UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
P.O. Box 21668
Juneau, Alaska 99802-1668

May 15, 2015

Rear Admiral Daniel Abel
District Commander
United States Coast Guard
District 17, Alaska
709 W. 9th Street
Juneau, AK 99803

Mr. Dennis McLerran
Regional Administrator, Region 10
United States Environmental Protection Agency
1200 6th Avenue, Suite 900
Seattle, WA 98101

Re: Proposed Alaska Unified Response Plan, NMFS# AKR-2014-9361

Dear Rear Admiral Abel and Mr. McLerran;

Attached is the National Marine Fisheries Service (NMFS) Programmatic Biological Opinion on the *Alaska Federal/State Preparedness Plan for Response to Oil and Hazardous Substance Discharges/Releases* (Unified Plan). The Unified Plan provides a strategy for a coordinated, multi-jurisdictional emergency response to a discharge of oil or hazardous substances within the boundaries of the State of Alaska and its surrounding waters.

NMFS determined that the Unified Plan, as described, is not likely to jeopardize the continued existence of any ESA-listed species, nor will it destroy or adversely modify any designated critical habitat. We concur with your determination that this action may affect, and is likely to adversely affect Steller sea lions in the western Distinct Population Segment (DPS), humpback whales, Cook Inlet beluga whales, ringed seals, Beringia bearded seals, bowhead whales, 6 Chinook salmon ESUs, one coho salmon ESU, and critical habitat for Steller sea lions and Cook Inlet beluga whales; and may affect, but is not likely to adversely affect North Pacific right whales, fin whales, blue whales, sei whales, sperm whales, Western North Pacific gray whales, 4 ESUs of steelhead trout, and critical habitat for North Pacific right whales.

In formulating this opinion, NMFS used the best available information, including: relevant published research, traditional knowledge of Alaska Natives, stock assessment reports, status reviews, and information provided by the actions agencies, as well as other sources.

Thank you for your commitment to the completion of this consultation. If you have any questions about the attached Biological Opinion please contact Sadie Wright at sadie.wright@noaa.gov or call (907) 586-7630.

Sincerely,

James W. Balsiger, Ph.D.
Administrator, Alaska Region

Endangered Species Act
Section 7 Consultation - Biological Opinion

Agency:	United States Coast Guard, District 17 United States Environmental Protection Agency, Region 10
Activities Considered:	Alaska Federal/State Preparedness Plan for Response to Oil & Hazardous Substance Discharges/Releases (Unified Plan)
Consultation By:	National Marine Fisheries Service (NMFS) Alaska Region

Date Issued: MAY 15, 2015

Approved by:

For James W. Balsiger
Administrator, Alaska Region
NMFS

ESA-Listed Species	**Status**	**Is Action Likely to Adversely Affect Species or Critical Habitat?**	**Is Action Likely To Jeopardize the Species?**	**Is Action Likely To Destroy or Adversely Modify Critical Habitat?**
Bowhead Whale *Balaena mysticetus*	Endangered	Yes	No	N/A
Fin Whale *Balaenoptera physalus*	Endangered	No	No	N/A
Humpback Whale *Megaptera novaeangliae*	Endangered	Yes	No	N/A
North Pacific Right Whale *Eubalaena japonica*	Endangered	No	No	No
Ringed Seal, Arctic subsp. *Phoca hispida hispida*	Threatened	Yes	No	N/A
Bearded Seal, Beringia DPS *Erignathus barbatus barbatus*	Threatened*	Yes	No	N/A
Steller Sea Lion, Western DPS *Eumetopias jubatus*	Endangered	Yes	No	No
Blue Whale *Balaenoptera musculus*	Endangered	No	No	N/A
Cook Inlet Beluga Whale *Delphinapterus leucas*	Endangered	Yes	No	No
Sei Whale *Balaenoptera borealis*	Endangered	No	No	N/A
Sperm Whale *Physeter macrocephalus*	Endangered	No	No	N/A
Western North Pacific Gray Whale *Eschrichtius robustus*	Endangered	No	No	N/A
Chinook Salmon *Oncorhynchus tshawytscha*	Endangered/ Threatened	Yes	No	No
Coho Salmon *Oncorhynchus kisutch*	Threatened	Yes	No	No
Steelhead Trout *Oncorhynchus mykiss*	Threatened	No	No	No

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* - On July 25, 2014, the U.S. District Court for the District of Alaska issued a memorandum decision in a lawsuit challenging the listing of bearded seals under the ESA (Alaska Oil and Gas Association v. Pritzker, Case No. 4:13-cv-00018-RPB). The decision vacated NMFS's listing of the Beringia DPS of bearded seals as a threatened species. NMFS is appealing that decision. In the interim, our Biological Opinions under section 7(a)(2) of the ESA will continue to address effects to bearded seals so that action agencies have the benefit of NMFS's analysis of the consequences of proposed actions on this DPS, even though the listing of this species is not in effect.

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ABBREVIATIONS AND TERMS

ACC	Alaska Coastal Current
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
AKR	Alaska Region
ANSC	Aleutian North Slope Current
AO	Arctic Oscillation
ARRT	Alaska Regional Response Team
BA	Biological Assessment
BMP	Best Management Practices
BSC	Bering Sea Current
CFR	Code of Federal Regulations
CWA	Clean Water Act
dB	Decibels
DNA	Deoxyribonucleic Acid
DOC	United States Department of Commerce
DOI	United States Department of the Interior
DPS	Distinct Population Segment
EEZ	Exclusive Economic Zone
ENSO	El Niño Southern Oscillation
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
EU	Environmental Unit
FOSC	Federal On Scene Coordinator
GOA	Gulf of Alaska
GRS	Geographic Response Strategy
IAP	Incident Action Plan
ICS	Incident Command System
IPCC	Intergovernmental Panel on Climate Change
ITS	Incidental Take Statement
MMPA	Marine Mammal Protection Act

MMS	Minerals Management Service
MOA	Memorandum of Agreement
NMFS	National Marine Fisheries Service
NCP	National Contingency Plan
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
NPDES	National Pollution Discharge Elimination System
NPGO	North Pacific Gyre Oscillation
NPI	North Pacific Index
NPO	North Pacific Oscillation
NRC	National Research Council
OCH	Oscillating Control Hypothesis
OPA	Oil Pollution Act of 1990
PAH	Polycyclic Aromatic Hydrocarbon
PCEs	Primary Constituent Elements
PDO	Pacific Decadal Oscillation
PNA	Pacific-North America Pattern
PRD	Protected Resources Division
PSO	Protected Species Observer
RP	Responsible Party
SCP	Subarea Contingency Plan
SMART	Special Monitoring of Applied Response Technologies
SPLASH	Structure of Populations, Levels of Abundance, and Status of Humpback
SSC	Scientific Support Coordinator
SST	Sea Surface Temperature
USCG	United States Coast Guard
USFWS	United States Fish and Wildlife Service
VGP	Vessel General Permit

EXECUTIVE SUMMARY

The United States Coast Guard (USCG) and the United States Environmental Protection Agency (EPA) initiated consultation pursuant to section 7 of the Endangered Species Act (ESA) on February 7, 2014. The National Marine Fisheries Service (NMFS) received letters from USCG and EPA formally requesting consultation on the effects of activities associated with the *Alaska Federal/State Preparedness Plan for Response to Oil & Hazardous Substance Discharge/Releases (Unified Plan)* on all threatened and endangered species under the authority of NMFS in compliance with section 7(a)(2) of the ESA. The letters were attached to a Biological Assessment (BA) on the Federal action submitted jointly to NMFS by USCG and EPA.

The term "action area" means "all areas to be affected directly or indirectly by the Federal action, and not merely the immediate area involved in the action" (50 CFR §402.02(d)). As such the action area for this federal action includes all waters from the coast of Alaska extending 20 miles beyond the Exclusive Economic Zone (EEZ; extending 200 miles from land), and any coastal land where response activities can potentially impact ESA-listed species included in this consultation.

This document is the product of a consultation pursuant to Section 7(a)(2) of the ESA and implementing regulations found at 50 Code of Federal Regulations (CFR) Part 402. This consultation considers whether the effects of these actions are likely to jeopardize the continued existence of Steller sea lions in the western Distinct Population Segment (DPS), humpback whales, Cook Inlet beluga whales, North Pacific right whales, fin whales, blue whales, ringed seals, Beringia bearded seals, bowhead whales, sei whales, sperm whales, Western North Pacific gray whales, 6 Chinook salmon DPSs, coho salmon, and 4 DPSs of steelhead trout.

Listed species within the action area may be affected by several direct and indirect factors as a result of implementing the proposed action: the potential for collisions between transiting vessels and whales; harassment or displacement of whales, seals, and sea lions by vessel operations; disturbance of whale, seal, and sea lion prey vessel activity which may cause whales, seals, and sea lions to redistribute; an increase in acoustic impacts from vessel noise which could impede whale, seal, and sea lion communication or damage or interfere with hearing; the disruption and alteration of normal feeding, resting and other critical behaviors; habitat modification including prey disruption; increased exposure to oil and oil residue due to use of chemical dispersants and *in situ* burning; and ultimately, reduced fitness, leading potentially to population level changes.

Regulations that implement section 7(b)(2) of the ESA require biological opinions to evaluate the direct and indirect effects of federal actions to determine if it would be reasonable to expect them to appreciably reduce listed species' likelihood of surviving and recovering in the wild by reducing their reproduction, numbers, or distribution. Section 7 of the ESA and its implementing regulations also require biological opinions to determine if federal actions would destroy or adversely modify critical habitat.

Jeopardy analyses usually focus on the effects of an action on a species' population dynamics. A conclusion of "jeopardy" for an action means that the action could reasonably be expected to reduce appreciably the likelihood of both the survival and recovery of a listed species.

After reviewing the current status of all of the ESA-listed species listed above, NMFS agrees with the USCG/EPA determinations that North Pacific right whales, blue whales, sei whales, sperm whales, fin whales, Western North Pacific gray whales, and steelhead trout are not likely to be adversely affected by the actions directed by the Unified Plan. In addition, NMFS agrees that bowhead whales, ringed seals, bearded seals, Western DPS Steller sea lions, Cook Inlet beluga whales, humpback whales, Chinook salmon, and coho salmon are likely to be affected.

Adverse modification analyses usually focus on the effects of an action on the physical, chemical, and biological resources that support a population. NMFS has concluded that adverse modification is not expected to the critical habitat of Cook Inlet beluga whales, Steller sea lions, or North Pacific right whales.

1.0 PURPOSE AND CONSULTATION HISTORY

1.1 PURPOSE

The Endangered Species Act of 1973 (ESA or Act) (16 U.S.C. 1531-1544) establishes a national program for the conservation of threatened and endangered species of fish, wildlife, and plants and the habitat on which they depend. Section 7(a)(2) of the ESA, 16 U.S.C. § 1536(a)(2), requires that each federal agency to ensure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered species or threatened species, or destroy or adversely modify critical habitat of such species. When the action of a federal agency may adversely affect a protected species, that agency (i.e., the "action" agency) is required to consult with either the National Marine Fisheries Service (NMFS) or the U.S. Fish and Wildlife Service (FWS), depending upon the protected species that may be affected. For the actions described in this opinion, the lead action agencies representing the Alaska Regional Response Team (ARRT) are the United States Coast Guard (USCG) and the United States Environmental Protection Agency (EPA), and the consulting agency is the Alaska Region, NMFS.

The USCG and EPA requested formal consultation to address potential impacts of oil spill response decisions and activities to listed marine species. The purpose of this Biological Opinion, therefore, is to fulfill the section 7 requirements for consultation on the marine components of the *Alaska Federal/State Preparedness Plan for Response to Oil & Hazardous Substances Discharges and Releases* (Unified Plan).

This Biological Opinion presents NMFS's review of the status of the listed species considered in this consultation, the condition of the critical habitat, the environmental baseline for the action area, all the potential effects and exposure of the action as proposed, and cumulative effects (50 CFR 402.14 (g)). For the jeopardy analysis, NMFS analyzes those combined factors to conclude whether the proposed action is likely to appreciably reduce the likelihood of the survival or recovery of the affected listed species.

The critical habitat analysis determines whether the proposed action will destroy or adversely modify critical habitat for listed species by examining any change in the conservation value of the essential features of critical habitat. This analysis does not rely on the regulatory definition of "adverse modification or destruction" of critical habitat invalidated by the 9th Circuit Court of Appeals (Gifford Pinchot Task Force et al. v. U.S. Fish and Wildlife Service, 378 F.3d 1059). Instead, this analysis focuses on statutory provisions of the ESA, including those in Section 3 that define "critical habitat" and "conservation," Section 4 that describe the designation process, and Section 7 that set forth the substantive protections and procedural aspects of consultation.

If the action under consideration is likely to jeopardize the continued existence of an ESA-listed species, or destroy or adversely modify critical habitat, NMFS must identify any reasonable and prudent alternatives for the action that avoid jeopardy or destruction or adverse modification of critical habitat and meet other regulatory requirements (50 CFR 402.02).

1.2 CONSULTATION HISTORY

The USCG/EPA initiated discussion with NMFS regarding ESA Section 7 consultation for the Unified Plan in December 2010, and collaborated to form an interagency working group for this project. On October 17, 2011, the interagency working group met face-to-face for an initial organizational meeting at the EPA office in Anchorage, AK. This meeting included representatives from the USCG, EPA, USFWS, NMFS, and contractors hired by the USCG and EPA to draft the Biological Assessment. One outcome of this initial meeting was to establish monthly teleconferences for the group.

NMFS received hard copies of the final Biological Assessment (BA) from the USCG and EPA on February 7, 2014 (dated January 23, 2014), and began reviewing the submission for completion. On April 4, 2014 the USCG and EPA sent NMFS via email the revised Draft Dispersant Use Plan which is a component of the Unified Plan. In December 2014, the USCG and EPA notified NMFS that they did not want to include the sub-surface application of dispersants, although mentioned in the Draft Dispersant Use Plan, in the section 7 consultation. Only surface application dispersant methods will be included in this consultation and Biological Opinion (USCG and EPA 2015). On February 17, 2015 the USCG sent NMFS via email final revisions to the Draft Dispersant Plan including avoidance areas that removed North Pacific right whale critical habitat from the Preauthorization Area, where dispersants can be applied without incident-specific approval.

2.0 DESCRIPTION OF THE PROPOSED ACTION

2.1 ACTION AREA

"Action areas" are defined as "all areas to be affected directly or indirectly by the Federal action, and not merely the immediate area involved in the action" (50 CFR §402.02(d)). The action area considered in this consultation is 1) all State and federal marine waters within the EEZ (U.S. Exclusive Economic Zone) along Alaska's coast (low water line to 200 nautical miles from shore), 2) a 20-mile strip of ocean along the EEZ boundary extending into international waters that may be impacted by oil spill response activities within the EEZ, and 3) areas along the coastline that may have terrestrial response activities that impact marine waters (e.g., noise, runoff) (Figure 1).

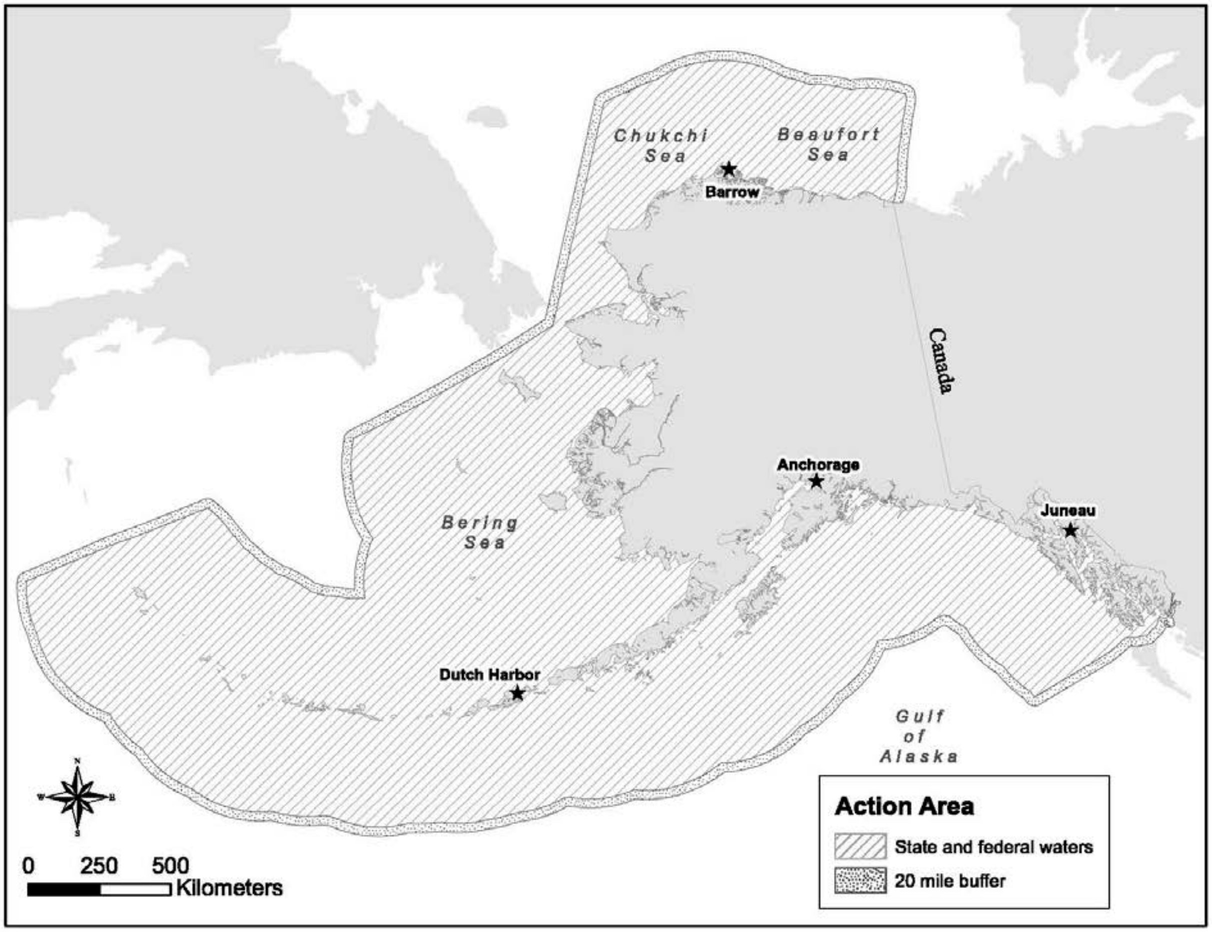

Figure 1. Map of Alaska showing the action area considered for the activities described by the USCG and EPA for this Biological Opinion.

