsistence harvest, vessel traffic and construction of man-made structures. As climate change alters the location of fish stocks, seafood processing vessels may approach the North Slope area of spectacled eider habitat. While this is a potential future action, at this time the potential for these vessels to move north is not reasonably certain to occur.

7.0 CONCLUSIONS

Table 7.1 Effect Conclusions for ESA species

Species	Summary of Effect Analysis Conclusion
Fish	
Chinook salmon	Not likely to adversely affect
Steelhead	Not likely to adversely affect
Pacific Herring	Not likely to adversely affect
Birds	
Short-tailed Albatross	Not likely to adversely affect
Steller's Eider	Not likely to adversely affect
Spectacled Eider	Not likely to adversely affect
Kittlitz Murrelet	Not likely to adversely affect
Marine Mammals	
Polar Bear	No Effect
Steller Sea Lion	Not likely to adversely affect
Northern Sea Otter	Not likely to adversely affect
Northern Right Whale	Not likely to adversely affect
Bowhead Whale	Not likely to adversely affect
Sei Whale	Not likely to adversely affect
Blue Whale	Not likely to adversely affect
Fin Whale	Not likely to adversely affect
Humpback Whale	Not likely to adversely affect
Sperm Whale	Not likely to adversely affect
Cook Inlet Beluga Whale	Not likely to adversely affect
Amphibians	
Green Sea Turtle	No Effect
Loggerhead Sea Turtle	No Effect
Leatherback Sea Turtle	No Effect

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9.0 ESSENTIAL FISH HABITAT

9.1 DESCRIPTION OF PROPOSED ACTION

Please refer to Section 2 of this document for a description of the proposed action.

9.2 EFH FOR APPROPRIATE FISHERIES MANAGEMENT PLANS

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 National Marine Fisheries Service (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. Again, NOAA 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).

EFH has been designated in waters of Alaska for anadromous fish and certain life stages of marine fish under NMFS' jurisdiction. EFH for Fishery Management Plans in Alaska are described in Chapter 6, "NMFS Recommendations on the Description and Identification of EFH" in the "Essential Fish Habitat – Environmental Assessment for Amendment 55 to the Fishery Management Plan for the Groundfish Fishery of the Bering Sea and Aleutian Islands Area; Amendment 55 to the Fishery Management Plan for Groundfish of the Gulf of Alaska; Amendment 8 to the Fishery Management Plan for the King and Tanner Crab Fisheries in the Bering Sea/Aleutian Islands; Amendment 5 to the Fishery Management Plan for Scallop Fisheries off Alaska; Amendment 5 to the Fishery Management Plan for the Salmon Fisheries in the EEZ off the Coast of Alaska," dated January 20, 1999 (http://www.fakr.noaa.gov/habitat/efh_ea/; NPFMC, 1999). The discussion in the following three paragraphs is an excerpt from Chapter 6. Table 9.1 lists FMP-managed species in Alaska.

Briefly, EFH for Bering Sea and Aleutian Islands (BSAI) region groundfish includes pelagic, epipelagic, and meso-pelagic waters, as well as on-bottom and near-bottom habitats of the Bering Sea and Aleutian Islands. It also includes pelagic and bottom nearshore, inshore, and intertidal waters of the Bering Sea and Aleutian Islands. EFH for Gulf of Alaska (GOA) species include pelagic, pelagic inshore, epipelagic, and bottom habitats; EFH for BSAI crabs occurs throughout the water column and includes bottom habitats and inshore waters.

EFH for the salmon fisheries off the coast of Alaska consists of the aquatic habitat, both fresh water and marine, necessary to allow for salmon production needed to support a long-term sustainable salmon fishery and salmon contributions to healthy ecosystems (NPFMC, 1999). For the purpose of identifying EFH, the distribution of salmon in a watershed can be assumed based on access to salt water, with the upstream limits determined by presence of migration blockages. According to the Alaska Forest Resources and Practices Act (AS 41.17), an "anadromous water body" means the portion of a fresh water body or estuarine area that (a) is cataloged under AS 16.05.870 as important for anadromous fish; or (b) has been determined by AD&FG to contain or exhibit evidence of anadromous fish in which case the anadromous portion of the stream or waterway extends up to the first point of physical blockage. Therefore, if salmon occur in a stream's estuary, the area of stream up to the first point of physical blockage is presumed to be salmon habitat.

Information on life histories and salmon distributions can be found in the "Catalog of Waters Important for Spawning, Rearing or Migration of Anadromous Fishes" and the "Atlas to the Catalog of Waters Important for Spawning, Returning or Migration of Anadromous Fishes." However, not all waters important to salmon are identified in the Catalog and Atlas. For example, these documents are derived from U.S. Geological Survey maps which may be out of date because of changes in channel and coastline configurations. In addition, only a limited number of water bodies have actually been surveyed and are not included in the Catalog or Atlas. Waters that may not be included may include small- and medium-sized tributaries, flood channels, intermittent streams and beaver ponds which are often used for rearing or otherwise provide important habitat for anadromous fish (NPFMC, 1999).

Table 9.1 Fisheries management plan (FMP)-managed species in Alaska (from Appendix D, Section D-3, Final Environmental Impact Statement for Essential Fish Habitat Identification and Conservation in Alaska, NOAA, 2005. Available at: http://www.fakr.noaa.gov/habitat/seis/efheis.htm).

Bering Sea-Aleutian Islands Groundfish		**Gulf of Alaska Groundfish**	
Walleye pollock	Shortraker/rougheye rockfish	Walleye pollock	Thornyhead rockfish
Pacific cod	Northern rockfish	Pacific cod	Yelloweye rockfish
Yellowfin sole	Thornyhead rockfish	Yellowfin sole	Dusky rockfish
Greenland turbot	Yelloweye rockfish	Arrowtooth flounder	Atka mackerel
Arrowtooth flounder	Dusky rockfish	Rock sole	Sculpins
		Alaska plaice	Skates

Rock sole Atka mackerel Alaska plaice Skates Rex sole Sculpins Dover sole Sharks Flathead fole Forage fish complex Sablefish Squid Pacific ocean perch Octopus	Rex sole Sharkes Dover sole Forage fish complex Flathead sole Squid Sablefish Octopus Pacific ocean perch Shortraker/rougheye rockfish Northern rockfish
Bering Sea-Aleutian Island Crab Red king crab Tanner crab Blue king crab Snow crab Golden king crab	**Alaska Stocks of Pacific Salmon** Pink Chinook Chum Coho Sockeye
Alaska scallops Weathervane scallop	

9.2.1 Walleye Pollock

Pollock are widely distributed throughout the North Pacific Ocean in temperate and sub arctic waters (NMFS 2005). Pollock are found throughout the water column from the surface to about 500 meters (1,640 feet). Juveniles have EFH in inner continental shelf regions with water depths ranging from 1 to 50 meters (3 to 164 feet). Seasonal migrations occur from the outer continental shelf to shallow waters (90 to 140 meters [295 to 459 feet]) for spawning. Spawning takes place in early spring; the eggs are pelagic, and found at depths from 0 to 1000 meters, and hatch in about 10-20 days depending on water temperature. Epipelagic larvae have a similar distribution, spending 20-30 days in the surface waters. Juvenile and adults are most often in lower and middle portion of the water column at depths less than 200 meters, for juveniles, and less than 1000 meters for adults. These life stages have no substrate preference.

9.2.2 Pacific Cod

Pacific cod is a demersal species that occurs on the continental shelf and upper continental slope. Spawning habitat occurs along the continental shelf and slope between about 40 to 290 meters (131 to 951 feet) with spawning typically occurring from January to April. Pacific cod converge in large spawning masses over relatively small areas, with spawning occurring in the sublittoral/bathyl zone near the bottom. The eggs sink to the bottom and are somewhat adhesive. Little is known about the substrate type required for egg incubation. The optimal conditions for embryo development are water temperatures between 3 to 6ºC, salinity between 13 to 23 parts per thousand (ppt), and dissolved oxygen concentrations from 2 to 3 parts per million (ppm). The larvae are epipelagic, occurring primarily in the upper 45 meters (148 feet) of the water column shortly after hatching, and they move downward in the water column as they grow. The larvae occur primarily in waters less than 100 meters deep over soft substrate. Cod are concentrated on the shelf edge and the upper slope (100 to 200 meters deep) in the winter and spring. These fish overwinter in this zone and spawn from January to April; then they move to shallower waters (less than 100 meters deep) in the summer. Adults occur in depths from the shoreline to 500 meters (1,640 feet); their preferred substrate is soft sediment from mud to clay or sand (NMFS 2005). All life stages of Pacific cod, except juveniles, have EFH in inner continental shelf regions with water depths ranging from 1 to 50 meters (3 to 164 feet). Juvenile and adult EFH occurs in the lower portion of the water column in the inner, middle, and outer continental shelf from 0 to 200 meters; where their preferred substrate is soft sediment primarily from mud to gravel (NMFS 2005).

9.2.3 Yellowfin Sole

The EFH for all the life stages of the yellowfin sole occurs in either intertidal or inner continental shelf waters at depths less than 50 meters (164 feet). Yellowfin sole eggs, larvae, and juveniles are pelagic and are usually found in shallow areas. Larvae are planktonic for at least 2 to 3 months until metamorphosis occurs, usually inhabiting shallow nearshore areas. Adults are benthic and occupy separate winter and spring/summer spawning and feeding grounds. Adults overwinter near the shelf slope-break at approximately 200 meters and move into nearshore spawning areas as the shelf ice recedes (NMFS 2005). Spawning is protracted and variable, beginning as early as May and continuing through August. Spawning primarily occurs in water less than 30 meters deep. After spawning, adults disperse broadly over the continental shelf for feeding. Adults exhibit wintertime migration to deeper waters of the shelf margin to avoid extreme cold water temperatures, and feeding diminishes during this time.

9.2.4 Greenland Turbot

Also know as Greenland halibut, are distributed from Baja California northward throughout Alaska, although primarily found in the eastern Bering Sea and Aleutian Island region. Spawning occurs in winter from September through March, on the eastern Bering Sea slope. The eggs are benthypelagic (suspended in the water column near the bottom). The larvae are planktonic for up to 9 months until metamorphosis occurs, usually with a widespread distribution throughout shallow waters. Juveniles spend the first 3 to 4 months on the continental shelf, and then move to the slope as adults. Greenland halibut or turbot are demersal to semi pelagic. Adults inhabit continental slope waters with annual spring/fall migrations from deeper to shallow waters.

9.2.5 Arrowtooth Flounder

All life stages of arrowtooth flounder occur in inner continental shelf regions with water depths ranging from 1 to 50 meters (3 to 164 feet). Spawning is thought to occur from September through March. Larvae are planktonic for at least 2 to 3 months until metamorphosis occurs; juveniles usually inhabit shallow areas. Adults are found in continental shelf waters until age four and occupy both shelf and deeper slope waters at older ages with highest concentrations at 100 to 200 meters (NMFS 2005). Both adults and juveniles are found often over softer substrate, typically mud and sand, in the lower portion of the water column.

9.2.6 Rock Sole

EFH for all life stages of rock sole, except egg, occurs in inner continental shelf regions with water depths ranging from 1 to 50 meters (3 to 164 feet) along the western portions of Alexander Archipelago extending eastward along the coastline to Kodiak Island. Spawning takes place during late winter/early spring near the edge of the continental shelf at depths from 125 to 250 meters (410 to 820 feet). Eggs are demersal and adhesive. The larvae are planktonic for at least 2-3 months until metamorphosis occurs. Juveniles inhabit shallow waters until at least age one (NMFS 2005). Juveniles and adults occur over moderate to softer substrates of sand, gravel and cobble mostly in depths from 0 to 200 m.

9.2.7 Alaska Plaice

Defined EFH for Alaska plaice includes eggs, larvae, late juveniles and adults. Alaska plaice is considered a “deep water” species in the Gulf of Alaska groundfish management area. Eggs are present over a range of depths (0 to 500 meters) in the spring. Juvenile and adult EFH is in the lower portion of the water column at depths of 0 to 200 meters, over sand and mud substrate (NMFS 2005).

9.2.8 Dover Sole

EFH for Dover sole life stages from egg through late juvenile occurs in intertidal and inner shelf [1 to 50 meters (3 to 64 feet)]. These areas include areas adjacent to the western sides of Admiralty, Baronof, Chichagof, Kuiu, and Kupreano Islands. This fish is considered a “deep water flatfish” in the Gulf of Alaska management area. The EFH ranges to great depths (0 to 3000 meters) for larvae and eggs. Adults and juvenile EFH are less deep (0 to 500 meters) in the middle and outer shelf and upper slope areas, occurring in the lower portion of the water column over softer substrate of sand and mud (NMFS 2005).