NMFS determined that dispersant use would likely have the largest potential sphere of impact. Dispersants applied sub-surface during the Deepwater Horizon Oil Spill were detected at measureable levels 300 kilometers from the application site (Kujawinski et al. 2011); however, we expect the detectable dispersant plume to be less than that in Alaska under the Unified Plan for several reasons. First, the primary purpose of dispersants is to prevent oiling of the shorelines, so we would expect dispersants to primarily be used relatively nearshore when wind and currents are directing the oil plume towards shore. If the wind or current shifted, we expect dispersant use would be halted (i.e., we do not expect chemical dispersants to be used at the far edge of the EEZ when wind and currents are directing dispersants offshore into international waters). Second, the distance referenced above was for sub-sea dispersant use, which is not an approved use being evaluated for this consultation and Biological Opinion. Sub-surface dispersant use would lead to a more extensive dispersed oil footprint than surface dispersant application.

The Unified Plan is designed to be implemented only in State of Alaska waters (extending 3 miles out from shoreline), and the Alaska EEZ, which consists of marine waters extending from the low water line on shore to 200 nautical miles from the coast of Alaska. Any response activities that occur in international waters are not part of this consultation and Biological Opinion. Potential effects of response activities within the EEZ on international waters are expected to be captured in the 20-mile buffer described above.

2.2 PROPOSED ACTION

The proposed action considered in this Biological Opinion includes the oil and hazardous substance discharge responses authorized and conducted under the Unified Plan. The Unified Plan describes the decision-making processes that direct oil spill response in Alaska. Major components of the activities that may be authorized or conducted to respond to oil spills in Alaska are as follows:

Potential Response Action	Description of Response Action
Mechanical countermeasures	Deflection and containment phase: • Booming • Constructing barriers, dams, pits, and trenches • Culvert blocking
	Recovery phase: • Skimming/Vacuuming • Sorption

	Removal/cleanup phase: • Flushing and flooding • Steam cleaning and sandblasting • Removing contaminated soil, sediment, vegetation, or natural debris
Non-mechanical countermeasures and monitoring	• Application of approved chemical dispersants by vessel or aircraft • *In situ* burning • Application of other chemical agents (e.g., solidifiers and fire foam) • Application of biodegradative organisms or nutrient stimulants to enhance biodegradation • Required real-time efficacy monitoring with specialized equipment
Tracking and surveillance	• The use of aircraft, vessels, all-terrain vehicles, or heavy machinery • Installation of buoys • Sample collection
Waste management	• Waste handling and storage • Waste transport • Waste treatment and/or disposal • Decontamination
Wildlife protection	• Recovery of contaminated carcasses to prevent contamination of other wildlife • Wildlife deterrence (i.e., hazing) • Pre-emptive capture and relocation of uncontaminated wildlife • Capture, treatment, and release of contaminated wildlife • Strategic avoidance
Natural attenuation	No action; allow affected habitat to recover naturally and monitor results

2.2.1 Mechanical Countermeasures

Mechanical countermeasures are primary response actions that are intended to deflect, exclude, or contain oil or other spilled material before it can further impact ecological and cultural resources.

Deflection and Containment

Deflection or containment actions may involve deploying booms or constructing structures, such as earthen berms, on land to contain and collect spilled material. In upland environments, the placement and configuration of controls is often based on detailed drainage patterns and topography. In coastal environments, the mapping or modeling of winds, currents, and tidal patterns, in conjunction with real-time observations, supports the placement and configuration of booms and sorbents.

Booming

A boom is typically a flexible floating barrier that is used to divert (either into or away from an area) or contain buoyant spilled materials in aquatic environments (i.e., open water, nearshore, rivers, and lakes). Fire booms are used to concentrate spilled oil during an *in situ* burn. Oil spill containment booms generally have five operating components—flotation chamber, freeboard, skirt, tension member, and ballast. The overall height of the boom is divided between the freeboard (the portion above the surface of the water) and the skirt (the portion below the water surface). Boom heights range from approximately 6 inches to over 90 inches depending on environmental conditions. Flotation attached to the freeboard, and ballast (e.g., chain, weights) attached to the skirt, enable the boom to float upright in the water. Boom is typically made up of 50-foot sections and can be connected to form longer booms. Configurations vary according to the site-specific conditions and purpose (e.g., containment versus deflection). Deployment typically involves the use of one or more large vessels and/or small work boats with associated crew(s). Shoreside workers and heavy machinery on barges or piers may also be used if boom ends are anchored onshore. In open water, booms are typically deployed between two vessels in order to concentrate the spilled substance or oil slick for recovery actions (e.g., skimming).

The use of defensive or containment booms is one of the first response actions called for in geographic response strategies under the Unified Plan. Boom designs are specific to the environment in which they will be used; however, booms are less effective in conditions of rough water, high winds, fast currents, or broken ice (Stevens and Aurand 2008, NOAA 2010).

Booms require frequent tending and adjustment to stay in position over the course of their use and thus require the periodic or continuous presence of a work vessel (or other equipment) and crew to be effective.

Constructing Barriers, Dams, Pits, and Trenches

Filter fences, berms, dams, pits, and trenches are used to divert or contain spilled materials in upland, riparian, or sea ice environments. These physical barriers are typically used in conjunction with skimming or other recovery techniques (e.g., sorbents, vacuuming).

The construction of these physical structures typically requires the use of heavy machinery (hand construction is possible, depending on location) to install man-made materials (e.g., filter fences, sand bags, air- or water-filled seal booms) or place natural substrates (e.g., soil, snow, ice rubble). If water flow from a bermed area is necessary, an underflow culvert or overflow weir may be included in the construction of a berm or dam. There is also activity associated with construction as equipment and personnel are mobilized to and from the site (air, boat, or land transportation to the site).

Culvert Blocking

Open culverts present a potential route for spilled material to enter otherwise unaffected areas. In order to eliminate this threat, culverts may be blocked with a temporary or permanent fixture (e.g., plywood, plug, plastic sheeting, sandbags). Culvert blocking may also be achieved through the use of deflection booming (as discussed above in the description of booming) near the culvert.

Recovery

The recovery of spilled oil is often an important component of an oil spill response action and is typically carried out in conjunction with containment, diversion, deflection, and/or removal actions. In the case of uncontaminated petroleum products, recovered material is reprocessed and refined for commercial use. Several technologies or processes, including skimmers, vacuums, sorbent materials, and manual or mechanical removal, may be used in recovery, depending on the environment in which the spill occurred, the nature and amount of the material spilled, and the behavior of the material following release. Highly refined petroleum products such as gasoline, diesel, and kerosene tend to evaporate from the water very quickly, even during winter months. Crude oil becomes difficult to recover, burn, or chemically disperse after the first 24 to 48 hours because evaporation accelerates as the oil spreads and thins, viscosity and density may increase, emulsification tends to occur, and slick thickness rapidly decreases (NOAA 2010). When sea ice is present, many of the processes that affect oil behavior in open water (e.g., evaporation, emulsification, and natural dispersion) are slowed down or halted for extended periods of time (Payne et al. 1991, NRC 2014). Overall, recovery efforts in open water tend to have limited effectiveness; recovery rates can range from 1 to 30% (MMS 2010). Booms and skimmers recovery oil less effectively with increased concentrations of sea ice (NRC 2014). Sea ice interferes with boom operation and reduces flow to the skimmer head (Potter et al. 2012, NRC 2014)

Skimming/Vacuuming

Skimmers are mechanical devices that collect oil or other floating contaminants at the water's surface through suction or sorption. They are designed to minimize the intake of water and maximize the uptake of spilled material but often generate wastewater that requires additional space (on land or shipboard) for storage and treatment. The efficiency of skimmers is limited if the water is rough; if aquatic vegetation, floating debris, or ice is present; or if the floating material is too viscous.

The objective of this response activity is to recover floating oil from the water surface. There are numerous types or categories of skimming devices, including weir, centrifugal, submersion plane, and oleophilic. Weir skimmers use gravity to drain oil from the water surface into a submerged holding tank. Once in the holding tank, oil may be pumped away to larger storage facilities. Centrifugal (also vortex) skimmers create a water/oil whirlpool in which the heavier water forces oil to the center of the vortex. Once in the center, oil may be pumped away from the chamber within the skimmer. Submersion plane skimmers use a belt or inclined plane to push the oil beneath the water surface and toward a collection well in the hull of the vessel. Oil is scraped from the surface or removed by gravity and then flows upward into a collection well where it is subsequently removed with a pump. Oleophilic (i.e., having an affinity for oil) skimmers may take on several forms (e.g., disc, drum, belt, rope, brush), but the general principle of oil collection remains the same; oil on the surface of the water adheres to a rotating oleophilic surface. Once oil has adhered to the surface it may be scraped off into containers or pumped directly into large storage tanks.

Skimmers are placed at the oil/water interface to recover, or skim, oil from the water surface. Skimmers may be operated independently from shore, be mounted on vessels, or be completely self-propelled. To minimize the amount of water collected incidental to skimming oil, booming may be used in conjunction with skimming to concentrate the floating oil in a wedge at the back of the boom, which directs a thick layer of oil to the skimmer head.

In shallow water, hoses attached to vacuum pumps may be used instead of other skimming devices. Oil may be removed from the water surface using circular hose heads (4 to 6 inches in diameter); however, this is likely to result in the intake of a large water-to-oil ratio and inefficient oil removal. Instead, flat head nozzles, sometimes known as “duckbills” are often attached to the suction end of the hose in order to maximize the contact between the oil and vacuum, minimizing the amount of water that is removed from the environment. Duckbills (very much like an attachment to a vacuum cleaner) are typically 18 inches or less in width and less than 2 inches in height. In other words, duckbills are relatively small and designed for maximizing the amount of oil removed from the water surface relative to the volume of water removed. Vacuum hoses may also be attached to small, portable skimmer heads to recover oil they have collected. Adequate storage for recovered oil/water mixtures, as well as suitable transfer capability, must be available. Recovery systems that use skimmers are often placed where oil naturally accumulates: in pockets, pools, or eddies.

Vacuums may be small, portable units or truck/vessel-mounted units used to remove pooled or stranded material (typically oil), regardless of the viscosity. Large amounts of water may be entrained during the vacuuming of floating material and require storage, treatment, and disposal.

Sorption

Sorbents collect spilled materials, particularly petroleum or similar products, through either adsorption (adherence to the sorbent surface) or absorption (penetration of the pores of the sorbent). Natural and mineral sorbents include peat moss, straw, snow, and clay. Synthetic sorbents are inert and insoluble materials that are generally manufactured in particulate form and are designed to be spread over an oil slick or deployed as sheets, rolls, pillows, or booms. They are typically deployed by hand or machine to the spilled material (either floating or on land) and are removed and replaced once coated or saturated. In the case of oil spills, the sorbent material is recovered from the coated/saturated sorbents to the degree practicable. Used sorbents require collection, handling, and offsite hazardous waste disposal.

The objective of this response is to remove floating oil by allowing it to adhere to pads or rolls made of oleophilic material. The dimensions of sorbent pads are typically 2 feet by 2 feet. Sorbent rolls are approximately the same width as pad and may be 100 feet long. The use of sorbents to remove floating oil is different from the use of skimmers in two ways: (1) the use of sorbents is a passive oil collection technique that requires no mechanized equipment, whereas skimmers may be attached to active vessels for oil collection, and (2) sorbents are left temporarily in the affected environment to adsorb oil in a specific locale, whereas skimmers may transit in order to collect oil in a broader area.

Sorbents are most likely to be used to remove floating oil in nearshore environments that contain shallow water. They are often used as a secondary method of oil removal following gross oil removal, such as skimming. Sorbents may be used for all types of oil; lighter oils absorb into the material and heavier oils adsorb onto the surface of sorbent material, requiring sorbents with greater surface area. Retrieval of sorbent material is mandatory, as well as at least daily monitoring to check that sorbents are not adversely affecting wildlife or breaking apart after lengthy deployments. However, sorbent materials generally do not remain in the environment for longer than 1 day.

Passive collection with sorbents can also be used in conjunction with other techniques (e.g., flushing, booming) to collect floating oil for recovery. This variation of the removal of surface oil allows for oil adsorption onto oleophilic material placed in the intertidal zone or along the riverbank. Sorbent material is placed on the surface of the shoreline substrate, allowing it to adsorb oil as it is released by tidal or wave action. The sorbents most typically used for medium to heavy oils are snares (like cheerleader pompoms) made of oleophilic material; snares are attached at 18-inch intervals along a rope that can be tied, anchored, or staked along the intertidal shoreline. As the snares are moved about by tidal or wave action, they also help remobilize oil by rubbing across rock surfaces. Snare lines are monitored on a regular basis for their effectiveness at picking up oil, and to collect and replace oiled sorbents with new material. This method is often used as a secondary treatment method after gross oil removal, and along sensitive shorelines where access is restricted.

Removal/Cleanup

A response action may include the manual or mechanical removal of spilled material, contaminated soil, sediment, vegetation, or debris in upland (including shorelines) and nearshore environments. Shorelines or streams that are in the path of a spill may be subject to the pre-emptive removal of debris (e.g., large logs or root balls) to minimize the retention of a spilled material and its subsequent release over time.

Removal may also be augmented by flushing or otherwise washing surfaces (including large vegetation) to which spilled materials have adhered. Flushing or related responses are used in conjunction with containment and recovery actions. If approved by the ARRT, chemicals may also be used to assist in the removal or release of spilled materials (particularly oil) from surfaces. At present no chemicals are approved for use in Alaska in this manner.

Flushing and Flooding

Flushing and flooding are response actions that rely on hydraulic action to remove a spilled material from a solid or semi-solid surface (e.g., rocks, bulkhead, cobble beach), so that the material can be contained and collected. Water can be heated to enhance the removal process. These actions are typically applied in shoreline habitats.

Flushing involves forcing large quantities of ambient or supplied water at pressure (ranging from < 50 to 1,000 pounds per square inch) through sediment or across surfaces to move hydrophobic contaminants into a containment area. Flooding involves the use of very large quantities of water to flush a spilled product from the sediment to the surface into a containment area.

The objective of ambient water flushing is to remobilize oil stranded on surface substrate, as well as oil from crevices and rock interstices, to water's edge for collection. Water is pumped from hoses onto an oiled beach, beginning above the highest level where the oil is stranded and slowly working down to the water level. The flow of water remobilizes oil stranded on the surface sediments and flushes it down to water's edge. The remobilized oil is contained by boom and recovered for disposal. Increased water pressure may be needed to assist in the remobilization as the oil weathers and begins to harden on the substrate. Because of the potential for higher pressures to cause siltation and physical disruption of the softer substrates, flushing with higher pressures is restricted to rock or hard man-made substrates.

Intake and outflow hoses may range from 2 – 4 inches in diameter and, depending on the pump used, pump between 200 and 400 gallons of water per minute. Intake hoses are fitted with screens to minimize the extraction of debris, flora and fauna. Screen holes generally range from 0.25 inch to 1 inch in diameter, depending on the environment from which the water is being pumped. Intake hoses are propped off bottom using rebar in about 3 feet of water to further minimize the amount of sediment and debris, and the number of organisms, taken into the hose and pump.

Flooding is a variation of ambient water flushing used to mobilize stranded oil from rock crevices and interstices. Ambient water is pumped through a header pipe at low pressure above and inshore from the fouled area of shoreline. The pipe is meant to create a sheet of water that simulates tidal washing over the affected area. Removing stranded oil may be particularly important when a more sensitive habitat is nearby and in danger of becoming fouled with oil after the intertidal zone is washed over the next tidal cycle, remobilizing the oil. The effects of flooding may also be desired when a spring tide has deposited oil above the normal high water mark or when the wave energy of the adjacent water is not great enough to sufficiently wash the affected area over the following tidal cycle. After oil has been loosened from the substrate it is collected and removed using a variety of mechanical, manual and passive methods.

Low pressure washing with ambient water is used to mobilize liquid oil that has adhered to the substrate or man-made structures, pooled on the surface, or become trapped in vegetation to the water's edge for collection. Low-pressure washing (<50 pounds per square inch) with ambient seawater sprayed through hoses is used to flush oil to the water's edge for pickup. Oil is trapped by booms and picked up with skimmers or sorbents. This variation may also be used in concert with ambient water flooding, which helps move the oil without the potential effects associated with higher water pressures.

High pressure washing with ambient water is used to mobilize oil that has adhered to hard substrates or man-made structures to the water's edge for collection. It is similar to low-pressure washing except the water pressure may reach 100+ pounds per square inch, and it can be used to flush floating oil or loose oil out of tide pools and between crevices on riprap. Compared to the lower pressure spray, high-pressure spray will more effectively remove oil that has adhered to rocks. Because water volumes are typically low, this response method may require the placement of sorbents directly below the treatment area or flushing to carry oil to the water's edge for collection.

Warm water, moderate-pressure washing is used to mobilize thick and weathered oil that has adhered to rock surfaces, prior to flushing it to the water's edge for collection. Seawater is heated (typically between the ambient temperature and 90ºF) and applied at moderate pressure to mobilize weathered oil that has adhered to rocks. If the warm water is not sufficient to flush the oil down the beach, flooding or additional low- or high-pressure washing may be used to float the oil to the water's edge for pickup. Oil is then trapped by boom and may be picked up with skimmers or sorbents.

Hot water, moderate-pressure washing is used to dislodge and mobilize trapped and weathered oil from inaccessible locations and surfaces not amenable to mechanical removal, prior to flushing oil to water's edge for collection. Water heaters are mounted on offshore barges or on small land-based units. The water is heated to temperatures from 90ºF to 170ºF, which is usually sprayed in small volumes by hand using moderate-pressure wands. Used without water flooding, this procedure requires immediate use of vacuums (vacuum trucks or super suckers) to remove the oil/water runoff. With a flood system, the oil is flushed to the water's edge for collection with skimmers or sorbents. This response is generally used when the oil has weathered to the point that even warm water at high pressure is ineffective for the removal of adhered oil, which must be removed due to the threat of continued release of oil or for aesthetic reasons.