9.2.9 Flathead sole

EFH for all life stages of flathead sole occurs in inner continental shelf regions with water depths ranging from 1 to 50 meters (3 to 164 feet). Adults are benthic and have separate winter spawning and summer feeding distributions. The fish over-winter near the continental shelf margin and then migrate onto the mid and outer-continental shelf areas in the spring to spawn. The eggs are pelagic and the larvae are planktonic and usually inhabit shallow areas. Egg and larvae EFH ranges from 0 to 3000 meters, while juvenile and adults’ EFH is shallower 0 to 200 meters occurring over sand and mud substrate. Like all flatfish they occur in the lower portion of the water column.

9.2.10 Sablefish

Sablefish are found in the Gulf of Alaska, westward to the Aleutian Islands, and in gullies and deep fjords generally at depths greater than 200 meters such as Prince William Sound and Southeast Alaska. Studies have shown that sablefish can be highly migratory for at least part of their lifecycle moving between the Gulf of Alaska to the Aleutian Islands and the Bering Sea. EFH for early juvenile sablefish occurs in inner continental shelf regions in water depths less than 50 meters (164 feet). Spawning is pelagic at depths of 300 to 500 meters (984 to 1,640 feet) near the edges of the continental slope. Larvae are oceanic through the spring; by late summer small juveniles [10-15 centimeters (4-6 inches)] occur along the outer coasts of Southeast Alaska, where they predominantly spend their first winter. First to second year juveniles are found primarily in nearshore bays; they move to deeper offshore waters as they age with EFH habitat at depths of 200 to 1000 meters. Adults are found on the outer continental shelf mainly on the slope and in deep gullies at typical depths of 200 to 1000 meters, over varied habitat, usually in softer substrate (NMFS 2005).

9.2.11 Pacific Ocean Perch

This species has historically been the most abundant rockfish species in the Gulf of Alaska. Known spawning areas are southeast of the Pribilof Islands in the Eastern Bering Sea and in the Gulf of Alaska near Yakutat. Major feeding areas are found off Unimak Pass and Kodiak Island and adjoining islands. Most of the adult population occurs in patchy, localized aggregations. Pacific Ocean perch appear to exhibit annual bathymetric migration from deep water in winter (approximately 300 to 420 meters) to shallower water (150 to 300 meters) in the summer and fall. It is primarily a demersal species that inhabits the outer continental shelf and upper continental slope regions of the North Pacific Ocean. Similar to other rockfish, Pacific Ocean perch have internal fertilization and release live young. Insemination occurs in the fall, and release of larvae occurs in April or May. The larvae are thought to be pelagic and drift with the current. Later-stage juveniles are believed to migrate to an inshore, demersal habitat, where they seem to inhabit rockier, higher relief areas than adults. As they mature, juveniles move to progressively deeper waters of the continental shelf. Adults [longer than 25 centimeters (10 inches)] are associated with pebble substrate on flat or low relief bottom, while juveniles prefer rugged areas containing cobble-boulder and epifaunal invertebrate cover (NMFS 2005).

9.2.12 Shortraker/Rougheye Rockfish

Shortraker and rougheye rockfish inhabit the outer continental shelf and upper continental slope of the northeastern Pacific from the Eastern Bering Sea to as far south as Point Conception, California. Trawl surveys have found juvenile rougheye rockfish at many inshore locations and also offshore on the continental shelf. In contrast, very few juvenile shortraker rockfish have ever been caught, and their preferred habitat is unknown. Adults of both species are semidemersal and are usually found on the continental slope in deeper waters and over rougher bottoms than Pacific Ocean perch. Shortraker and rougheye adults appear together often in trawl hauls and are concentrated in a narrow band along the slope at depths of 300 to 500 meters. Habitats with steep slopes and frequent boulders are used at a higher rate than those with gradual slopes and few boulders (NMFS 2005).

9.2.13 Northern Rockfish

Northern rockfish in the northeast Pacific range from the Eastern Bering Sea, throughout the Aleutian Islands and the Gulf of Alaska, to northernmost British Columbia. Little is known about the biology and life history of this species. Like other members of their genus, they are believed to bear live young in the early spring. There is no information on the habitat requirements of larval or early juvenile stages. Older juveniles are found on the continental shelf, generally at locations inshore of adult habitat, which is on relatively shallow rises of banks on the outer continental shelf at depths of 75 to 150 meters (NMFS 2005). The fish appear to be associated with relatively rough bottoms on these banks, and they are mostly demersal in their distribution.

9.2.14 Thornyhead Rockfish

Thornyheads in Alaska comprise two species: the shortspine thornyhead and the longspine thornyhead. The shortspine thornyhead is a demersal species found in deep water from 93 to 1460 meters, from the Eastern Bering Sea to Baja California. The longspine thornyhead inhabit depths from 370 to 1600 meters. Little is known about thrornyhead life history. These fish spawn large masses of buoyant eggs during the late winter and early spring. Juveniles are pelagic for the first year. Thornyhead rockfish inhabit the outer shelf and slope region through the northeastern Pacific and the Eastern Bering Sea.

9.2.15 Yelloweye Rockfish

Yelloweye rockfish occur on the continental shelf from Northern Baja California to the Eastern Bering Sea, commonly in depths less than 200 meters (NMFS 2005). They inhabit areas of rugged, rocky relief, and adults appear to prefer complex bottoms with “refuge spaces”.

9.2.16 Dusky Rockfish

Dusky rockfish are included within the assemblage of rockfish species termed “pelagic shelf rockfish”. Genetic and morphometric studies indicate that two species of dusky rockfish occur in the North Pacific Ocean: an inshore, shallow water, dark-colored variety and an offshore lighter-colored variety (NMFS 2005). Life history information on the dusky rockfish is extremely sparse. Females give birth to live young apparently in the spring, but there is no information on the larval or early juvenile stages. Older juveniles have not been sampled in large numbers, but appear to live on the inner continental shelf, generally at locations inshore of adults. The preferred habitat of adult fish appears to occur over the offshore banks of the outer continental shelf at depths of 100 to 149 meters (328 to 489 feet) (NMFS 2005).

9.2.17 Atka Mackerel

Atka mackerel are distributed from the east coast of the Kamchatka Peninsula, throughout the Aleutian Islands and the Eastern Bering Sea, and eastward through the Gulf of Alaska to Southeast Alaska (NMFS 2005). Their current center of abundance is in the Aleutian Islands, with marginal distributions extending into the southern Bering Sea and the western Gulf of Alaska. Adult Atka mackerel are semi-pelagic and spend most of the year over the continental shelf in water depths generally less than 200 meters (656 feet). Adults migrate annually to shallow coastal waters during spawning. Females deposit adhesive eggs in nests or rocky crevices (NMFS 2005). Planktonic larvae are found up to 800 kilometers from shore, usually in the upper water column, but little is known about their distribution until the fish are 2 years old and appear in the fishery.

9.2.18 Skates

EFH for adult skates is defined as waters from 0 to 500 meters on shelf and upper slope areas. They are present in the lower portion of the water column over varied substrate from mud to rock. Skates are oviparous, fertilization is internal, and eggs are deposited in a horny case for incubation. After hatching, juveniles likely remain in shelf and slope waters, but distribution is unknown. Adults and juveniles are demersal and feed on bottom invertebrates and fish. Data from surveys indicates that Alaska skates are most common from 50 to 200 meters deep on the continental shelf in the Eastern Bering Sea and the Aleutian Islands and are less common in the Gulf of Alaska between 100 and 350 meters. The Bering skate is found in the Gulf of Alaska and the Eastern Bering Sea between 100 and 350 meters. No data is available on habitat requirements or movement (NMFS 2005).

9.2.19 Sculpins

Both juvenile and adults sculpin species are present in the lower portion of the water column in the inner, middle and outer shelf (0 to 200 meters) and also in the upper slope (200 to 500 meters) in the Gulf of Alaska, over varied substrate (mud to rock). Most spawning occurs in the winter, with some species having internal fertilization. Typically eggs are laid in rocks where males guard them. Larvae often have diel migrations (near surface at night), and may be present year around.

9.2.20 Sharks

Sharks in the project area include spiny dogfish, the Pacific sleeper shark, and salmon sharks. Spiny dogfish are widely distributed in the Pacific Ocean. In the North Pacific, they are more common in the Gulf of Alaska, but are also found in the Eastern Bering Sea. They are a pelagic species, found from the surface down to 700 meters, but most commonly along the continental shelf to 200 meters depth. The females give birth in shallow coastal waters from September to January. Spiny dogfish move inshore in summer and offshore in winter. The Pacific sleeper shark is distributed throughout the Eastern Bering Sea, and occurs primarily on the outer shelf and the upper slope, but has also been seen near shore. Fertilization and development of these sharks is unknown.

Salmon sharks are distributed epipelagically along the continental shelf. They can be found in shallow waters throughout the Gulf of Alaska and the Eastern Bering Sea. These sharks have been found mostly on the outer shelf/upper slope areas in the Eastern Bering Sea, but from nearshore areas to the outer shelf in the Gulf of Alaska, especially near Kodiak Island and in Prince William Sound. Females likely give birth in offshore pelagic areas.

9.2.21 Forage Fish Complex

Forage fish, as a group, occupy a central position in the North Pacific Ocean food web, being consumed by a wide variety of fish, marine mammals, and seabirds. The complex includes many species, but the most common are capelin, eulachon, Pacific sand lance, and Pacific herring.

Capelin are distributed along the entire coastline of Alaska and south along British Columbia to the Strait of Juan de Fuca. Spawning occurs in the spring in intertidal zones of coarse sand and fine gravel, especially in Norton Sound, northern Bristol Bay, and around Kodiak Island. In the Eastern Bering Sea, adults are found only in nearshore habitats during the months surrounding the spawning run. During other times of year, capelin are found far offshore in the vicinity of the Pribilof Islands and the continental shelf break. This seasonal migration may be associated with the advancing and retreating polar ice front. Capelin have fairly narrow temperature preferences and probably are very susceptible to increases in water column temperatures.

Eulachon spawn in the lower reaches of coastal rivers and streams from northern California to Bristol Bay. This fish plays a significant cultural and ecological role in the coastal areas of Alaska. The number of streams supporting eulachon on the west coast of North American is relatively small, but Southeast Alaska has more than 25 runs of eulachon. They spawn in the spring in the rivers of the Alaska Peninsula and are consistently found in groundfish surveys between Unimak Island and the Pribilof Islands in the Eastern Bering Sea, and the Shelikof Strait in the Gulf of Alaska.

Pacific sand lance are usually found on the sea bottom, at depths between 0 and 100 meters except when feeding (pelagically) on crustaceans and zooplankton. Spawning occurs in winter and little is known about their distribution and abundance. Near Kodiak Island, sand lance have been found to hatch between March and April after spending up to several months in beach sediments. Newly hatched sand lance migrate offshore in early spring and spend time in offshore bank areas. In late summer, massive schools of fish start migrating inshore to suitable beach habitat for spawning and overwintering.

Pacific herring migrate in schools and are found along both shores of the ocean, ranging from San Diego Bay to the Bering Sea. They generally spawn during the spring in confined shallow vegetated areas in the intertidal and subtidal zones with eggs hatching about two weeks later. Young larvae drift and swim with the currents before metamorphosis into the juvenile form. Juveniles rear in sheltered bays and inlets. After spawning, most adults leave inshore waters and move offshore to feed. Herring schools spend daylight hours near the bottom and move upward in the evening to feed.

9.2.22 Squid

Juvenile and adult squid use the entire water column over the shelf (0 to 500 meters) and the entire slope (500 to 1,000 meters) regions (NMFS 2005). Reproduction is poorly known. But fertilization is internal, and squid lay eggs in gelatinous masses in water 200 to 800 meters deep. Young juveniles are often in water less than 100 meters deep, while older juveniles and adults are more often in waters 150 to 500 meters deep. Spawning occurs in the spring (NMFS 2005).

9.2.23 Octopi

In the Bering Sea and the Gulf of Alaska, the most commonly encountered octopi are the shelf demersal species *Enteroctopus dofleini* (the giant octopus), which inhabits the sublittoral to upper slope regions, and the bathypelagic species *Vampyroteuthis infernalis*, which lives at depths well below the thermocline, most commonly from 700 to 1500 meters depth. Little is know of their food habits, longevity, or abundance.

9.2.24 Red King Crab

The red king crab is widely distributed in the Gulf of Alaska and the BSAI, but defined EFH is restricted to the BSAI. They are present in the shelf areas to 250 meters depth. Mating occurs in water less than 50 meters deep from January to June. Larvae spend 2 to 3 months in a pelagic stage. After metamorphosis young of the year juvenile crabs are present in water less than 50 meters. At age of 1.5 to 2 years juveniles migrate in large pods to deeper water. Early stage juveniles use high relief coarse substrate (e.g., boulders, cobbles) areas. This habitat is present in the continental shelf area of 0 to 200 meters wherever there is substrate of rock, cobble, gravel and biogenic structures. Defined late juvenile and adult stage EFH is located primarily in Bristol Bay, with small areas in the Aleutian Islands and Norton Sound (NMFS 2005).