Steam Cleaning and Sandblasting

In the event that a constructed or low-value shoreline habitat is contaminated by a floating product, steam cleaning or sandblasting may be used to remove the product from rocky substrates. This process is very limited in scope but nonetheless effective for oil recovery. Biota living in areas treated in this manner will likely be destroyed by the high heat, pressure, and/or abrasion.

Removing Contaminated Soil, Sediment, Vegetation, or Natural Debris
Manual removal is conducted using hand tools (e.g., rakes, shovels, scrapers). Material is collected in containers that are typically transported by vehicle to a storage area for later disposal. Mechanical removal relies on heavy equipment (e.g., bulldozers, backhoes) and is usually implemented when the spill area/debris size exceeds the capacity of manual removal.

Oiled sediment is removed by either use of hand tools or by use of various kinds of motorized equipment. Oiled sediment removal is restricted to the supratidal and upper intertidal areas to minimize disturbance of biological communities in the lower intertidal and subtidal. After removal, oiled sediments are transported and disposed of offsite.

Aquatic, shoreline, or riparian vegetation that has been heavily contaminated by a spilled product may be a continuing threat to organisms that either forage on that vegetation or use it as habitat. Vegetation can be removed either manually or mechanically. The heavier the machinery used, the greater the soil or sediment compaction and noise produced, although foot traffic by workers will also cause some compaction.

Debris (e.g., seaweed, trash, and logs) is removed from the shoreline when it becomes heavily contaminated and when it is either a potential source of chronic oil release, an aesthetic problem, or a source of contamination for organisms on the shoreline.

2.2.2 Non-mechanical Countermeasures and Monitoring

Non-mechanical countermeasures are actions that alter the physical or chemical properties of the spilled material (i.e., petroleum or oil-like materials) such that the options for recovery are improved or the overall impacts of spilled material that cannot be recovered are potentially reduced.

Sea-Surface Application of Approved Chemical Dispersants
Only surface applications of dispersants are proposed in this action and subsequent analyses in this Biological Opinion. The use of sub-surface chemical dispersant is outside the scope of the proposed action (USCG and EPA 2015). Accordingly, the effects from such use are not included in this consultation and no take from such activities is authorized under the accompanying incidental take statement.

Two dispersant formulations from EPA’s product schedule, Corexit® EC9500A and Corexit® EC9527A (hereafter referred to as Corexit® 9500 and Corexit® 9527), are currently available for use in Alaska. Use of these dispersants requires authorization from ARRT, and the use of Corexit® 9527 is restricted to existing stocks and will be phased out (since December 2013, Corexit® 9527 is presumed by the USCG/EPA to be depleted). Other chemicals currently available for use during an oil spill (i.e., those listed on the NCP product schedule) would require ARRT approval for use in Alaska and are not considered in this Biological Opinion.

Chemical dispersants are mixtures of surfactants, hydrocarbon-based solvents, and other compounds that alter the spatial distribution, chemical fate, and physical transport of spilled oil in aquatic environments. Dispersants are specifically designed to enhance dispersion of oil into the water column by generating smaller droplets of oil that are subject to natural processes, such as dissolution, volatilization from the water surface, biodegradation, and sedimentation from interactions with suspended particulate material. The application of chemical dispersants in marine environments as a response action is restricted to spilled petroleum or other oil-carried or oil-like contaminants. Dispersants do not reduce the total amount of oil in the environment, but instead, may change the characteristics of the oil, thereby changing the transport, fate, and potential effects of the oil.

Corexit® 9500 and Corexit® 9527 dispersant formulations

Chemical Constituent	Chemical Type	CAS No.
Propylene glycol	solvent	57-55-6
2-Butoxy ethanol[a]	solvent	111-76-2
Sodium dioctyl-sulfosuccinate	surfactant	577-11-7
Sorbitan monooleate	surfactant	1338-43-8
Polysorbate 80	detergent/surfactant	9005-65-6
Polysorbate 85	surfactant	9005-70-3
1-(2-Butoxy-1-methylethoxy)-2-propanol	solvent	29911-28-2
Petroleum distillates, hydro-treated, light	solvent	64742-47-8

a This chemical is not included in the formulation of Corexit® 9500

CAS – Chemical Abstracts Service

Dispersant use generally requires ARRT approval on a case-by-case basis, except in the case of immediate risk to humans of the ignition or inhalation of volatile and poisonous constituents of oil†. Another exception is the Preauthorization Zone (Figure 2). Within this zone, use of dispersants would not require case-by-case approval by the ARRT. The use of chemical dispersant as a response option is reserved for occasions when resources are at risk and other

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† Spilled oil products may contain poisonous and flammable volatile organic compounds, and oil dispersal is a possible option to reduce the immediate risk of ignition or inhalation. The FOSC may be empowered to use dispersants without obtaining outside consent or consultation under circumstances presenting a hazard to human life (40 CFR 300.910(d)).

response actions are either not feasible or not adequate to contain or control the spill because of field conditions (e.g., remote location, lack of access).

The purpose of chemical dispersants is to reduce the concentration of oil at the surface of the water by breaking the oil into emulsified droplets that can be suspended and distributed (and thus diluted and degraded) throughout the water column. This dilution of oil likely reduces wildlife exposure to oil at the sea surface (NRC 2005); dispersed oil is also less likely to wash ashore in sensitive coastal areas. However, the use of dispersants represents a tradeoff in exposure because more pelagic species may be exposed to oil after chemical dispersion (USCG and EPA 2014).

Dispersants are applied to the oil's surface via either vessel-mounted equipment or aerial spraying (at concentrations of 2-5% by volume of the oil). Subsurface application, as was performed for the Deepwater Horizon spill in the Gulf of Mexico, is not considered as part of this consultation. The effectiveness of dispersants is dependent upon the amount of time that has elapsed since the spill (oil weathering), surface oil thickness, oil viscosity, water depth, salinity, temperature, and sea conditions (NRC 2005). Dispersants require physical mixing for optimum effect. The mixing can be intentionally induced (use of propeller wash in broken ice conditions), or by the sea state.

Efficacy of applied dispersant can be assessed in a variety of ways. The NCP describes three levels of SMART monitoring:

- **Tier I—**A trained observer, flying over the oil slick and using photographic job aids or advanced remote sensing instruments, assesses dispersant efficacy and reports results to the incident command post. This is the minimum level of monitoring required for dispersant use nationally.
- **Tier II—**Real-time empirical data is gathered from the treated slick. A sampling team on a boat uses a monitoring instrument to continuously monitor for dispersed oil 1 m under the dispersant-treated slick and reports the results to the incident command post. Water samples are also taken for later analysis at the laboratory.
- **Tier III—**Expanded real-time empirical data is gathered from the treated slick to determine where the dispersed oil goes and what happens to it. Similar to Tier II, a sampling team(s) uses at least two monitoring instruments to monitor the water at several depths, often from the center of the slick. A portable water laboratory provides data for water temperature, pH, conductivity, dissolved oxygen, and turbidity. Results are reported to the incident command post.

Conditions/stipulations of the Dispersant Use Plan include:

- All dispersant application field tests will be conducted on a representative portion of the oil slick.

- The FOSC immediately notifies the DOC ARRT representative of the decision to authorize dispersant use.
- If the FOSC determines that dispersant use may affect ESA-listed species under NMFS's jurisdiction, the FOSC initiates a spill-specific emergency ESA Section 7 consultation during which the NMFS Section 7 biologist will provide mitigation measures to lessen potential impacts to ESA-listed species.
- The NOAA SSC and Environmental Unit (EU) (which a NMFS PRD Section 7 biologist is a part of), provides the FOSC any necessary supporting information, including weather and other environmental characteristics, and a description and prioritization of Resources at Risk.
- Following review of the dispersant field test, the EU provides the FOSC with a recommendation on whether full-scale dispersant applicant should commence.
- Dispersant application effectiveness and potential trade-offs associated with its use will be evaluated on a daily basis, informing the FOSC's decision to continue, postpone, modify, or cease dispersant application based on that day's monitoring information.
- Dispersant applications will only be carried out in daylight conditions.
- Use of dispersants will not exceed 96 hours (unless an extension is approved under "atypical dispersant use" using the Process for Case-by-Case Dispersant Use Authorization).
- Dispersants will only be applied in areas where the water depth is 10 fathoms (60 feet) or greater, and at sufficient distances from shore to ensure that sensitive near-shore and benthic habitats are not affected by dispersants and/or dispersed oil.
- Dispersants applications will maintain a minimum 500 meters (1,640 feet) horizontal separation from swarming fish, rafting flocks of birds, marine mammals in the water, and/or marine mammal haulouts.
- Any monitoring required by USFWS and/or NMFS for Endangered Species Act Section 7 compliance will be conducted.
- DOI and/or DOC will provide a specialist in aerial surveying of marine mammals and pelagic birds to accompany a SMART Tier 1 monitoring team to help ensure compliance with the above requirements. If DOI and/or DOC cannot provide the appropriate specialist(s), a third party acceptable to the DOI and/or DOC will be identified to accompany the monitoring team.
- Any atypical use of dispersants will be guided by the NRT "Environmental Monitoring for Atypical Dispersant Operations."
- Information on the location of all dispersant application(s) will be provided to the public, including posting on the ARRT web site.
- Completion of a checklist to ensure that all conditions/stipulations have been met prior to approval of dispersant use.
- Other incident-specific conditions/stipulations.

The Dispersant Use Plan as described in Final Draft form (April 2014) is included in this consultation as Annex F under the Unified Plan (Appendix A of Biological Assessment) (USCG and EPA 2014); however, the use of subsea chemical dispersant is outside the scope of the proposed action (USCG and EPA 2015). Accordingly, the effects from such use are not included in this consultation and no take from such activities is authorized under the accompanying incidental take statement.

The Dispersant Use Plan includes a Preauthorization Zone that extends from the Western Aleutians to the east side of Prince William Sound, starting 24 nautical miles from the coast and extending south out to the 200 mile Exclusive Economic Zone (EEZ), and north 100 nautical miles offshore (Figure 2). North Pacific right whale critical habitat and a 20-mile buffer around that critical habitat is classified as an Avoidance Area in the Dispersant Use Plan and is not part of the Preauthorization Zone. According to the Dispersant Use Plan, Avoidance Areas shall automatically be classified as an Undesignated Area where requests for dispersant use shall follow the process for a case-by-case dispersant use authorization.

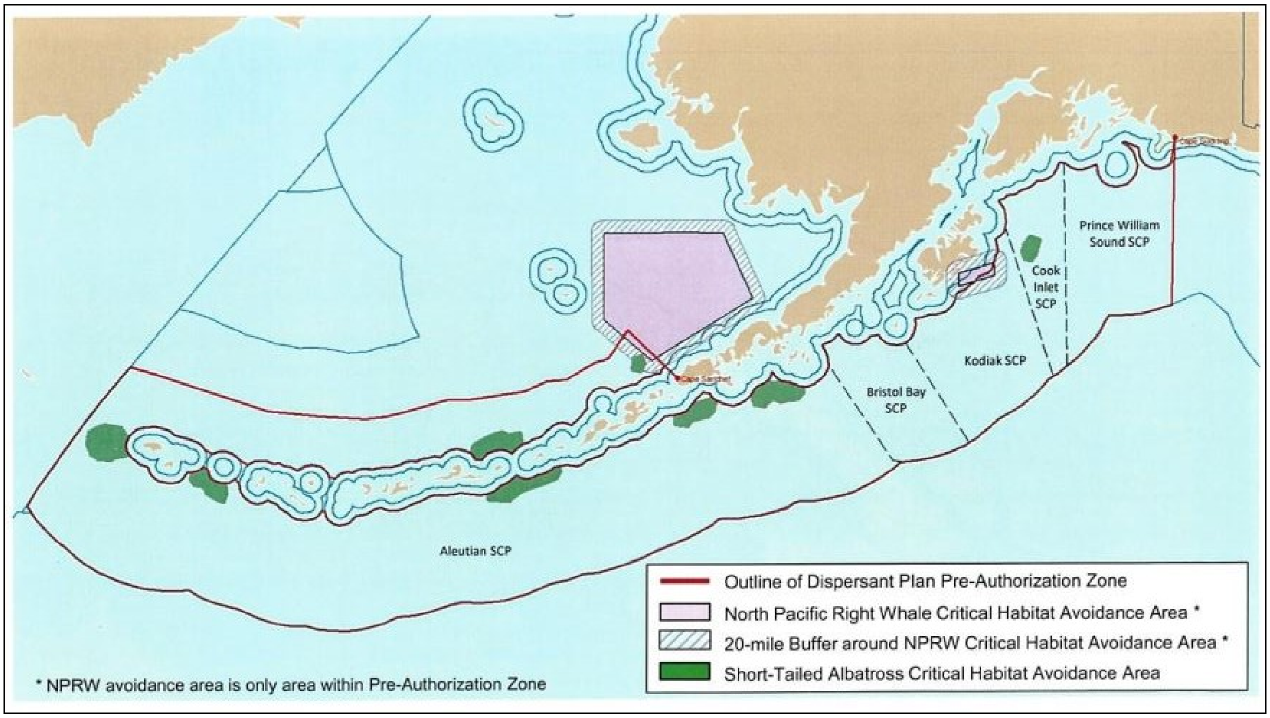

Figure 2. The boundaries of the Preauthorization Zone of the Dispersant Use Plan under the Unified Plan. The boundaries of the Subarea Contingency Plans (SCPs) are shown where they overlap with the Preauthorization Area. North Pacific right whale critical habitat and a 20-mile buffer around critical habitat is designated as an Avoidance Area and is not considered part of the Preauthorization Zone.

The Preauthorization Zone enables the USCG to require certain vessel and facility response plan holders in Alaska to maintain a minimum dispersant use capability in accordance with the USCG August 31, 2009 rulemaking, 33 CFR Parts 154 and 155; "Vessel and facility response plans for oil: 2003 removal equipment requirements and alternative technology revisions; Final Rule."

Conditions/stipulations that apply within the Preauthorization Zone include:

- The preauthorization of dispersant use only applies to tank vessels carrying crude oil to/from a US port.
- The Preauthorization Zone excludes any avoidance areas identified in certain Subarea Contingency Plans (SCPs). State and federal natural resource trustees, including NMFS PRD, will assist in the identification of these avoidance areas.
- A checklist will be followed prior to dispersant application, including initiation of ESA section 7 and Essential Fish Habitat consultations, SMART dispersant application field testing, and recommendations from the Environmental Unit about whether to conduct a full scale application of dispersant or a second field test.

The National Contingency Plan (NCP) Section 300.910(d) enables the FOSC to authorize the use of dispersant without obtaining concurrence from the ARRT when the FOSC has judged that the use of dispersant is necessary to prevent or substantially reduce a hazard to human life. Once the threat to human life is reduced, the continued use of dispersants must follow the approval process in the NCP Section 300.910(b) which includes review and approval by DOC.

In Situ Burning

In situ burning is a response action used to address spilled oil in either aquatic or terrestrial habitats. According to the "*In Situ* Burning Guidelines for Alaska, Revision 1" (ADEC et al. 2008) (included in the Unified Plan as Appendix II to Annex F), burning can be conducted if, "mechanical containment and recovery by themselves are incapable of controlling the oil spill, burning is feasible, and the burn will lie a safe distance from populated areas." The FOSC has the authority to authorize *in situ* burning on a case-by-case basis after obtaining concurrence from the EPA and ADEC representatives to the ARRT‡. A review checklist is included in the *in situ* burning guidelines to facilitate the decision process. The checklist includes the following steps:

1. Review the completed Application to Burn Plan (Appendix A to the *In Situ* Burn Guidelines for Alaska, Revision 1 (ADEC et al. 2008))
2. Determine the feasibility of burning
3. Determine whether burn may be conducted at a safe distance from population areas
4. Determine whether environmental and other considerations will be adequately addressed
5. Review consultations and requests for authorization
6. Make a decision on whether to authorize burn

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‡ Concurrence from DOI and DOC natural resource trustees will be obtained when practicable.

The objective of *in situ* burning is to remove oil from the water surface or habitat by burning it in place. Oil floating on the water surface is collected into slicks a minimum of 2-3 mm thick and ignited. The oil is typically collected in fire-resistant boom that is towed through the spill zone by watercraft, or collected by natural barriers such as the shore. Although *in situ* burning may be used in any open water environment, the environment dictates the specific procedure employed in a given burn. For example, in offshore and nearshore marine environments, bays and estuaries, large lakes and large rivers a boom may be towed at 1 knot or less during the burning process in order to maintain the proper oil concentration or thickness. Wind or mechanically generated currents (known as herding) may be used to collect and concentrate oil along the shoreline or in a stationary boom attached to the shoreline.

Once an oil slick is sufficiently thick, an external igniter is used to heat the oil, generating enough vapors above the surface of the oil to sustain a burn. It is these vapors, rather than the liquid oil on the water surface, that actually burn. When the oil burns enough so the remaining layer is less that 1-2 mm thick, the fire goes out, because the oil slick is no longer sufficiently thick to provide insulation from the cool water. This insulation is necessary to sustain the heat that produces the vapors, which are subsequently burned. The small quantity of burn residue remaining in the boom is then manually recovered for disposal.

The use of *in situ* burning as a response action requires ARRT approval and is a valuable tool to quickly remove oil from open water or upland areas and prevent it from reaching sensitive habitats or populations. The burning of weathered or emulsified oil is typically infeasible because it is not likely to continue burning once ignited. This is due to the emulsion of oil with water, as well as the evaporation of flammable, volatile oil components. Sea and wind conditions also affect the feasibility of *in situ* burning. Concentrated oil is better able to remain ignited, and oil trapped between sea ice floes is often sufficiently concentrated so that further containment measures may not be necessary prior to an *in situ* burn.

For *in situ* burning operations, SMART protocols include deploying one or more air quality monitoring teams with specialized portable equipment downwind of the burn at sensitive locations, such as population centers. Teams begin sampling before the burn to collect background baseline air quality data. After the burn starts, the teams continue sampling for particulate concentration trends, recording them both manually at fixed intervals and automatically, and report results to the incident command post.