9.2.25 Blue King Crab

Blue king crab are found in discontinuous populations throughout their range which includes Alaskan regions from the Bering Sea, Pribilof Islands, St. Mathews Island, St. Lawrence Island to Southeast Alaska (NMFS 2005). Defined EFH is restricted to the BSAI region and excludes the GOA region. Adults are found at an average depth of 70 meters. Larvae, after 3.5 to 4 months as pelagic stage, settle to the bottom between 40 to 60 meters. Juveniles require rocky shell hash nearshore habitat, while adults reside typically at 45 to 75 meters in mud-sand substrate (NMFS 2005). The EFH characteristics for late juveniles is found in nearshore waters where rocky areas and shell hash are present in 0 to 50 meters, extending out wherever rock cobble and gravel are present to 200 meters in the continental shelf areas of the BSAI (NMFS 2005). Adult EFH characteristics are the same as late juveniles except substrate consists of sand and mud adjacent to rocky –shell hash areas. Defined late juvenile and adult stage EFH is located primarily in the central Bering Sea (Pribilofs, St. Mathews Island areas), with a very small region in Norton Sound.

9.2.26 Golden King Crab

Golden king crab in the Alaskan region has a wide distribution ranging from the BSAI to Southeast Alaska. They are present at great depths, 200 to 1000 meter deep, typically in regions of high relief such as inter Island passes (NMFS 2005). Defined EFH is restricted to the BSAI region and excludes the GOA. Life stage affects depth distribution. Legal males occur at about 274 to 639 meters, and females from 274 to 364 meters. Juveniles can be found at all depths within their depth range distribution. EFH characteristic for late juvenile crab ranges from upper slope (200 to 500 meters) to basins more than 3000 meters deep containing boulders, vertical walls, ledges and panicles in high relief with living substrate areas of the BSAI. EFH characteristics for adults are similar to juveniles except they extend into shallower outer shelf waters (100-200 meters) as well as regions greater than 3000 meters. Defined late juvenile and adult stage EFH is located in small areas primarily surrounding the Aleutian Islands, and scattered areas in the Bering Sea.

9.2.27 Tanner Crab

Tanner crab in Alaska are concentrated around the Pribilof Islands, just north of the Alaskan Peninsula, and in low abundance in the GOA (NMFS 2005). Defined EFH is restricted to the BSAI and excludes regions in the GOA. Mating occurs in January to

June and egg hatching from April to June. Larvae are pelagic in the 1 to 100 meters depth, and then settle to bottom areas of mud, 10 to 20 meters deep, in the summer. Late juveniles migrate offshore. EFH includes inner (0 to 50 meters) to outer (100 to 200 meters) continental shelf regions for both late juveniles and adults, wherever substrate is primarily mud, in the regions designated as EFH (NMFS 2005). Defined late juvenile and adult stage EFH is located primarily in a triangular shape region extending from a wide area just north of the Alaskan Peninsula in Bristol Bay to the northwest central Bering Sea (NMFS 2005).

9.2.28 Snow Crab

Snow Crab in Alaskan waters are found from the Arctic Ocean to the Bering Sea and do not extent to the GOA (NMFS 2005). They are most common at depths less than 200 meters. Immature crabs are more abundant at less than 80 meters depth. Mating occurs from January to June, with brooding likely occurs at depths greater than 50 meters. EFH characteristics for late juvenile and adult stages include inner (0 to 50 meters) to outer (100 to 200 meters) continental shelf regions throughout the BSAI where mainly mud bottom is present. Defined late juvenile and adult stage EFH is located primarily in a large central Bering Sea area surrounding the Pribilof Islands and St. Matthews Island, mostly well offshore.

9.2.29 Weathervane Scallop

Weathervane scallops can be present from intertidal to 300 meters, but highest abundance is 40 to 130 meters (NMFS 2005). They mature in 3 years and spawn from May to July by releasing eggs and sperm into the water. Larvae are pelagic for a month before settling to the bottom. The defined EFH of late juvenile and adult stage weathervane scallops extends to suitable depths from about the entrance of Icy Straits west of Juneau, to north just short of Prince William Sound and then again from the Cook Inlet entrance along the south region of the Alaskan Peninsula, with a small area extending into the Bering sea near the end of the Alaskan Peninsula. EFH habitat of late juveniles and adults are along the sea floor in the middle (50 to 100 meters) to outer (100 to 200 meters) shelf areas. Their distribution is generally elongated with the current flow direction lines (NMFS 2005). They are typically present over clay to gravel substrates. While they are capable of swimming they generally remain along sea floor depressions. Fertilization is external, with pelagic larvae drifting for a month before settling to the sea floor (NMFS 2005).

9.2.30 Salmon

There are five Pacific salmon species (pink, chum, sockeye, Chinook and coho salmon) that are present in Alaskan waters. They have broad distribution in Alaskan waters with some species found in nearly all potential marine or freshwater action areas. They are unique among the EFH species with EFH in the project area in being present in the freshwater, estuarine and marine environments. While each species has specific life history characteristics, several common characteristics are present among the species. They all deposit their eggs in freshwater or estuarine (some) environments, these eggs and early juveniles incubate within a gravel environment for several months. The juveniles emerge from gravel and spend days to years in mostly freshwater before entering estuarine and marine areas. They eventually move into the marine environment where they may rear for at least a year in regions that may be several hundred miles from where juveniles emerged from gravel. As they approach adult stage they all return to their natal freshwater source area to spawn once and die. So EFH in the overall potential action area may include any of the 6 life stage categories (freshwater eggs, freshwater larvae and juveniles, estuarine juveniles, marine juveniles, marine immature and maturing adults, and freshwater adults)(Table 8-4).

9.2.30.1 Pink Salmon

Pink salmon are the most common salmon species in Alaska and have freshwater distribution covering nearly the entire coastal areas. The EFH for pink salmon, within the potential project areas, includes adult spawning, juvenile freshwater rearing, estuarine juvenile, marine juvenile and marine immature and maturing adults (NMFS 2005). The estuarine EFH would be the mouth areas of streams from the mean high tide line to the salinity transition zone. All other marine life stage EFH could be included in the entire potential project area, as EFH habitat for this species extends from the mean higher tide line to the 200 nautical mile limit of the U.S. EEZ. This species is pelagic to a depth of about 200 meters. Pink salmon spawn in small streams within a few miles of the shore, or within the intertidal zone, or at the mouths of streams. Eggs are laid in stream gravels. After hatching salmon fry move downstream to the open ocean. Pink salmon stay close to the shore moving along beaches during their first summer feeding on plankton, insects and small fish. At about 1 year of age, pink salmon move offshore to ocean feeding Adult pink salmon return to their natal streams to spawn between June and mid-October. This species is pelagic to a depth of about 200 meters, and generally rears in ocean areas south of the limits of spawning streams (NMFS 2005).