Other Non-mechanical Countermeasures and Monitoring

Other non-mechanical countermeasures and oil spill response monitoring methods are not currently part of the Unified Plan because they have not been previously approved by the ARRT. Therefore, they are not part of the proposed action, and are not part of this consultation. Examples of other non-mechanical countermeasures include application of other chemical agents (e.g., solidifiers and fire foam), and application of biodegrading organisms or nutrient stimulants used to enhance biodegradation of oil.

2.2.3 Tracking and Surveillance

Tracking and surveillance (e.g., aerial reconnaissance) is performed for almost all spill events for which a response is planned. These activities are conducted in order to visually and electronically assess the field conditions and extent of a spill and to project, through computational modeling, the future movements of the spill. Information is also gathered on the location and movement of sensitive wildlife.

Nuka Research (2006) identifies two tracking tactics: plume delineation on land and discharge tracking on the water. Each is used to determine the size, shape, and trajectory of a spill, as well as the resources required to appropriately control the spilled material so as to reduce ecological and economic impacts. On land, it is easier to map a plume of spilled material and predict its trajectory. Actions may involve land transport or aerial surveillance. The location of a plume can be validated through the use of monitoring equipment (e.g., photo ionization detection). To monitor deep soil, excavation equipment may be required.

For spills on the water, aerial surveillance is typically used to visually inspect a spill. In addition, infrared remote sensing and other non-invasive imaging technologies can be used during aerial surveillance to facilitate location, trajectory, and density mapping, including under ice. In some instances, buoy-based systems that move through a spill on the water and electronically track the position and direction of the material’s movement may be deployed. Additional in-water tracking may be conducted by means of vessels. Material sampled by operators of these vessels can be analyzed for current spill conditions (i.e., extent of oil weathering).

The trajectory of a plume and wildlife movement is tracked over time. Information gathered during tracking and surveillance helps support the development of an IAP, wildlife protection measures, and other BMPs.

Use of Aircraft, Vessels, All-terrain Vehicles, or Heavy Machinery

Fixed and rotary wing (i.e., helicopters) aircraft, small craft, ships, all-terrain vehicles, and/or heavy machinery may be routinely employed during tracking and surveillance activities and do not require special approval by the ARRT for deployment. Based on capabilities (e.g., operating limits, range, onboard equipment, personnel), such purpose-built or general purpose assets may be staged in forward staging areas adjacent to but outside the operating area to minimize mobilization/demobilization intervals and maximize asset time available to perform response activities. Personnel using these assets may perform aerial, water surface, subsurface, ground, or subterranean reconnaissance visually or electronically, transport tracking and surveillance personnel to remote areas, move/deploy/recover equipment or supplies used in tracking and surveillance, sample collection, and/or communication. The majority of these assets are preidentified in industry or government response plans, and in most cases, are continuously maintained and ready for use.

Installation of Buoys

In certain cases, buoys may be deployed from aircraft, small craft, ships, or shore for tracking and surveillance of spilled product, or for marking the boundaries of environmentally sensitive areas or specially designated on-water zones potentially in the path of spilled product. The buoys used in these applications are of two main types: drift buoys and static buoys.

Drift (i.e., unanchored) buoys may be deployed into spilled product or near the spill's leading edge. Drift buoys have highly visible colors to help track product movement in the water visually, and/or radar-reflective material/features for aerial/surface radar tracking, and/or more sophisticated electronics for longer-range monitoring (e.g., radio telemetry) from satellite, aerial, surface, or shore-based tracking.

Static (i.e., anchored) buoys of similar configuration may be set-up to mark outer boundaries of protected or environmentally sensitive areas (e.g., rookeries, hatcheries, haulouts) or specially designated on-water special use zones (e.g., safety/security zones, channels).

Sample Collection

Water, tissue, soil, and product samples are often collected as part of tracking and surveillance activities. Collection of water and soil samples, both from baseline (i.e., unaffected) and affected areas is vital to assess and document size, volume, toxicity, and other impacts on the environment before and during the event. Collection of product samples from spill sources and in the spill environment are essential for determining characteristics of the product and the nature and course of the interaction between the pollutant and the environment. This critical information informs response strategies developed and tactics used to combat the spill.

2.2.4 Waste Management

Waste handling and associated activities are common to all response actions apart from natural attenuation. Response actions produce large volumes of waste (e.g., contaminated soils, used sorbents, personal protection equipment) that must be handled, stored, decontaminated, transported, and/or disposed of properly. Protocols that comply with state and federal regulations are in place for the storage and transfer of all solid, hazardous, or petroleum wastes that may be generated during recovery and cleanup activities in order to minimize the reintroduction of wastes into the environment and protect habitats, endangered species, and response workers.

Waste Handling and Storage

Waste handling and storage are required throughout a spill response. Materials (e.g., soil, sediment, and snow) used to construct diversion and exclusion or containment structures may be contaminated by the spilled material due to leaching or other processes, generating additional wastes to be handled and disposed of properly. Some spilled materials may be pumped or suctioned directly into storage tanks or drums for the purpose of either recovery or treatment and disposal. Pumping and suctioning usually entrain large volumes of water that must also be stored and treated. In the case of viscous oils, reheating might be required prior to pumping.

Waste Transport

The handling, transport, and disposal of wastes require the use of heavy machinery and vessel or overland transport. It is possible that the volume of waste produced by the response operations will exceed the capacity of local waste receivers. In this event, disposal at multiple sites will be required. There are also some wastes (e.g., oil emulsions, oily water, and hazardous wastes) that cannot be treated in Alaska and must be transported to the contiguous United States. In these cases, longer transport distances could increase the possibility of spills or other accidents.

Waste Treatment and/or Disposal

Under ideal conditions, spilled products can sometimes be recovered and reused, reducing the wastes generated by a response action. For example, recovered oil can be refined into low-grade fuel or other petroleum products. Some chemical agents can separate oil from water or other materials, allowing the volume of wastewater that requires treatment or disposal to be reduced. Although no chemical agents are currently pre-approved for such use in Alaska, they may be proposed on a case-by-case basis.

Oil collected from aquatic habitats will be mixed with water and require separation and decanting prior to disposal; such decanting may take place on board a work vessel or be conducted at an upland location or facility. Decanted water may contain small amounts of dissolved oil constituents or consist of an oil-water emulsion but must meet water quality standards prior to discharge.

Waste disposal involves either direct disposal (i.e., without treatment) or treatment and then disposal. Wastes can be incinerated (onsite or offsite), but any incineration of waste in Alaska is subject to ADEC regulations.

Decontamination

During an oil spill response action, all personnel, hand tools, equipment, vehicles, and vessels must be decontaminated in a manner that does not reintroduce oily wastes into the natural environment. The decontamination process involves a multi-stage flushing procedure that removes and collects such wastes. The wastes are then stored and treated in accordance with state and federal regulations.

Of primary concern is the reintroduction of oily waste and contaminated materials into the natural environment during the decontamination procedure. The use of engineered controls (e.g., berms, booms, plastic sheeting, tarps) reduces the risk of the accidental release of contaminated materials.

2.2.5 Wildlife Protection/Mitigation Measures

Wildlife protection responses are actions that could be implemented should wildlife be threatened by exposure to a spilled material. Wildlife protection is conducted by trained personnel under a federal permit.

The Unified Plan described that wildlife might be deterred from entering an area impacted by a spill in order to prevent animals from becoming contaminated, or captured and treated after they have been exposed or injured. Animals might also be captured and temporarily held or relocated (i.e., preemptively captured) to prevent them from being exposed to spilled material. Although returning captured animals to the wild is the ultimate goal, not all captured animals may be able to be released following holding or treatment due to injuries received from exposure to spilled products. Guidelines that address procedures and decision criteria have been developed by the ARRT Wildlife Protection Working Group in accordance with the NCP and approved by the ARRT (see Annex G of the Unified Plan).

Recovery of Contaminated Carcasses to Prevent Contamination of Other Wildlife

Recovery of contaminated carcasses from affected areas is an important primary response strategy to prevent further contamination of other wildlife in water and on land. Contaminated carcasses can cause further direct or indirect environmental harm through mechanisms such as secondary pollution (i.e., pollution reentering the environment from a contaminated source) or by ingestion by other creatures using the carcass as a food source.

The Unified Plan contains detailed guidelines (Appendix 11 of Annex G) on carcass collection including procedures for searching, documentation of collection *in situ*, chain of custody, inventory, storage, use as evidence, and disposal. Natural resource trustees, including NMFS, use these basic guidelines to develop incident-specific guidelines tailored to each event.

Deterrence

Deterrence (i.e., hazing) of wildlife is the act of causing animals to move away from the spill area to prevent them from being exposed to the spilled materials. Deterrence of species under NMFS's authority was previously consulted on under Section 7 of the ESA (see project PCTS# FPR-2013-9029); therefore, this activity is not included in this Biological Opinion. Deterrence of wildlife under NMFS's authority requires incident-specific approval from the NMFS Marine Mammal Health and Stranding Response Program to be conducted lawfully (under the existing ITS from the previous consultation).

Pre-emptive Capture and Relocation of Uncontaminated Wildlife

Similar to deterrence (above), this activity was previously consulted on under Section 7 of the ESA (see project PCTS# FPR-2013-9029); therefore, this activity is not included in this Biological Opinion. Capture and handling of wildlife under NMFS's authority requires training and incident-specific approval and coordination with the NMFS Marine Mammal Health and Stranding Response Program to be conducted lawfully (under the existing ITS from the previous consultation).

Capture, Treatment, and Release of Contaminated Wildlife

Similar to the two sections above, this activity was previously consulted on under Section 7 of the ESA (see project PCTS# FPR-2013-9029); therefore, this activity is not included in this Biological Opinion. Capture, treatment, and release of wildlife under NMFS's authority requires training and incident-specific approval and coordination with the NMFS Marine Mammal Health and Stranding Response Program to be conducted lawfully (under the existing ITS from the previous consultation).

Strategic Avoidance

Strategic avoidance as a means of wildlife protection occurs during response strategy formulation and as part of tactical practice in the field. At the strategic level, environmentally sensitive areas are identified within the Environmental Unit of the Incident Command. Areas threatened by the spill are prioritized for protection as a primary response strategy. Such areas are also disqualified for use as forward operating locations (e.g., bases, heliports, staging areas, decontamination sites) in the response.

At the field tactical level, environmentally sensitive areas are avoided in the development of plans and procedures (e.g., shoreline cleaning, berming) which may result in wildlife exposures to cleaning agents and mechanisms. Methods which may cause irritation, injury, or death receive consultation with natural resource trustees, including NMFS, during deployment planning.

2.3 DECISION-MAKING PROCESSES

As described in the "Potential Effects of the Proposed Action" section below, oil spill response activities have the potential to negatively impact ESA-listed species under NMFS's authority if not properly managed and mitigated. Therefore, it is important to understand when and how various response activities are taken during an incident. Although it is not possible to precisely predict where, when, and how big a spill may occur, it is possible to understand the shape the response would take based on the existing planning documents, the revision process for those planning documents, and the decision-making process that occurs during each incident.

2.3.1 Response Planning

Spill response planning in Alaska is accomplished through the development of a series of inter-related plans, for which the NCP provides the overarching framework and establishes procedures that are designed to minimize the imminent threat to human health, natural resources, and the marine environment from an uncontrolled release of oil or other hazardous substances.

The Unified Plan uses the framework and priorities set forth in the NCP and applies them in a regional context (i.e., Alaska). The Unified Plan contains both administrative and technical statewide guidance for all members of the response community to follow during emergency response to a spill. This guidance is organized as a series of annexes (A through Z), each with supporting appendices. Administrative guidance in the Unified Plan establishes how the spill response will be organized, managed, and funded; technical guidance addresses countermeasures that have been approved for use as part of the response.

Mechanical countermeasures are the main focus of emergency spill response under the Unified Plan; however, most of the details regarding the selection and implementation of a response are provided in supplemental documents (Nuka Research 2006, NOAA 2010, ACS 2012) that were prepared in response to or in support of the Unified Plan§. The Unified Plan also incorporates guidance on the use of non-mechanical countermeasures (i.e., the application of dispersants or other chemical agents and *in situ* burning) and responses (i.e., wildlife protection) because of their greater potential for adverse effects. The Unified Plan further describes the decision process leading to the selection of a non-mechanical countermeasure in order to support the evaluation of tradeoffs associated with implementation (i.e., magnitude of environmental harm versus benefit).

The Unified Plan is supplemented by 10 Subarea Contingency Plans (SCPs), which provide greater detail for local response planning in large inland and coastal areas of Alaska (Figure 3). The SCPs set resource protection priorities and incorporate key provisions of local government emergency response plans and applicable information from responsible party (RP) spill response plans. These SCPs are updated regularly, and the updates are reviewed and approved by ARRT to maintain consistency with the Unified Plan. The SCPs also include site-specific Geographic Response Strategies (GRS) developed by multi-stakeholder working groups, including NMFS, to protect specific sensitive resources at specific locations within each subarea. Sensitive resources are broadly defined to include human and cultural resources, as well as species and habitats of concern (i.e., not just ESA-listed resources).

In 2001, the USCG, EPA, DOI Office of Environmental Policy and Compliance, USFWS, NMFS, and NOS signed an agreement entitled "*Inter-agency Memorandum of Agreement Regarding Oil Spill Planning and Response Activities Under the Federal Water Pollution Control Act's National Oil and Hazardous Substances Contingency Plan and the Endangered Species Act*" which provides a general framework for cooperation and participation in the exercise of their respective oil spill planning and response responsibilities. The MOA outlines

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§ A more complete list of documents describing mechanical countermeasures and their uses can be found in Annex N of the Unified Plan

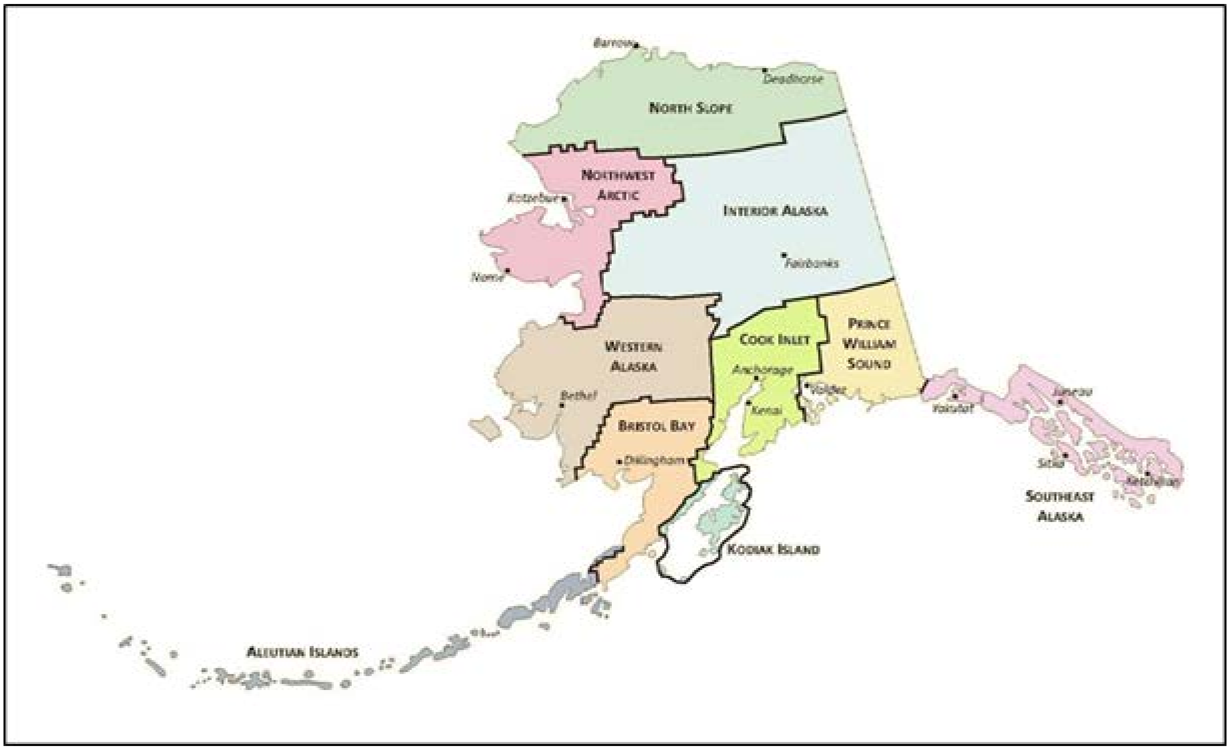


Figure 3. Map of Alaska showing the delineations for the 10 subareas designated under the Unified Plan. Each subarea has a separate Subarea Contingency Plan for oil spill response.

procedures to streamline ESA compliance before, after, and during an incident (USCG et al. 2001). Per the 2001 Inter-agency MOA, Area Committees will engage NMFS in the planning process when developing or revising Subarea Contingency Plans and GRSs. GRSs incorporate elements of emergency response actions that are intended to minimize impacts on listed species and critical habitats from both the actions and the spilled material. The development of GRSs is an ongoing effort; not all are complete at the time that this consultation was concluded. Final, draft, and proposed GRSs are available on the ADEC Geographic and Response Strategies for Alaska website (http://dec.alaska.gov/spar/perp/).

2.3.2 During an Incident

The selection and implementation of incident-specific response strategies are ultimately at the discretion of the Unified Command (i.e., the team of on-scene coordinators that represents the RP and federal, state, and local agencies), following the guidance in the Unified Plan and in consultation with other members of the response community. Therefore, NMFS Section 7 biologists are involved in selection of site-specific strategies either though involvement in the EU or through coordination with the NOAA SSC and DOC representatives on the ARRT.

The Unified Command is responsible for selecting, prioritizing, and implementing the actions that will meet these goals. The selection of the response action (or actions) for a given spill is dependent on a number of factors, including the nature and magnitude of the spill, weather, timing, location, accessibility, resources at risk, and likely fate and effects of the material released. Every response strategy has uncertainties, along with potential environmental tradeoffs that are evaluated as part of the action selection process. Response decisions are made using the best information available, with the knowledge that the initial understanding of the event may be incomplete. During a spill, responses are modified as environmental conditions change or additional information becomes available. The spill response community relies on training and exercises to make the uncertainties manageable. This emergency spill response training, a requirement of the Unified Plan, is expected to assist decision-making in the face of uncertainty and to ensure that at-risk environmental resources, such as ESA-listed species and habitats, are properly protected within the scope of resources available or mobilized during an emergency spill response.

During each incident, the FOSC (USCG or EPA) will make a determination whether the response may affect ESA-listed species. If the response may overlap in time and space with ESA-listed species under NMFS's authority, the FOSC will initiate an emergency Section 7 consultation under the ESA with NMFS (Figure 4). The emergency Section 7 consultation is another avenue for NMFS to provide recommendations to the FOSC to minimize impacts on ESA-listed species.

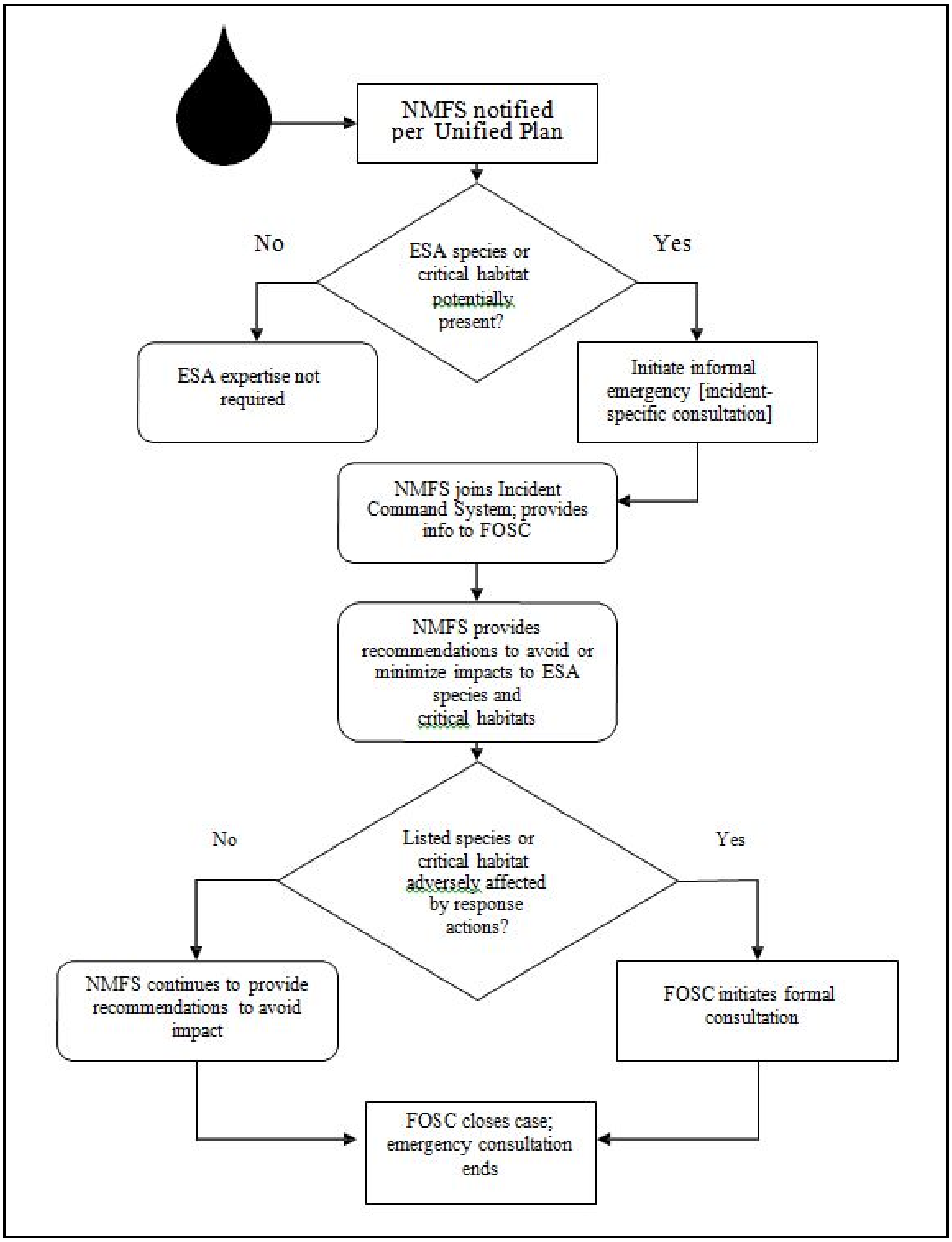


Figure 4. Diagram showing the notification of NMFS and initiation of an emergency ESA Section 7 consultation following an oil spill.

Dispersants or *in situ* burning can serve as methods for mitigating the impacts of oil when response options with mechanical countermeasures are limited and the risk of environmental harm from the spilled oil is great. The use of chemical dispersants outside of the Preauthorization Zone and *in situ* burning as countermeasures for oil spills requires an additional decision-making process under the Unified Plan (Annex F).

Decisions regarding the use of dispersants must take into account the resources at risk, the size of the spill, the physico-chemical properties of the type of oil spilled, the feasibility of the response actions, and site-specific conditions (e.g., weather, sea state, the presence of ice). The overarching criterion for decision-making is whether dispersed oil will be less harmful than non-dispersed oil.

In the absence of pre-authorization, the FOSC must formally request to use dispersants anywhere in Alaska's waters (Figure 5). The FOSC works with the RP, NOAA's SSC, the Environmental Unit of incident command, and other resource agencies to complete a comprehensive, detailed checklist and application, and submit them to the incident-specific ARRT for expedited approval. This request documents the conditions under which the dispersant would be applied and the environmental tradeoffs associated with the decision. The ARRT considers each request on a case-by-case basis. The EPA representative to the ARRT must concur, modify, or reject the request. If State of Alaska waters or interests are involved or threatened by the spill, the state's representative to the ARRT must also concur, modify, or reject the request. EPA and State of Alaska representatives must be in agreement as to the disposition of the FOSC's dispersant use request. DOI and DOC representatives to the ARRT must also be consulted in decisions to use chemical dispersants in case-by-case instances.

Decision-making regarding *in situ* burning should take into account the same information as considered for dispersant use (described above and also described in Revision 1 to the *In Situ* Burning Guidelines for Alaska, included in Annex F to the Unified Plan) (ADEC et al. 2008). Burning may be considered if mechanical countermeasures are ineffective, and burning is feasible and can be conducted at a safe distance from populated areas or sensitive resources.

No other non-mechanical countermeasures have been approved for use in Alaska; any proposal would require approval by ARRT, of which DOC is a member.

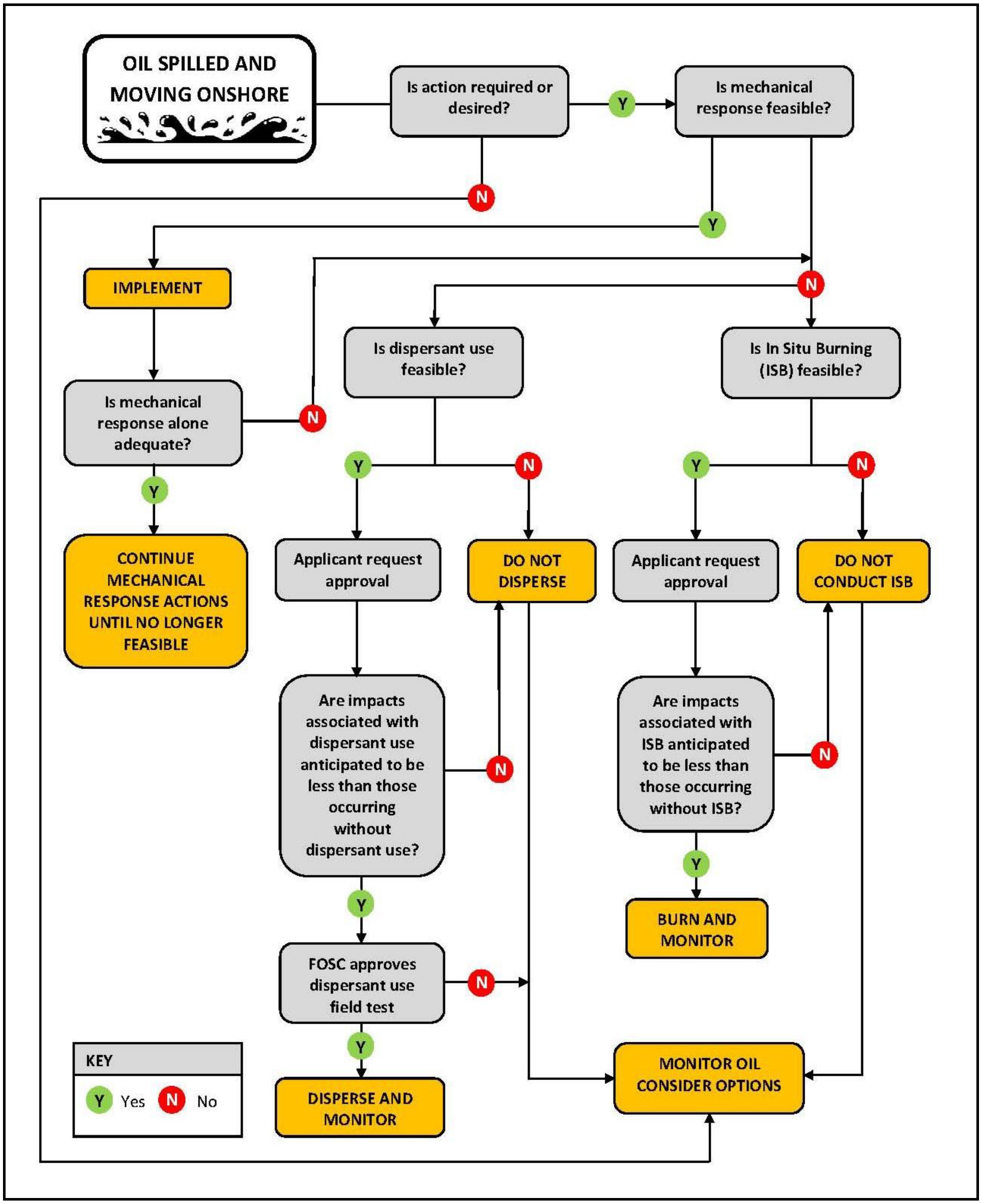


Figure 5. Diagram showing the incident-specific decision-making process for the use of dispersants and *in situ* burning as oil spill response tools.

2.4 INTERRELATED AND INTERDEPENDENT ACTIONS

For purposes of the ESA, "effects of the action" means the direct and indirect effects of an action on the listed species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action (50 CFR 402.02). To concur that an action may affect, but is not likely to adversely affect, listed species, NMFS must find that all of the effects of the proposed action or interrelated or interdependent actions are expected to be insignificant, discountable, or entirely beneficial. *Insignificant effects* relate to the size of the impact and should never reach the scale where a take will occur. *Discountable effects* are those that are extremely unlikely to occur. Based on best judgment, one would not 1) be able to meaningfully measure, detect, or evaluate insignificant effects; or 2) expect discountable effects to occur. *Beneficial effects* are contemporaneous positive effects with no adverse effects to listed species. Determinations are also required of the effects of a federal action on any designated critical habitat for listed species.

Interrelated and interdependent actions are actions that have no independent utility apart from the proposed action. They depend on the larger action for their justification (50 CFR §402.02).

Interrelated and interdependent actions related to oil spill response activities include actions not directed by the Unified Plan, but resulting from decisions made under the Unified Plan. This includes the influx of people and supplies into the response area during an event. Depending on the size of a spill, this associated movement of people and supplies can be the equivalent of a small community, and the effects can be especially pronounced in rural areas of Alaska that do not have the infrastructure to support such a large presence of people and associated activity. The establishment of a small community for the purposes of spill response would include increased flights or marine vessel traffic to the area to transport people and supplies, increased water and energy consumption, increased waste management, and increased human activity in the vicinity of the community (which could have a marine coastal component).

Increased recreational human activity from oil spill responders during their time off may increase baseline stressors on the environment (e.g., potentially increased coastal disturbance, noise, additional oil spills) in marine or coastal areas.

2.5 MITIGATION MEASURES

In addition to the mitigation measures within the action described above, incident-specific mitigation measures will be provided to the Unified Command by NMFS (through the emergency ESA section 7 consultation) to minimize the impact of oil spill response activities to species under NMFS's authority, including all of the ESA-species considered in this consultation. These incident-specific mitigation measures may include:

- Use of protected species observers on response vessels and aircraft engaged in oil spill response or transiting the action area to engage in response (e.g., carrying response personnel or supplies, conducting surveys, deploying response equipment, etc.). Observers are expected to notify vessel and aircraft operators of nearby marine mammals in order to modify the response activity to minimize impacts to wildlife (either through changing direction, slowing vessel speed, or not deploying equipment until marine mammals have departed the area of their own volition). Note: vessels assigned to dispersant application are expected to have protected species observers automatically assigned to that activity to meet the mitigation measures for wildlife avoidance described above.

- Implementation of protected (no-entry) buffer zones around marine mammal concentration areas. This can include altitude minimums for aircraft near seal or sea lion haulouts or rookeries, or avoidance of high-use areas (e.g., migration pathways). Buffer zones can also be areas downwind of proposed *in situ* burning (e.g., NMFS could recommend that *in situ* burning not occur until the wind changes direction if a group of marine mammals would be exposed to heavy smoke from the burn). Buffers could be established around known haulouts or rookeries to prevent responders doing shoreline work from chasing animals into the water, thereby increasing the risk of exposure to oil. Although buffer distances can be incident specific, 1,500 feet is typically recommended.

- Implementation of speed limits for vessels or aircraft. Reduced speeds will likely result in reduced risk of ship strikes for marine mammals, and less noise (less risk of noise-induced harassment). Although speed limits can be incident specific, a maximum speed of 13 knots is typically recommended in Alaska when marine mammals are in the area.

Additional examples of mitigation measures that may be provided to the Unified Command during applicable incidents are listed by response type in Section 5.2 below.

2.6 HISTORIC SPILLS IN ALASKA

The Unified Plan Biological Assessment includes a detailed review of oil and other hazardous materials spills in Alaska marine waters from 1995-2012. Although the historical spill record does not give direct information about future spills, it does help identify high risk areas and shows that spills have occurred throughout the marine waters of Alaska, but primarily in coastal, nearshore areas (Figure 6).

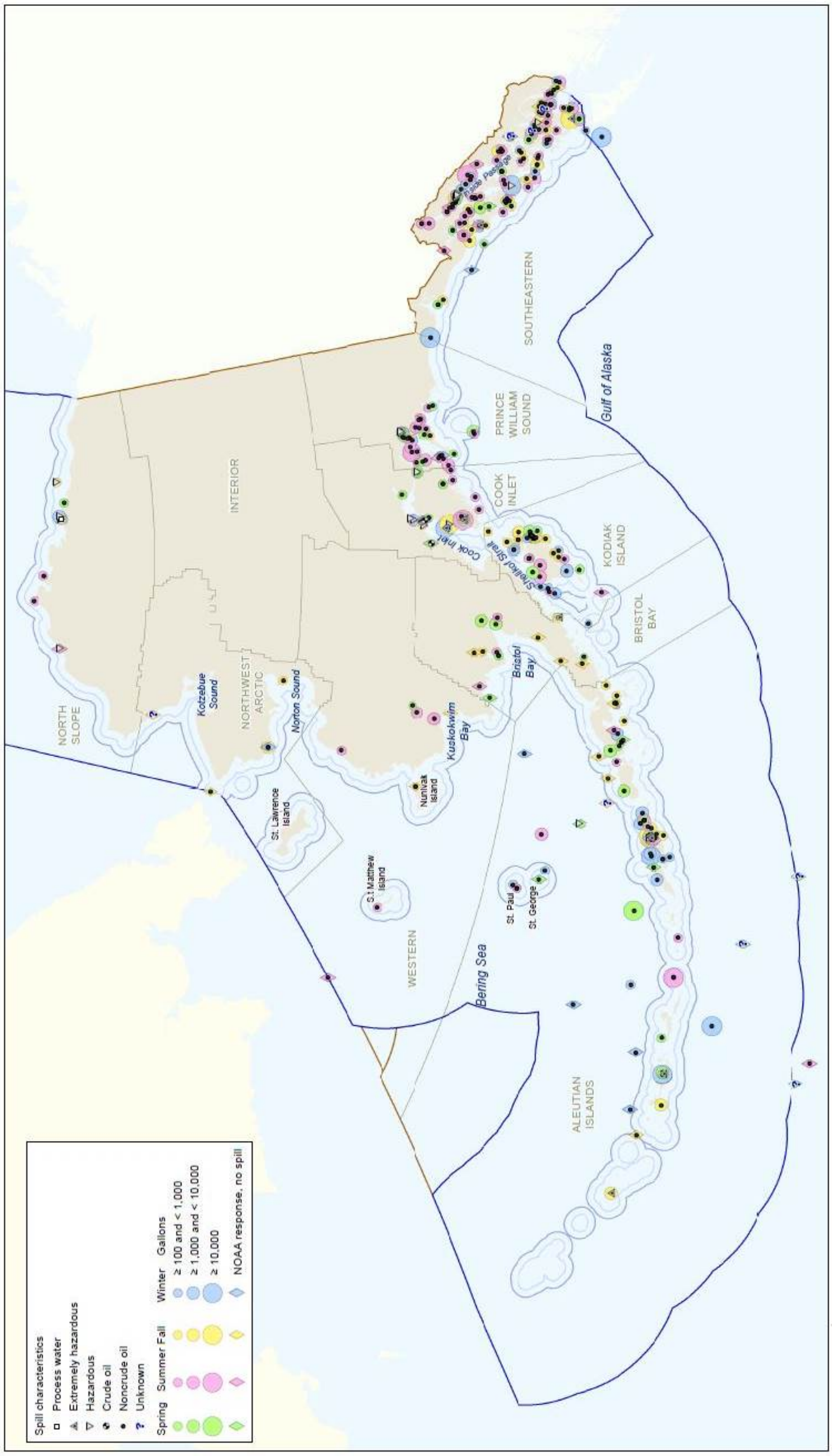


Figure 6. Hazardous materials spills reported in Alaska marine waters from 1995-2012 (adapted from a figure created by Windward Environmental, LLC for the Unified Plan BA using data available in 2012.)