9.2.30.2 Chum Salmon

Chum salmon have the widest distribution in the North Pacific Ocean of any salmon species (NMFS 2005). The EFH for chum salmon, within the potential action areas, includes adult spawning, juvenile freshwater rearing, estuarine juvenile, marine juvenile, and marine immature and maturing adults (NMFS 2005). The estuarine EFH would be the mouths of streams from the mean high tide line to the salinity transition zone. All other marine life stage EFH could be included in the entire potential action area, as EFH habitat for this species extends from the mean higher tide line to the 200 nautical mile limit of the U.S. EEZ. This species is pelagic to a depth of about 200 meters. Most chum salmon spawn in small streams within 100 miles of the ocean, or within the intertidal zone, but sometimes travel great distances up large rivers (e.g., Yukon River). Adults return to spawn between June and January, with earliest spawning occurring in the northern portion of their range. Eggs are laid in stream gravels or in some areas in intertidal zones, such as Prince William Sound (NMFS 2005). After hatching salmon fry move downstream to estuaries then into the open ocean. Estuaries are very important to chum salmon during the spring and summer (NMFS 2005).

9.2.30.3 Sockeye Salmon

Sockeye salmon have wide distribution within Alaskan waters, but are unique among salmon species in usually requiring a lake for early rearing. The EFH for sockeye salmon, within the potential project area, includes adult spawning, juvenile rearing, estuarine juvenile, marine juvenile and marine immature and maturing adults (NMFS 2005). The estuarine EFH includes the mouth areas of streams from the mean high tide line to the salinity transition zone. All other marine life stage EFH could be included in the potential project area, as EFH habitat for this species extends from the mean higher tide line to the 200 nautical mile limit of the U.S. EEZ. This species is pelagic to a depth of about 200 meters. Sockeye salmon spawn in stream systems with lakes, or on lake shoreline areas, during late summer or fall. After moving into lakes in the spring they typically rear in the limnetic zone. After one to 3 years in fresh water lakes the fry move downstream to the open ocean. During their first year in the ocean they generally stay in a narrow nearshore band until at least fall when they are suspected to move offshore (NMFS 2005).

9.2.30.4 Chinook Salmon

Chinook salmon, which are the largest of all salmon species, are usually most abundant in the largest river systems in Alaska. The EFH for Chinook salmon, within the potential action area, includes adult spawning, juvenile freshwater rearing, estuarine juvenile, marine juvenile and marine immature and maturing adults (NMFS 2005). The estuarine EFH would be the mouth areas of streams from the mean high tide line to the salinity transition zone. All other marine life stage EFH could be included in the entire potential project area, as EFH habitat for this species extends from the mean high tide line to the 200 nautical mile limit of the U.S. EEZ. This species is pelagic to a depth of about 200 meters. Chinook salmon spawn in small and large streams, but may include some of the longest migration of any salmon, over 2000 miles in some systems. Adults return to streams at age 2 to 7 years. They usually spawn in freshwater systems during late summer or early fall. Eggs are laid in stream gravels. Two forms of juvenile freshwater rearing life history are present for Chinook salmon. Juveniles that emerge and migrate to the ocean within weeks or a few months are called "ocean type", and have extensive estuary rearing. Those juveniles that rear in freshwater for typically 1 to 3 years before migrating to the ocean in the spring are called "stream type", and spend less time in estuarine waters. Stream-type Chinook salmon are dominant in Alaska. Chinook salmon tend to stay deeper in the water column than other salmon, typically deeper than 30 meters, while other species tend to stay in the upper 20 meters (NMFS 2005).

9.2.30.5 Coho Salmon

Coho salmon, which use the broadest environment of any salmon, are present in many streams south of Point Hope Alaska, including the Aleutian Islands (NMFS 2005). The EFH for coho salmon, within the potential project areas, includes adult spawning, juvenile freshwater rearing, estuarine juvenile, marine juvenile and marine immature and maturing adults (NMFS 2005). The estuarine EFH would be the mouth areas of streams from the mean high tide line to the salinity transition zone. All other marine life stage EFH could be included in the entire potential action area, as EFH habitat for this species extends from the mean higher tide line to the 200 nautical mile limit of the U.S. EEZ. This species is pelagic to a depth of about 200 meters. Coho salmon spawn in small streams. They are typically the last salmon to arrive at the spawning areas, generally from July to December (NMFS 2005). Eggs are laid in stream gravels. After one to 3 years in fresh water ponds, lakes, and stream pools the salmon smolts move downstream to the open ocean. Some coho salmon may use estuarine areas in the summer of their first year in the ocean, but migrate upstream to overwinter in freshwater (NMFS 2005).

9.3 EFFECTS OF THE PROPOSED ACTION

9.3.1 Potential effects of action on BSAI groundfish EFH

BSAI groundfish EFH is found within the action area, including federal waters 3 nautical miles (nm) or more from shoreline. Visual inspection of NOAA EFH maps (http://www.fakr.noaa.gov/habitat/efh.htm; accessed May 2006) and text descriptions of EFH indicate that EFH for multiple life stages of many BSAI groundfish are within the potential action area for offshore seafood processing facilities. The coastal waters of southeastern Alaska, the southern coast of the Kenai peninsula, waters of the Shelikof Strait, coastal waters surrounding Kodiak Island, coastal waters surrounding the Alaska Peninsula and Aleutian Islands, and some coastal waters of the Bristol Bay area are designated as EFH for one or more BSAI groundfish, including the following: walleye pollock, pacific cod, Greenland turbot, arrowtooth flounder, rock sole, Alaska plaice, rex sole, Dover sole, flathead sole, and yelloweye rockfish. No information was found on the geographic distribution of EFH for some BSAI groundfish, including forage fish complex or octopus.

The following description of potential adverse effects from seafood processing discharges is provided in Appendix G to the Alaska Essential Fish Habitat Environmental Impact Statement (NOAA 2005)

Offshore seafood processing wastes consist of biodegradable materials that contain high concentrations of soluble organic material. 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.

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). This permit covers offshore seafood processors 3 nm or more from shore and requires discharges to occur in areas with adequate flushing.

Processors discharging fish waste are required to adhere to the technology based and water quality based limits outlined in the NPDES permits. 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 EFH from particle suspension (Council 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.