The number and volume of oil and other hazardous materials spills in the marine waters of the State of Alaska is unpredictable and has been highly variable in the past (Table 1). Between 1995-2012 the number of marine spills reported annually ranged from 11 (2005) to 37 (1998), and total annual spill volume ranged from 352,602 gallons (2004) to 5,017 gallons (2003). Most spills in Alaska marine waters between 1995-2012 were non-crude oil spills (primarily diesel and other lighter fuels). Crude oil spills were much less frequent ranging from 0-2 per year, with total volumes ranging from 0 to 924 gallons (1999). The decision-making processes detailed in the Unified Plan could be used to respond to any of the incidents quantified below (Table 1).

Table 1. Total reported spills in Alaska marine waters by year, 1995 to 2012 [adapted from data presented in the Biological Assessment (USCG and EPA 2014)].

	Number of Spills by Material (total spill volume [gal.] in parentheses)						
Year	**Crude Oil**	**Extremely Hazardous Substance**	**Hazardous Substance**	**Non-Crude Oil**	**Process Water**	**Unknown**	**Total by Year**
1995	1 (0)			25 (75,545)			26 (75,545)
1996		2 (28,325)	1 (3,000)	28 (221,735)		1 (742)	32 (253,802)
1997		2 (15,450)	2 (695)	31 (63,849)			35 (79,994)
1998		1 (8,270)	1 (100)	35 (14,655)			37 (23,025)
1999	2 (924)	1 (515)		27 (31,095)			30 (32,534)
2000		1 (7,000)	4 (3,400)	26 (13,271)			31 (23,671)
2001	1 (200)			18 (47,145)		1 (110)	20 (47,455)
2002		1 (1,030)	2 (2,600)	17 (16,195)		1 (500)	21 (20,325)
2003				13 (5,017)			13 (5,017)
2004	1 (100)	1 (1,082)		21 (351,420)			23 (352,602)
2005			2 (6,600)	9 (5,108)			11 (11,708)
2006				23 (6,150)			23 (6,150)
2007		1 (92,736)		29 (27,443)	1 (730)		31 (120,909)
2008			1 (2,100)	22 (150,636)			23 (152, 736)
2009	1 (0)	2 (515)	1 (1,705)	27 (26,685)			31 (28,905)
2010			2 (650)	12 (209,506)			14 (210,156)
2011			1 (1,000)	29 (14,601)			30 (15,601)
2012				12 (22,870)			12 (22,870)
TOTAL							**443 (1,483,005)**

The Alaska region with the greatest number of reported oil and other hazardous substance spills in marine waters between 1995 and 2012 was Southeast Alaska, however, the greatest volume of spills during this same time period occurred in the Aleutian Islands region (Table 2). The Northwest Arctic and Western Alaska regions reported very few spills >100 gallons (2 and 6, respectively), likely due to a lack of reporting, low human population density, and lack of major development. Cook Inlet is the only region to report crude oil spills during the 1995-2012 time period.

Table 2. Number and volume of spills >100 gallons in the marine waters by Alaska region, 1995-2012 [adapted from data presented in the Biological Assessment (USCG and EPA 2014)].

Number of Spills >100 Gallons by Material (total spill volume [gal.] in parentheses)							
Region	**Crude Oil**	**Extremely Hazardous Substance**	**Hazardous Substance**	**Non-Crude Oil**	**Process Water**	**Unknown**	**Total by Region**
Aleutians		6 (129,091)	1 (150)	74 (1,035,373)			81 (1,164,614)
Bristol Bay				7 (7,190)			7 (7,190)
Cook Inlet	4 (1,224)	2 (9,352)	3 (5,505)	19 (9,625)			28 (22,706)
Kodiak Island				46 (48,068)			46 (48,068)
North Slope			3 (8,595)	3 (500)	1 (730)		7 (9,825)
Northwest Arctic				2 (1,897)			2 (1,897)
Prince William Sound			3 (4,300)	40 (70,670)			43 (74,970)
Southeast Alaska		2 (16,480)	7 (6,300)	170 (124,593)		3 (1,352)	182 (148,725)
Western Alaska				6 (5,010)			6 (5,010)
TOTAL							**402 (1,483,005)**

Oil and other hazardous substance spills occur in Alaska year around. It appears that a relatively greater number of spills occurred in July, August, and September in the 1995-2012 time period, while relatively fewer spills occurred March-June, and October-December. In that same time period, January and February reported a relatively moderate number of spills in Alaska marine waters (Figure 7).

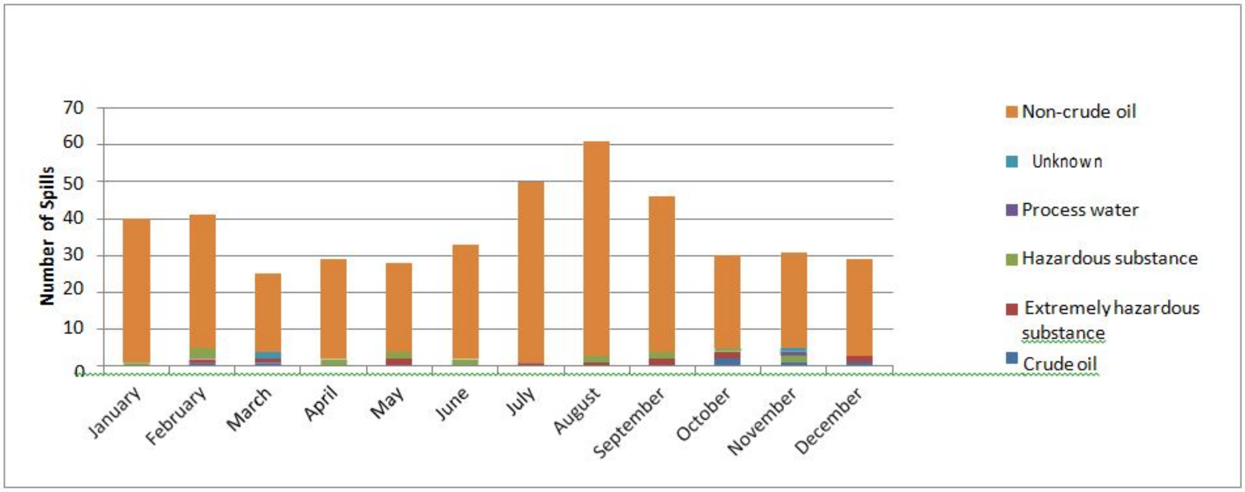


Figure 7. Number of spills in Alaska marine waters between 1995-2012, by month (USCG and EPA 2014).

2.7 ASSUMPTIONS

NMFS conducted this consultation using a number of assumptions. Largely, these relate to the assumption that the Unified Plan will be followed during a response as it is written (including its associated documents described above), and that the recommendations provided by NMFS during an incident in order to minimize effects to ESA-listed species will be followed.

For the purpose of the effects analyses, NMFS assumed that an incident has occurred to trigger the use of the Unified Plan. The Unified Plan is designed for use during response to a spill, or potential spill event, therefore NMFS assumed that the actions under consideration may occur during future spill events.

NMFS also assumes that per the *2001 Inter-agency MOA Regarding Oil Spill Planning and Response Activities Under the Federal Water Pollution Control Act's National Oil and Hazardous Substances Pollution Contingency Plan and the Endangered Species Act* the FOSC and Area Committees will solicit and involve NMFS Protected Resources Division in oil spill response planning when marine mammals under NMFS's authority may be affected.

If a response planning document (supplemental to the Unified Plan) provides contradictory information (e.g., related to a decision-making process or action description) to the Unified Plan, NMFS assumes that responders will defer to and operate under the Unified Plan.

3.0 STATUS OF LISTED SPECIES

The following species and designated critical habitats are considered in this Biological Opinion:

Common Name	Scientific Name	Status	Critical Habitat in AK
Bowhead Whale	*Balaena mysticetus*	Endangered	No
Eastern North Pacific Right Whale	*Eubalaena japonica*	Endangered	Yes
Ringed Seal	*Phoca hispida*	Threatened	No
Bearded Seal	*Erignathus barbatus*	Threatened	No
Western DPS Steller Sea Lion	*Eumetopias jubatus*	Endangered	Yes
Blue Whale	*Balaenoptera musculus*	Endangered	No
Cook Inlet Beluga Whale	*Delphinapterus leucas*	Endangered	Yes
Humpback Whale	*Megaptera novaeangliae*	Endangered	No
Sei Whale	*Balaenoptera borealis*	Endangered	No
Sperm Whale	*Physeter macrocephalus*	Endangered	No
Fin Whale	*Balaenoptera physalus*	Endangered	No
Western North Pacific Gray Whale	*Eschrichtius robustus*	Endangered	No
Chinook Salmon, Lower Columbia River ESU	*Oncorhynchus tshawytscha*	Threatened	No
Chinook Salmon, Upper Columbia River Spring ESU	*Oncorhynchus tshawytscha*	Endangered	No
Chinook Salmon, Puget Sound ESU	*Oncorhynchus tshawytscha*	Threatened	No
Chinook Salmon, Snake River Fall ESU	*Oncorhynchus tshawytscha*	Threatened	No
Chinook Salmon, Snake River Spring/Summer ESU	*Oncorhynchus tshawytscha*	Threatened	No
Chinook Salmon, Upper Willamette River ESU	*Oncorhynchus tshawytscha*	Threatened	No
Coho Salmon, Lower Columbia River ESU	*Oncorhynchus kisutch*	Threatened	No
Steelhead Trout, Lower Columbia River ESU	*Oncorhynchus mykiss*	Threatened	No
Steelhead Trout, Middle Columbia River ESU	*Oncorhynchus mykiss*	Threatened	No
Steelhead Trout, Snake River Basin ESU	*Oncorhynchus mykiss*	Threatened	No
Steelhead Trout, Upper Columbia River ESU	*Oncorhynchus mykiss*	Threatened	No
Steelhead Trout, Upper Willamette River ESU	*Oncorhynchus mykiss*	Threatened	No

3.1 BOWHEAD WHALE (*BALAENA MYSTICETUS*)

Population Structure/Status. The International Whaling Commission (IWC) recognizes four stocks of bowhead whales for management purposes (Allen and Angliss 2014). The Western Arctic bowhead whale stock is the largest, and is the only stock to inhabit U.S. waters (Allen and Angliss 2014) and the action area.

Historically, bowhead whales were severely depleted by commercial harvesting, which ultimately led to the listing of bowhead whales as an endangered species in 1970 (35 FR 8495). The worldwide population of bowhead whales prior to commercial whaling is estimated to have been 50,000 with 9,190-23,000 whales in the Western Arctic stock (Woodby and Botkin 1993, Brandon and Wade 2006). Western Arctic stock numbers dropped below 3,000 by the end of commercial whaling (Woodby and Botkin 1993).

Bowhead whale populations have increased significantly since the prohibitions on commercial whaling. From 1978-2001, the Western Arctic stock of bowhead whales increased at a rate of 3.4% annually during which time abundance doubled from approximately 5,000 to approximately 10,000 whales (George et al. 2004). The most recent population estimate for the Western Arctic bowhead stock is 16,892 with a continued 3.7% annual rate of increase (Givens et al. 2013).

Description/Natural History. Bowhead whales have a circumpolar distribution in high latitudes in the Northern Hemisphere, and range from 54º to 85º N latitude. They live in pack ice for most of the year, typically wintering at the southern limit of the pack ice, or in polynyas (large, semi-stable open areas of water within the ice), and move north as the sea ice breaks up and recedes during the spring. In the action area, bowhead whales are distributed in the seasonally ice-covered waters of the Arctic and subarctic, generally occurring north of 60°N and south of 75°N (Braham 1984, Rugh et al. 2003).

Western Arctic bowheads are widely distributed in the northern Bering Sea during the winter (November-April), generally associated with the marginal ice front. Most of these whales migrate north and east from April-May traveling through the Chukchi Sea into the Beaufort Sea (Figure 8). Bowheads range through the Beaufort Sea during most of the summer (June to September) independent of ice cover. From early September to mid-October, the bowheads move west out of the Beaufort Sea and into the Chukchi Sea, returning to the Bering Sea through the Bering Strait by late-October and December (Figure 8) (Rugh et al. 2003, Allen and Angliss 2014). Some bowhead whales are found in the Chukchi and Bering Seas during the summer months, and are thought to be part of the expanding Western Arctic stock (Rugh et al. 2003).

Bowhead whales are closely associated with sea ice much of the year (Moore and Reeves 1993, Allen and Angliss 2014). The bowhead spring migration from the Bering Sea north to the

Chukchi Sea follows polynyas in the sea ice along the coast of Alaska, generally in the zone between the shorefast ice and mobile pack ice. During the summer, most of the Western Arctic bowhead whales are in the southern Beaufort Sea, an area exposed to oil and gas development activity (Allen and Angliss 2014). During the fall migration south into the Bering Sea, bowheads appear to select shallow-shelf waters in low to moderate sea ice conditions, and slope waters in heavy ice conditions (Moore 2000). In the Bering Sea wintering grounds bowheads often use areas with 100% sea ice cover, even when polynyas are available (Allen and Angliss 2014).

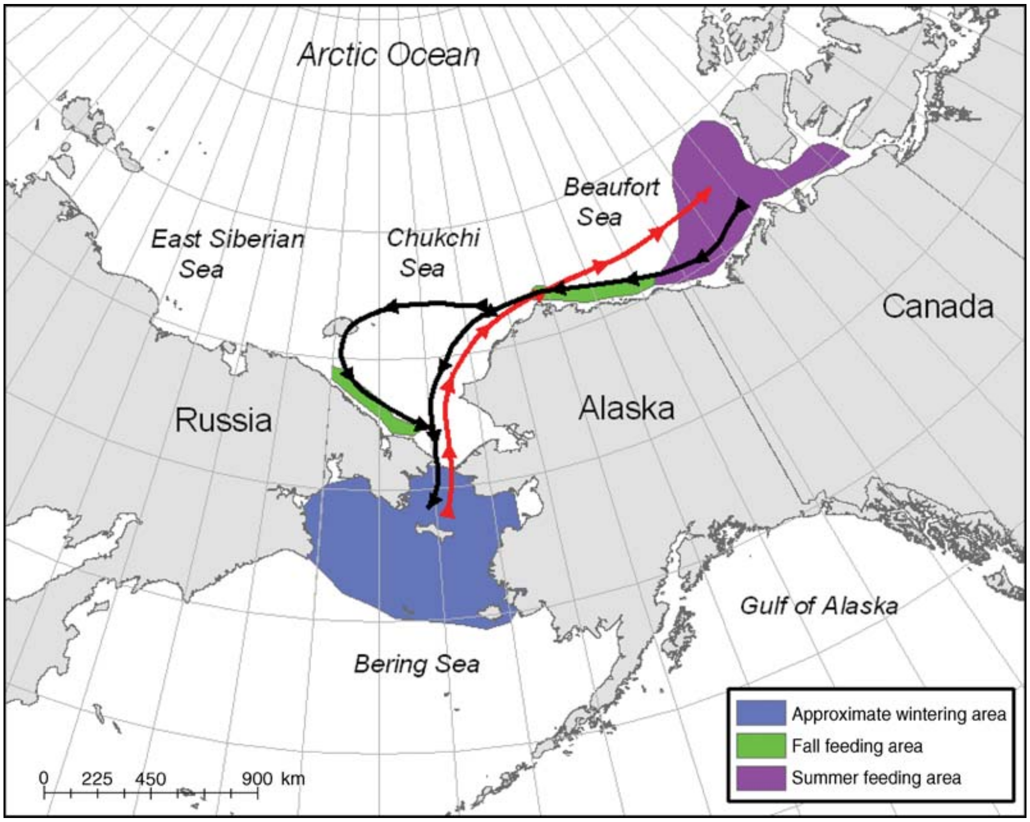


Figure 8. Migration route, feeding areas, and wintering areas for Western Arctic bowhead whales (Moore and Laidre 2006).

Bowheads are filter feeders, filtering prey from the water through baleen fibers in their mouths (Lowry 1993). Food items found in the stomachs of harvested bowheads include euphausiids, copepods, mysids, amphipods, other invertebrates, and fishes (Lowry 1993). Euphausiids and copepods are thought to be their primary prey. It is likely there is considerable inter-annual variability in the locations where feeding occurs during the summer and fall in the Alaska Beaufort Sea, in the length of time individuals spend feeding, and in the number of individuals feeding in various areas in the Beaufort Sea.

Bowhead whales usually travel alone or in groups of three to four individuals, but have been observed in groups of approximately 200 individuals (Clarke et al. 2011). Bowhead whales are well-adapted to navigate and survive in sea ice. Bowheads can move through areas with 100% sea ice coverage using their robust skulls to fracture ice up to 18 centimeters thick in order to breathe (George et al. 1989, Citta et al. 2012). Bowhead whales are thought to use the reverberations of their calls off the undersides of ice floes to help them assess ice thickness and navigate (George et al. 1989). Bowheads have extensive vocal capabilities and may use calls to maintain the social cohesion of groups, attract mates, dominate rivals, or locate food (Würsig and Clark 1993).

Bowhead whales are grouped among low frequency functional hearing baleen whales (Southall et al. 2007). Inferring from their vocalizations, bowhead whales should be most sensitive to frequencies between 20 Hz-5 kHz, with maximum sensitivity between 100-500 Hz (Erbe 2002). Bowhead whale songs have a bandwidth of 20-5000 Hz with the dominant frequency at approximately 500 Hz, and last from 1 minute to hours. Pulsed vocalizations range between 25 and 3500 Hz and last 0.3 to 7.2 seconds (Würsig and Clark 1993, Erbe 2002).

Stressors. Western Arctic bowhead whales are known to interact with fisheries gear, which can result in mortality and serious injury. There are several documented cases of bowheads having ropes or rope scars, some of which has been associated with crab pot gear. Fishing net and line is also an observed entanglement threat to bowheads (Allen and Angliss 2014). The minimum average entanglement rate of bowhead whales in U.S. commercial fisheries from 2007-2011 is 0.4 whales per year (Allen and Angliss 2014).

Bowhead whales have been hunted and harvested for over 2,000 years for subsistence purposes (Stoker and Krupnik 1993), and subsistence takes have been regulated by the International Whaling Commission since 1977 (Allen and Angliss 2014). Alaska native subsistence hunters (primarily from 11 northern Alaska communities) take approximately 0.1-0.5% of the population per year (Suydam et al. 2011, Allen and Angliss 2014). Quotas for aboriginal subsistence whaling are set based on cultural and subsistence need, provided that the quotas are either sustainable or low enough to allow populations to recover if they had previously been depleted by commercial whaling. The IWC-issued U.S./AEWC annual quota from 2014-2018 is anticipated to be 77 strikes, but in no case would exceed 82. Of the 82 strikes, 7 annual strikes are expected to be allotted to the Russian Federation through annual bi-lateral agreements with the U.S.

Transient killer whales are the only known non-human predators of bowhead whales. One study showed that 4.14% to 7.9% of subsistence harvested bowheads had scars indicating they had survived killer whale attacks (George et al. 1994).

Increased oil and gas development and shipping in the Arctic have led to increased noise and disturbance for bowhead whales, increased risk of effects from pollution (including oil spills), and increased risk of ship strike from marine vessel activity.

3.2 EASTERN NORTH PACIFIC RIGHT WHALE (*EUBALAENA JAPONICA*)

Population Structure/Status. The North Pacific right whale is comprised of two populations, the eastern and the western. The eastern population of North Pacific right whale occurs in the Bering Sea and Gulf of Alaska, but may range as far south as Baja California, Mexico in the eastern Pacific, and Hawaii in the central Pacific (Allen and Angliss 2014). This population was severely depleted by legal and illegal commercial whaling up until 1999 (Brownell et al. 2001, Wade et al. 2011a).

Right whales were listed as endangered under the Endangered Species Act in 1973, and on March 6, 2008, NMFS re-listed the North Pacific right whale as endangered as a separate species from the North Atlantic species, *E. glacialis* (73 FR 12024). The eastern North Pacific right whale is arguably the most endangered stock of large whale in the world with approximately 30 individuals (Wade et al. 2011b, Allen and Angliss 2014). The western population is also small and at risk of extinction; however, no reliable published estimate of abundance exists, but survey data suggest it is much larger than the eastern population, numbering several hundred or more animals (Brownell et al. 2001).

No estimate of trend in abundance is currently available. Due to insufficient information, the default cetacean maximum net productivity rate (R_{max}) of 4% is used for this stock, however, given the small apparent size and low observed calving rate of this population, this rate may be unrealistically high (Allen and Angliss 2014). Little is currently known about the rate of reproduction for eastern North Pacific right whales. There have been very few confirmed sightings of calves in the eastern North Pacific this century. Other species of right whales elsewhere in the world are known to calve every three to four years on average, although an increase in the inter-birth interval to more than five years has been reported for the North Atlantic right whale (Kraus et al. 2001).

Description/Natural History. Calving grounds for the eastern North Pacific right whale have not been located (Scarff 1986, Zerbini et al. 2010), and migratory patterns are relatively unknown. It is thought this stock migrates from high-latitude feeding grounds in summer to more temperate waters during the winter, possibly well offshore (Scarff 1986, Clapham et al. 2004). Since 1980, eastern North Pacific right whales have been observed singly or in small groups, sometimes in association with dense zooplankton layers, south of Kodiak, in on-shelf and mid-slope waters in the Gulf of Alaska, near Unimak Pass in the Aleutian Islands, and on the mid-shelf of the Bering Sea, suggesting that this is important habitat for this stock (Shelden et al. 2005, Zerbini et al. 2010, Wade et al. 2011a).

Right whales are large, slow moving whales. They feed by continuously filtering prey through their baleen while swimming mouth agape through patches of zooplankton. Several species of large copepods and other zooplankton constitute the primary prey of the North Pacific right whale.

While no information is available on the eastern North Pacific right whale hearing range, it is anticipated that they are low-frequency specialists similar to other baleen whales. Thickness and width measurements of the basilar membrane have been conducted on North Atlantic right whale and suggest an estimated hearing range of 10 Hz-22 kHz based on established marine mammal models (Parks et al. 2007b). Low-frequency anthropogenic noise such as ship traffic can mask the hearing capabilities of whales, potentially affecting critical life-history events (NRC 2003b), and can result in increased stress levels in right whales (Rolland et al. 2012).

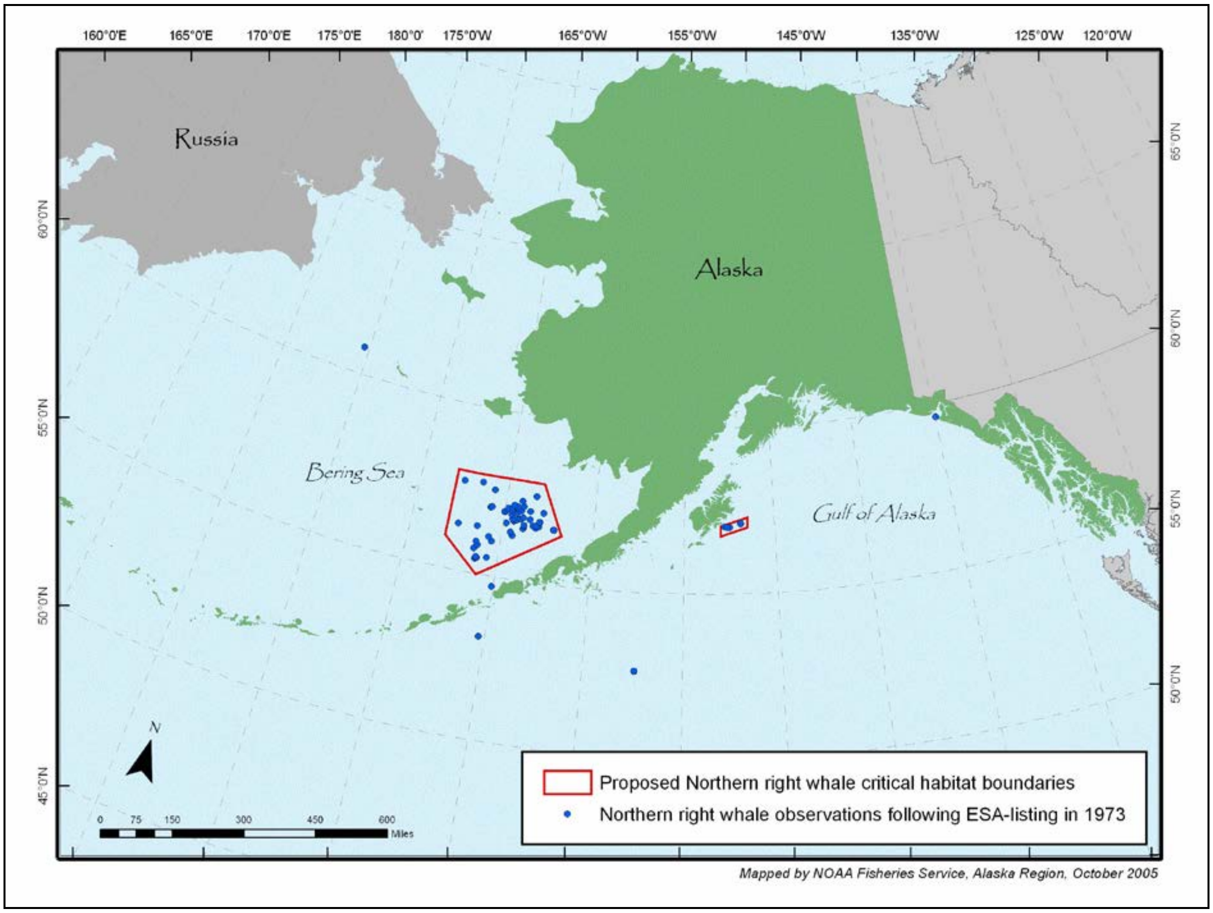
Stressors. There are no records of fisheries mortalities of eastern North Pacific right whales, however, gillnets were implicated in the death of a right whale off the Kamchatka Peninsula in Russia in 1989 (Allen and Angliss 2014). Entanglement in fishing gear, including lobster pot and sink gillnet gear, is a significant source of mortality for the North Atlantic right whale stock (Waring et al. 2004). The only evidence to date of North Pacific right whale entanglement in fishing gear is one photograph taken by a NMFS biologist (Allen and Angliss 2014). Any mortality incidental to commercial fisheries would be considered significant (Allen and Angliss 2014).

Right whales are slow-moving animals and are susceptible to injury or mortality by ship strike. Vessel collisions are considered the primary source of human-caused mortality of right whales in the North Atlantic (Cole et al. 2005). However, due to their rare occurrence and scattered distribution, it is impossible to assess the threat of ship strikes to the eastern North Pacific stock of right whales at this time. There is concern regarding the effects of increased shipping through Arctic waters and Bering Sea with retreating sea ice, which may increase the potential risk to right whales from shipping (Allen and Angliss 2014).

Subsistence hunters in Alaska and Russia are not reported to take animals from this stock (Allen and Angliss 2014). Although killer whales do attack other large whales in Alaska (George et al. 1994), there is no evidence that killer whales attack eastern North Pacific right whales.

Changes in oceanographic conditions that impacts the availability of zooplankton (Stabeno et al. 2012), the primary prey of eastern North Pacific right whales, has the potential to impact the health and fitness of this stock. A number of factors, including a warming climate, are expected to significantly change the distribution and abundance of zooplankton within key feeding areas for the eastern North Pacific right whale in the future (Mueter and Litzow 2008).

Critical Habitat. In 2006, NMFS designed critical habitat for the "northern right whale" including the North Pacific right whale (71 FR 38277), which was not officially split from the North Atlantic individuals until 2008. Two areas in Alaska were included in the designation, one in the Bering Sea and one in the Gulf of Alaska (Figure 9), comprising a total of approximately 95,200 square kilometers (36,750 square miles). From 1973 (when the species was listed under the ESA) to 2006 (when critical habitat was designated)182 of 184 sightings of the North Pacific right whale north of the Aleutians occurred within the area in the Bering Sea designated as critical habitat, and 5 of 14 sightings in the GOA occurred within the GOA critical habitat (Figure 9).



Mapped by NOAA Fisheries Service, Alaska Region, October 2005

Figure 9. Map of Alaska showing the critical habitat designated for the North Pacific right whale, including recorded sightings of the species from 1973-2005.

In 2008, NMFS designated these same two sites in the Bering Sea and Gulf of Alaska as critical habitat for the North Pacific right whale soon after it was listed as endangered as a separate species from the North Atlantic right whale (73 FR 19000). The primary constituent elements protected by the critical habitat designation are species of large zooplankton in areas where right whales are known or believed to feed. In particular, this includes three species of copepods (*Calanus marshallae*, *Neocalanus cristatus*, and *N. plumchrus*) and one species of euphausiid (*Thysanoessa raschii*), whose large size, high lipid content, and occurrence in the region makes it the preferred prey for right whales (73 FR 19000). The two areas designated as critical habitat are characterized by certain physical and biological features which include nutrients, physical oceanographic processes, the above listed species of zooplankton, and long photoperiod due to the high latitude. These feeding areas support a significant assemblage of the remaining North Pacific right whales, and are critical in terms of their conservation value.

3.3 RINGED SEAL (*PHOCA HISPIDA*)

Population Structure/Status. The Alaska stock of ringed seals is the only stock that occurs in U.S. waters and within the proposed action area. This stock is part of the Arctic ringed seal subspecies. Arctic ringed seals have a circumpolar distribution, occur in all seas of the Arctic Ocean, and range seasonally into adjacent seas, including the Bering Sea. Arctic ringed seals are year-round residents in the Chukchi and Beaufort Seas.

NMFS listed Arctic ringed seals as threatened under the ESA on December 28, 2012 (77 FR 76706), primarily due to anticipated loss of sea ice through the end of the 21st century due to ongoing climate change (Kelly et al. 2010b). Arctic ringed seals are thought to number over 1 million, while the Alaska stock is estimated to number at least 300,000 seals (Kelly et al. 2010b, Allen and Angliss 2014). A reliable estimate of the trend in abundance of the Alaska stock of ringed seals is not currently available (Allen and Angliss 2014).

Description/Natural History. Arctic ringed seals remain in contact with sea ice most of the year and use it as a platform for pupping and nursing in late winter and early spring, molting from late spring to early summer, and resting throughout the year (Figure 10). They are well-adapted to occupying shorefast and pack ice and rarely observed onshore (Kelly et al. 2010a). The seasonality of ice cover strongly influences ringed seal movements, foraging, reproductive behavior, and vulnerability to predation.

Ringed seals eat a wide variety of prey in several trophic levels. They most commonly eat small fish (5-10 cm) and crustaceans (2-6 cm). Regional variation in diet is likely due to differences in prey availability and preference, oceanographic differences (e.g., water depth), and sea ice cover (Kelly et al. 2010b). Despite regional differences, gadid fishes tend to be the primary prey of ringed seals from late autumn to early spring, and Arctic cod (*Boreogadus saida*) is often reported to be the most common gadid in seal diets during ice covered months. Invertebrates appear to be an important diet component during open-water months, and large zooplankton are also a significant prey item seasonally (Kelly et al. 2010b).

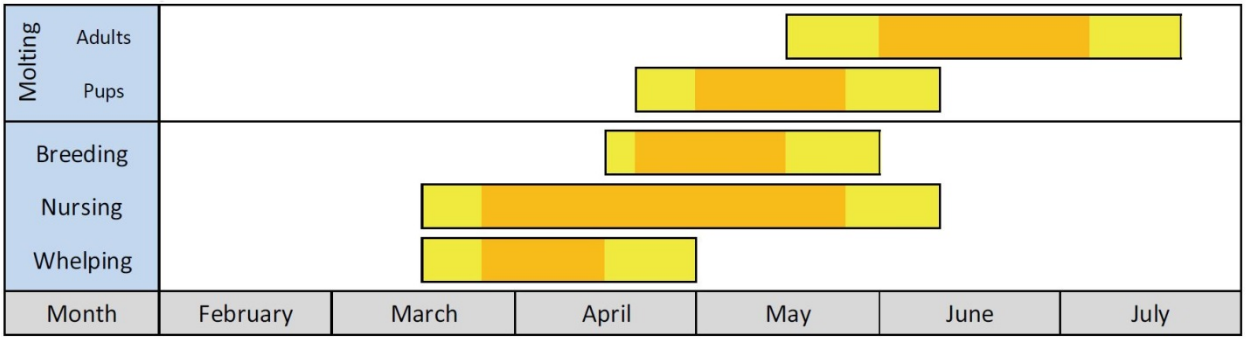


Figure 10. Approximate annual timing of reproduction and molting for Arctic ringed seals. Yellow bars indicate the normal range over which each event is reported to occur and orange bars indicate the peak timing of each event (Kelly et al. 2010b).

Ringed seals vocalize underwater in association with territorial and mating behaviors. Underwater audiograms for phocids suggest that they have very little hearing sensitivity below 1 kHz, though they can hear underwater sounds at frequencies up to 60 kHz and make calls between 90 Hz and 16 kHz (Richardson et al. 1995). A more recent review suggests that the auditory bandwidth for pinnipeds in water should be considered to be 75 Hz to 75 kHz (Southall et al. 2007). Anthropogenic noise has the potential to mask biologically important sounds and even cause injury to ringed seals (Kelly et al. 2010b). Noise exposure may affect the vestibular and neurosensory systems of ringed seals. In pinnipeds, there is direct coupling through the vestibule of the vestibular and auditory systems; therefore, it is possible that noise-induced effects may impact vestibular function as has been shown in land mammals and humans (Southall et al. 2007). Noise-induced effects on vestibular function may be even more pronounced than in land mammals considering a single vibrissa on a ringed seal contains ten times the number of nerve fibers typically found in one vibrissa of a land mammal (Hyvärinen 1989).

<u>Stressors.</u> Between 2007 and 2011, there were incidental serious injuries and mortalities of ringed seals in the Bering Sea/Aleutian Islands flatfish trawl fishery, the Bering Sea/Aleutian Islands pollock trawl, Bering Sea/ Aleutian Islands Pacific cod trawl, and the Bering Sea/ Aleutian Islands Pacific cod longline. Based on data from 2007 to 2011, there was an annual average of 3.52 (CV = 0.06) mortalities of ringed seals incidental to commercial fishing operations (Allen and Angliss 2014).

Prior to 2001, the Alaska Department of Fish Game, Division of Subsistence maintained a database of seal subsistence harvest in Alaska. As of August 2000, the database indicated that the estimated number of ringed seals harvested for subsistence use per year in Alaska is 9,567 (Allen and Angliss 2014). Ice seal subsistence harvest in three Alaskan communities indicated that the number and species of ice seals harvested in a particular village may vary considerably between years (Coffing et al. 1999). These interannual differences are likely due to differences in ice and wind conditions that change the hunters' access to different ice habitats frequented by different types of seals. The estimate of 9,567 ringed seals is the best estimate currently available (Allen and Angliss 2014).

Between 2007 and 2011, there were 4 records of dead and injured ringed seals reported to the Alaska Regional Office Marine Mammal Stranding Network. One male ringed seal was found in 2008 with a packing band and circumferential wound around its neck; it was disentangled. Two injured ringed seals were reported in 2010, one with a bleeding flipper that was captured and released on site, another that was caught in a subsistence salmon set net. This animal was disentangled by ADFG and released. In 2011, one ringed seal was reported dead from a gunshot wound to the head, presumably a struck and lost animal from the subsistence hunt. This animal presented with skin lesions consistent with those seen in animals considered part of the multi-species northern pinniped 2011 Unusual Mortality Event (Allen and Angliss 2014).