Seafood discharge piles can alter benthic habitat, reduce locally associated invertebrate populations and lower dissolved oxygen levels in overlying waters. Impacts from accumulated processing wastes are not limited to the area covered by the waste piles. Severe anoxic and reducing conditions occur adjacent to effluent piles (EPA 1979). Examples of localized damage to benthic environment include several acres of bottom driven anoxia by piles of decomposing waste up to 26 feet (7.9 meters) deep. Juvenile and adult stages of flatfish are drawn to these areas for food sources. One effect of this attraction may lead to increased predation on juvenile fish species by other flatfishes, diving seabirds and marine mammals drawn to the food source (Council 1999). The proposed permit covers offshore seafood processors which includes mobile vessels that are located in high tidal areas with good flushing which allows dispersion and dilution of the seafood discharges. In addition, ZODs are not permitted in this permit. Therefore, the potential for accumulated seafood wastes is minimal.

Scum and foam from seafood waste deposits can also occur on the water surface 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 takes the form of a fine gel or slime that can concentrate on surface waters and move onshore to cover intertidal areas. However, this permit requires discharge in high tidal areas with adequate flushing which should minimize the potential for these impacts to occur.

A number of important species including, walleye pollock, Pacific cod, rock sole, and sand lance release demersal eggs. As with other types of fish eggs, demersal eggs require oxygen for development. Seafood waste discharges resulting in waste piles are typically anoxic due to decay and decomposition of the waste. Thus, demersal eggs could be smothered if located beneath a discharge. Such smothering of demersal eggs could have a substantial adverse impact on these demersal species and other aquatic organisms that prey upon these fish. Seafood wastes that are discharged during spawning and egg production periods have the most potential to adversely affect these species. A number of studies have been conducted regarding effects of suspended solids on egg mortality, but the effect of waste deposition on egg mortality is not well documented (USEPA 1984b). In particular, 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 (e.g., 0.4 in) 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 the ZOD (e.g., Germano & Associates, 2004). As stated earlier, this permit covers vessels located 3 nm or more in high tidal areas with good flushing, which should minimize the potential for waste piles and smothering of demersal eggs.

For context, Alaska has approximately 47,000 miles of coastal marine shoreline, and the surface area of coastal bays and estuaries alone in Alaska is 33,211 square miles (ADEC, 2005). The potential aggregate area of all offshore seafood processor facilities in Alaska waters in the action area is unlikely to occupy more than a small fraction of the total offshore area.

The revised offshore seafood processing permit may reduce, but does not mandate avoidance of, adverse effects from authorized offshore seafood processing to EFH. The mechanisms described in the preceding paragraphs, together with an understanding of the characteristics of offshore seafood processors that have been authorized in Alaska, suggests that there is potential for offshore seafood processor discharge to adversely affect EFH.

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 BSAI groundfish species' EFH and the limited aggregate size of offshore seafood processor discharges relative to other available offshore water. In addition, some BSAI groundfish may have the ability to avoid areas where seafood processing discharges are located. Secondly, in areas with strong currents and high tidal ranges, waste materials disperse rapidly. Since the offshore seafood processors covered under this permit will be at least 3 nm from shore, the seafood processing discharge would be in areas with strong currents and high tidal ranges and would dissipate rapidly not allowing for accumulation of the seafood discharge.

Despite these factors, however, EPA is unable to rule out the possibility that the proposed approval of the revised offshore seafood processor permit will adversely affect BSAI groundfish EFH. The State's revised offshore seafood processor permit does not set forth a procedure for (a) assessing potential impacts of a permitting action on EFH or, in the event of a potential for adverse impact, (b) procedures or requirements for avoiding or otherwise addressing that impact.

Therefore, EPA has determined that the offshore seafood processor permit **may adversely affect** BSAI groundfish EFH.

9.3.2 Potential Effects of Action on GOA Groundfish EFH

GOA groundfish EFH is found within the action area, which is defined as federal waters 3 nm or more from shore. Visual inspection of NOAA EFH maps (http://www.fakr.noaa.gov/habitat/efh.htm; accessed July 2006) and text descriptions of EFH indicate that EFH for multiple life stages of many GOA groundfish are within the potential action area. For example, EFH has been defined for species including Pacific cod, arrowtooth flounder, Dover sole, flathead sole, northern rockfish, dusky rockfish, and Atka mackerel in coastal waters including those around the Aleutian Islands, Kodiak Island, and the Shelikof Strait.

For the same reasons explained in detail in Section 9.3.1, EPA has determined that the approval of the offshore seafood processor permit **may adversely affect** GOA groundfish EFH.

9.3.3. Potential Effects of Action on BSAI King and Tanner Crab EFH

BSAI King and Tanner crab EFH is found within the action area, which is defined as federal waters 3 nm or more from shore. Visual inspection of NOAA EFH maps (http://www.fakr.noaa.gov/habitat/efh.htm; accessed July 2006) and text descriptions of EFH indicate that EFH for BSAI King and Tanner crab is found within the potential action area. For example, EFH has been defined for blue king crab, red king crab, and Tanner crab in coastal waters including those around the Aleutian Islands, Pribilof Islands, and St. Matthew's Island.

Tanner and King crabs, which feed on a wide variety of organisms including worms, clams, mussels, snails, crabs, other crustaceans, and fish parts, may suffer adverse effects from loss of prey species due to burial from seafood processor discharge.

The revised offshore seafood processor permit may reduce, but does not mandate avoidance of, adverse effects from authorized offshore seafood processing to EFH. Indeed, the potential for adverse effects to EFH within offshore seafood processing facilities authorized by DEC has been recognized elsewhere.

EPA expects that these effects, while probable, 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 BSAI King and Tanner crabs' EFH and the limited aggregate size of offshore seafood discharges relative to other available offshore water. Secondly, in areas with strong currents and high tidal ranges, waste materials disperse rapidly.

Since the offshore seafood processors covered under this permit will be at least 3 nm from shore, the seafood processing discharge would be in areas with strong currents and high tidal ranges and would dissipate rapidly not allowing for accumulation of the seafood discharge.

Despite these factors, however, EPA is unable to rule out the possibility that the proposed approval of the offshore seafood processor permit will adversely affect BSAI crab EFH. The revised offshore seafood processor permit does not set forth a procedure for (a) assessing potential impacts of a permitting action on EFH or, in the event of a potential for adverse impact, (b) procedures or requirements for avoiding or otherwise addressing that impact.

Therefore, EPA has determined that the offshore seafood processor permit **may adversely affect** BSAI crab EFH.

9.3.4 Potential Effects of Action on Alaska Scallop EFH

Alaska scallop EFH is found within the action area. Visual inspection of NOAA EFH maps (http://www.fakr.noaa.gov/habitat/efh.htm; accessed July 2006) and text descriptions of EFH suggests that much of the scallop EFH may lie within the action area.

For the same reasons explained in detail in Section 9.3.1, EPA has determined that the proposed approval of the offshore seafood processor permit **may adversely affect** Alaska scallop EFH.

9.3.5 Potential Effects of Action on Alaska Stocks of Pacific Salmon EFH

EFH for Alaska stocks of Pacific salmon is also found within the action area. As described in Section 9.2.30, the five FMP-managed Pacific salmon have broad distribution in Alaskan waters with some species found in nearly all potential marine action areas. EFH for the FMP-managed Alaska stocks of Pacific salmon are present in the estuarine and marine environments. EFH in the potential action area may include any of the 6 life stage categories (freshwater eggs, freshwater larvae and juveniles, estuarine juveniles, marine juveniles, marine immature and maturing adults, and freshwater adults).

For the same reasons explained in detail in Section 9.3.1, EPA has determined that the proposed approval of offshore seafood processor permit **may adversely affect** EFH for Alaska stocks of Pacific salmon.

9.4 PROPOSED MITIGATION

As described in Section 9.3.1-9.3.5, EPA's proposed action may adversely affect BSAI groundfish, BSAI crab, GOA groundfish, Alaska scallop and Alaska stocks of Pacific salmon EFH. These adverse effects relate to physical, chemical, and biological changes to EFH within areas of offshore seafood processor discharge.

EPA has included the following list of conservation measures that are identified in Appendix G of the Alaska Essential Fish Habitat Environmental Impact Statement

(NMFS 2005). This is a potential approach that could identify, prevent, and/or mitigate any site-specific adverse effects of offshore seafood processor discharge authorized under Alaska's proposed NPDES permit.

The proposed conservation measures are as follows:

1) To the maximum extent practicable, base effluent limitations on site-specific water quality parameters including water depth, current velocity, tidal exchange, salinity, temperature, pH, etc. This permit requires that offshore processors discharge in 60 feet depths (MLLW) in areas of good flushing to avoid potential impacts to species.
2) To the maximum extent practicable, avoid the practice of discharging untreated solid and liquid waste directly into the environment. Encourage the use of secondary or wastewater treatment systems where possible. This permit requires that sanitary wastes are treated with a system that meets the applicable U.S. Coast Guard (USCG) pollution control standards in effect [33 CFR 159: "Marine sanitation devices"].
3) Minimization of new ZODs and reduction of footprints of existing ZODs. The proposed permit does not allow for ZODs. The current proposed permit is for mobile offshore facilities located in federal waters 3 nm or more from shore. According to the requirements of the permit, these processor vessels are expected to be in high tidal areas with good flushing so accumulation of seafood deposits on the seafloor is expected to be minimal.
4) Control stickwater by physical or chemical methods. Often, stickwater is collected and evaporated to produce condensed fish solubles which can be used as an attractant for fish meal rather than eliminating stickwater through processor effluent.
5) Promote sound fish waste management through a combination of fish-cleaning restrictions, public education and proper disposal of fish waste.
6) Encourage the alternative use of fish processing wastes (e.g. fertilizer for agriculture and animal feed). While some of the vessels covered under this permit have fish meal plants on board, which help minimize the disposal of fish processing wastes, not many of the processors can add them to vessels that do not have them already due to costs and ability of boats to handle the heavy equipment.
7) Explore options for additional research to minimize effects from seafood processor effluent. Look at potential to update technology-based effluent guidelines. The permit requires daily inspections of the grinder system and seafood wastes to ensure that wastes are reducing the seafood to 0.5 inches in size. The permit also requires daily sea surface inspections to ensure that residues and mats are not forming on the sea surface. This should further inform the potential effects seafood processor influent is having on EFH species.
8) Locate new plants outside rearing and nursery habitat. As the majority of offshore processors are moving vessels 3 nm or more from shore it is expected that most of the vessels will discharge outside rearing and nursery habitat. Biological and chemical changes to the sites should be minimal as the offshore processor vessels are in areas of high tidal activity which allow for dispersion and dilution of the discharges from the vessels.
9) Consider cumulative impacts of the discharges as well as other discharges into receiving waters and assure that the permittee is using state-of-the-art technology for collecting monitoring data for analyses. The current permit requires quarterly monitoring of both the influent and effluent for metals including arsenic, copper, cadmium, lead, mercury, nickel, selenium, silver and zinc for a minimum of two

years. This monitoring along with daily monitoring of the sea surface should provide additional information on cumulative impacts of offshore discharges along with other discharges into receiving water.

9.5 CONCLUSIONS BY EFH

Several specific mechanisms by which offshore seafood processors could impact aspects of essential fish habitat have been described in Section 9.1. For example, various fish and crab species have a diet composed mainly of small benthic invertebrates. Impacts from accumulated processing wastes can alter benthic habitat, reduce locally associated invertebrate populations and lower dissolved oxygen levels in overlying waters. This could result in reduced prey availability or loss of habitat for some of the EFH managed species. A number of important species including, walleye pollock, Pacific cod, rock sole, and sand lance release demersal eggs. Seafood waste discharges resulting in waste piles are typically anoxic due to decay and decomposition of the waste which could affect the viability of the demersal eggs. In addition, demersal eggs could be smothered if located beneath a discharge.

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 EFH species' habitat and the limited aggregate size of offshore seafood processor discharges relative to other available coastal water. In addition, some EFH species may have the ability to avoid areas where seafood processing discharges are located. Secondly, in areas with strong currents and high tidal ranges, waste materials disperse rapidly. Since the offshore seafood processors covered under this permit will be 3 nm from shore, the seafood processing discharge would be in areas with strong currents and high tidal ranges and would dissipate rapidly preventing accumulation of the seafood discharge in waste piles.

Due to the possibility that adverse effects on EFH may arise from offshore seafood processors, and because the provisions in the regulation do not ensure that adverse effects to EFH will be avoided, ***EPA has determined that EPA's proposed approval of the General NPDES permit for offshore seafood processors in Alaska may adversely affect essential fish habitat.***

9.6 REFERENCES

NMFS. 2005. Final Environmental Impact Statement for Essential Fish Habitat Identification and Conservation in Alaska (Chapter 3). National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Alaska Region. Available at http://www.fakr.noaa.gov/habitat/seis/efheis.htm.