Ringed seal predators include polar bears (*Ursus maritimus*), brown bears (*Ursus arctos*), Arctic foxes (*Vulpes lagopus*), red foxes (*Vulpes vulpes*), gray wolves (*Canis lupus*), lynx (*Lynx lynx*), European mink (*Mustela lutreola*), walruses (*Odobenus rosmarus*), killer whales (*Orcinus orca*), Greenland sharks (*Somniosus microcephalus*), common ravens (*Corvus corax*), and glaucous gulls (*Larus hyperboreus*) (Burns and Eley 1976, Heptner et al. 1976b, Fay et al. 1990, Sipilä 2003, Melnikov and Zagrebin 2005). Polar bears prey heavily on ringed seals but with regional and temporal variation (Kelly et al. 2010b).

The main concern about the status of ringed seals stems from the likelihood that their sea-ice and snow habitats have been modified by the warming climate and, more so, that the scientific consensus projections are for continued and perhaps accelerated warming in the foreseeable future (Kelly et al. 2010b). Climate models consistently project overall diminishing ice and snow cover through the 21st century with regional variation in the timing and severity of those loses. Increasing atmospheric concentrations of greenhouse gases are driving climate warming and increasing acidification of the ringed seal's habitat. Changes in ocean temperature, acidification, and ice cover threaten prey communities on which ringed seals depend (Allen and Angliss 2014). Laidre et al. (2008) concluded that on a worldwide basis ringed seals were likely to be highly sensitive to climate change based on an analysis of various life history features that could be affected by climate.

Additional concerns include the potential effects from oil and gas exploration activities, particularly in the outer continental shelf leasing areas, such as harm and harassment from vessel traffic, seismic exploration noise, or the potential for oil spills.

3.4 BEARDED SEAL (*ERIGNATHUS BARBATUS*)

Population Structure/Status. There are two described subspecies of bearded seal: *E. b. barbatus*, which inhabits the Atlantic region (Laptev, Kara, and Barents seas, North Atlantic Ocean, and Hudson Bay), and *E. b. nauticus*, which inhabits the Pacific region (remaining portions of the Arctic Ocean and the Bering and Okhotsk seas) (Rice 1998). The geographic distributions of the subspecies are not separated by distinct gaps, and regions of overlap occur along the Russian and central Canadian coasts (Rice 1998). Two distinct population segments (DPSs) are recognized for the *E. b. nauticus* subspecies–the Okhotsk DPS in the Sea of Okhotsk, and the Beringia DPS, which occurs in the Bering, Chukchi, Beaufort, and East Siberian seas. Only the Beringia DPS of bearded seals is found in U.S. waters (and the action area), and is also referred to as the Alaska stock (Figure 11) (Allen and Angliss 2014).

NMFS listed the Beringia DPS of bearded seals as threatened under the ESA on December 28, 2012 (77 FR 76740), primarily due to anticipated loss of sea ice through the end of the 21st century due to ongoing climate change (Allen and Angliss 2014). In a core area of their range in the central and eastern Bering Sea, the Beringia bearded seal DPS abundance is estimated to be 61,800 (Ver Hoef et al. 2013). Estimated abundance for the entire range of the Beringia DPS is 155,150 (Cameron et al. 2010). A reliable estimate of the trend in abundance of the Beringia DPS of bearded seals is not available (Allen and Angliss 2014).

Description/Natural History. Bearded seals closely associate with sea ice, particularly during the critical life history periods related to reproduction and molting, and can be found in a broad range of ice types. They generally prefer ice habitat that is in constant motion and produces natural openings and areas of open water such as leads, fractures, and polynyas, for breathing, hauling out on the ice, and access to water for foraging (Heptner et al. 1976a). Bearded seals tend to prefer areas with 70-90% sea ice coverage, and typically are more abundant 20-100 nautical miles from shore than within 20 nautical miles of shore (Bengtson et al. 2005). Many of the bearded seals that spend the winter in the Bering Sea migrate north through the Bering Strait from late-April through June, and spend the summer near the ice edge in the Chukchi Sea (Allen and Angliss 2014). Summer distribution is broad with seals rarely hauled up on land, and some seals that do not follow the ice north remaining near the coasts of the Bering and Chukchi Seas (Heptner et al. 1976a, Allen and Angliss 2014). As the ice forms again in the fall and winter, most bearded seals move south with the advancing ice edge through Bering Strait and into the Bering Sea where they spend the winter (Burns and Frost 1979, Cameron and Boveng 2009, Cameron et al. 2010). This southward migration is less noticeable and predictable than the northward movements in late spring, early summer (Burns and Frost 1979, Burns 1981, Cameron et al. 2010).

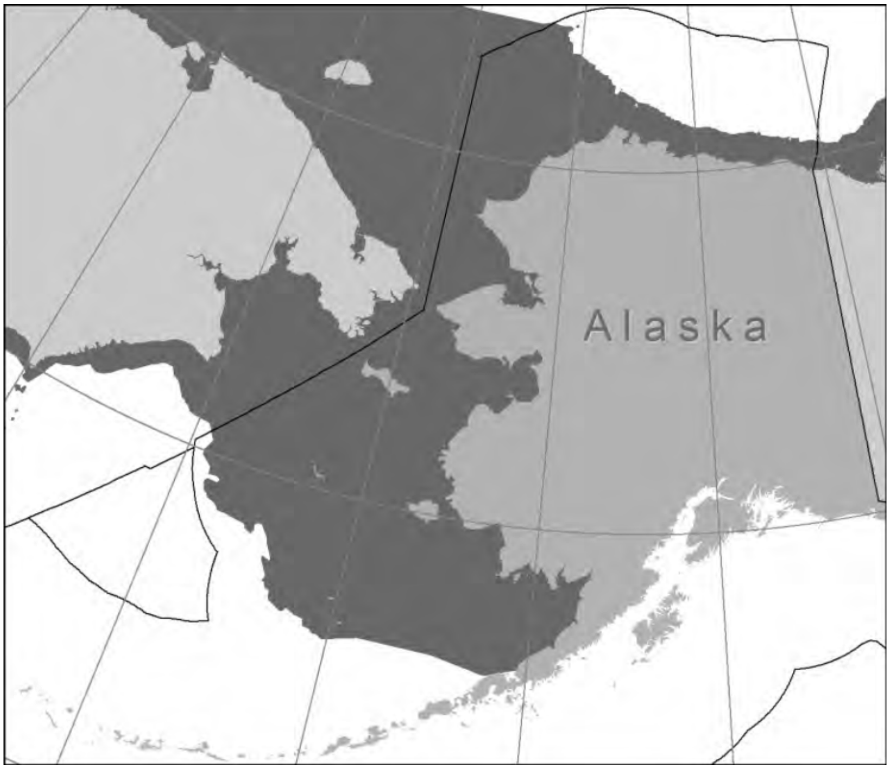


Figure 11. Approximate distribution of Beringia DPS bearded seals (shaded area) in Alaska. The combined summer and winter distribution are depicted (Allen and Angliss 2014).

The Bering and Chukchi seas are the largest area of continuous habitat for bearded seals (Burns 1981, Allen and Angliss 2014). Bearded seals can reach the bottom everywhere along the relatively shallow Bering Sea shelf thereby foraging more efficiently (Burns 1967). The Bering and Chukchi seas are generally covered by sea ice in late-winter and spring and are then mostly ice free in late-summer and fall, a process that drives a seasonal pattern in the movements and distribution of bearded seals in this area (Burns 1967, Allen and Angliss 2014).

Bearded seals are foraging generalists, but feed primarily on benthic organisms, which include invertebrates and demersal fishes (Cameron et al. 2010). They are able to switch their diet to pelagic schooling fishes when readily available. The bulk of their diet is bivalve mollusks, crustaceans such as crab and shrimp, and fishes such as sculpin, Arctic cod, saffron cod (*Eleginus gracilis*), and polar cod (*Arctogadus glacialis*) (Cameron et al. 2010). They primarily feed on or near the bottom, generally diving to depths of less than 100 meters (though dives of adults have been recorded up to 300 meters and young-of-the-year have been recorded diving down almost 500 meters) (Gjertz et al. 2000). Unlike walrus that root in the soft sediment for benthic organisms, bearded seals are believed to scan the surface of the seafloor with their highly sensitive whiskers, burrowing only in the pursuit of prey (Marshall et al. 2006, Marshall et al.

2008). Diet may vary with age, location, season, and possible changes in prey availability (Cameron et al. 2010).

Bearded seals are solitary throughout most of the year except for the breeding season. In the spring, adult males are suspected to spend a majority of their time in the water vocalizing and defending territories, though a few observations suggest they are not entirely aquatic and may haul out near females with or without pups (Burns 1967, Finley and Renaud 1980).

Pinnipeds have a well-developed vestibular apparatus that likely provides multiple sensory cues similar to those of most land mammals (Southall et al. 2007). Underwater audiograms for phocids suggest that they have very little hearing sensitivity below 1 kHz, though they can hear underwater sounds at frequencies up to 60 kHz and make calls between 90 Hz and 16 kHz (Richardson et al. 1995). A more recent review suggests that the auditory bandwidth for pinnipeds in water should be considered to be 75 Hz to 75 kHz (Southall et al. 2007). Anthropogenic noise has the potential to mask biologically important sounds for bearded seals, resulting in increased energy expenditure and changes in behavior (Cameron et al. 2010). Noise exposure may affect the vestibular and neurosensory systems of bearded seals. In pinnipeds, there is direct coupling through the vestibule of the vestibular and auditory systems; therefore, it is possible that noise-induced effects may impact vestibular function as has been shown in land mammals and humans (Southall et al. 2007).

Stressors. Between 2007 and 2011, there were incidental serious injuries and mortalities of bearded seals in the Bering Sea/Aleutian Islands pollock trawl and the Bering Sea/Aleutian Islands flatfish trawl fisheries. The estimated minimum mortality rate incidental to commercial fisheries is 1.8 (CV = 0.05) bearded seals per year, based exclusively on observer data.

Bearded seals are an important species for Alaska subsistence hunters. From 1966 to 1977, annual harvest in Alaska was estimated at 1,784 (SD = 941) bearded seals (Burns 1981). Prior to 2001, the Alaska Department of Fish Game, Division of Subsistence maintained a database of seal subsistence harvest in Alaska. Using data from the 1980s and 1990-1998, the subsistence harvest database indicated that the estimated number of bearded seals harvested for subsistence use per year was 6,788. This is currently the best available estimate for annual subsistence harvest of bearded seals (Allen and Angliss 2014).

Mortalities may occasionally occur incidental to marine mammal research activities authorized under MMPA permits issued to a variety of government, academic, and other research organizations. Between 2007-2011, there was 1 mortality resulting from research on the Alaska stock of bearded seals (2007), resulting in an average of 0.2 mortalities per year from this stock (Allen and Angliss 2014).

Direct observations or data on predation of bearded seals are limited. Known predators include polar bears, killer whales, brown bears, and rarely, walruses (Heptner et al. 1976a, Lowry and Fay 1984, Cameron et al. 2010). The Greenland shark is also a suspected predator of bearded seals (Heptner et al. 1976a).

The main concern about the conservation status of bearded seals stems from the likelihood that their sea-ice habitat has been modified by the warming climate and, more so, that the scientific projections are for continued and perhaps accelerated warming in the foreseeable future (Cameron et al. 2010). For bearded seals, the presence of sea ice is considered a requirement for whelping and nursing young. A second major concern, driven primarily by the production of carbon dioxide (CO2) emissions, is the modification of habitat by ocean acidification, which may alter prey populations and other important aspects of the marine ecosystem (Allen and Angliss 2014).

Additional concerns include the potential effects from oil and gas exploration activities, particularly in the outer continental shelf leasing areas, such as disturbance from vessel traffic, seismic exploration noise, or the potential for oil spills.

3.5 STELLER SEA LION (*EUMETOPIAS JUBATUS*)

Population Structure/Status. There are two Steller sea lion populations in Alaska: the western DPS is listed as endangered, and generally occurs west of Cape Suckling, and the eastern DPS generally occurs east of Cape Suckling, Alaska (144°W longitude). However, large movements by individual Steller sea lions on either side of the 144°W longitude demarcation are fairly common, and western DPS individuals are expected to occur in Southeast Alaska north of Sumner Strait (Jemison et al. 2013, NMFS 2013b). Steller sea lions are not known to migrate annually, but individuals may widely disperse outside of the breeding season (late-May to early-July) (Jemison et al. 2013, Allen and Angliss 2014).

The Steller sea lion was listed as a threatened species under the ESA in 1990 following declines of 63% on certain rookeries since 1985, and declines of 82% since 1960 (NMFS 2012). In 1997, NMFS reclassified the Steller sea lion into the two current DPSs and designated the western DPS as endangered (May 5, 1997; 62 FR 24345). A number of protective measures were implemented to aid recovery (NMFS 2012), and between the 1970s and 2002 the eastern DPS Steller sea lion population increased on average by 3.1% per year (Pitcher et al. 2007), which is one factor that led to NMFS's recent decision to delist the eastern DPS (November 4, 2013; 78 FR 66140).

The most recent comprehensive estimate (pups and non-pups) for the western DPS abundance in Alaska is 52,209 sea lions based on aerial surveys of non-pups conducted in June and July 2008-2011, and aerial and ground-based pup counts conducted in June and July 2009-2011 (Allen and Angliss 2014). The western DPS declined in abundance by about 70% between the late 1970s and 1990, with evidence that the decline had begun even earlier. Factors that may have contributed to this decline include 1) incidental take in fisheries, 2) legal and illegal shooting, 3) predation, 4) contaminants, 5) disease, and 6) climate change (NMFS 2008). Although Steller sea lion abundance continues to decline in the western Aleutians, numbers are thought to be increasing in the eastern part of the western DPS range (DeMaster 2011).

Description/Natural History. Steller sea lions range throughout the North Pacific Ocean from Japan, east to Alaska, and south to central California (Loughlin et al. 1984). They range north to the Bering Strait, with significant numbers at haul outs on St. Lawrence Island in the spring and fall (Kenyon and Rice 1961, Sheffield and Jemison 2010). Breeding range extends along the northern edge of the North Pacific Ocean from the Kuril Islands, Japan, through the Aleutian Islands and Southeast Alaska, south to California (Loughlin et al. 1984). Steller sea lions, the largest of the eared seals (*Otariidae*), currently have a worldwide population estimated at 142,360-157,498 animals (Allen and Angliss 2014). Historically, Steller sea lion abundance was significantly greater with an estimated worldwide population of 245,000 to 290,000 animals in the late 1970s (Loughlin et al. 1984).

Land sites used by Steller sea lions are referred to as rookeries and haulouts. Rookeries are used by adult sea lions for pupping, nursing, and mating during the reproductive season (generally from late May to early July). Haulouts are used by all age classes of both genders but are generally not where sea lions reproduce. Sea lions move on and offshore for feeding excursions. At the end of the reproductive season, some females may move with their pups to other haulout sites and males may migrate to distant foraging locations (Spalding 1964, Pitcher and Calkins 1981). Sea lions may make semi-permanent or permanent one-way movements from one site to another (Chumbley et al. 1997, Burkanov and Loughlin 2005). Round trip migrations of greater than 6,500 km by individual Steller sea lions have been documented (Jemison et al. 2013).

Most adult Steller sea lions occupy rookeries during the pupping and breeding season, which extends from late May to early July (Pitcher and Calkins 1981, Gisiner 1985), and exhibit high site fidelity (Sandegren 1970). During the breeding season some juveniles and non-breeding adults occur at or near the rookeries, but most are on haulouts (Rice 1998; Ban 2005; Call and Loughlin 2005).

The foraging strategy of Steller sea lions is strongly influenced by seasonality of sea lion reproductive activities on rookeries, and the ephemeral nature of many prey species. Steller sea lions are generalist predators that eat a variety of fishes and cephalopods (Pitcher 1981, Calkins and Goodwin 1988, NMFS 2008), and occasionally other marine mammals and birds (Pitcher and Fay 1982, NMFS 2008).

The ability to detect sound and communicate underwater is important for a variety of Steller sea lion life functions, including reproduction and predator avoidance. Loud anthropogenic sounds can interfere with Steller sea lion auditory capabilities. Steller sea lions are categorized in the pinniped functional hearing group which has an estimated auditory bandwidth of 75 Hz to 75 kHz in-water, and 75 Hz to 30 kHz on land (Southall et al. 2007). Studies of Steller sea lion auditory sensitivities have found that this species detects sounds underwater between 1 to 25 kHz (Kastelein et al. 2005), and in the air between 0.25 to 30 kHz (Mulsow and Reichmuth 2010).

Stressors. Between 2007-2011, there were incidental serious injuries and mortalities of western Steller sea lions observed in the following fisheries: Bering Sea/Aleutian Islands Atka mackerel trawl, Bering Sea/Aleutian Islands flatfish trawl, Bering Sea/Aleutian Islands Pacific cod trawl, Bering Sea/Aleutian Islands pollock trawl, and Gulf of Alaska Pacific cod longline (Allen and Angliss 2014). In addition, observers monitoring the Prince William Sound salmon drift gillnet fishery in 1990 and 1991 recorded 2 Steller sea lion mortalities in 1991, extrapolated to 29 (95% CI: 1-108) kills for the entire fishery (Wynne et al. 1992). The combined average annual mortality estimate in observed fisheries is 29.6 (CV = 0.49) western DPS Steller sea lions (Allen and Angliss 2014).

Entanglement or other interactions with fishing gear is another source of Steller sea lion mortality or injury. From 2007 to 2011, there were four confirmed fishery-related Steller sea lion strandings in the range of the western DPS (Allen and Angliss 2014). Fishery-related strandings during 2007-2011 result in an estimated annual mortality of 0.8 western DPS Steller sea lions. This estimate is considered a minimum because not all entangled animals strand and not all stranded animals are found or reported (Allen and Angliss 2014). Based on observer data (29.6) and stranding data (0.8), the minimum estimated mortality rate incidental to commercial and recreational fisheries is 30.4 (Allen and Angliss 2014).

The mean annual subsistence take (harvested plus struck-and-lost) from this DPS from 2004 through 2008, combined with the mean take over the 2007-2011 period from St. Paul, was 199 western DPS Steller sea lions/year (Allen and Angliss 2014).

Reports from the NMFS stranding database of Steller sea lions entangled in marine debris or with injuries caused by other types of human interaction are another source of mortality data. From 2007 to 2011, one animal possessed a circumferential neck entanglement of unknown marine debris, and presented with a gaff puncture wound. The mean annual mortality and serious injury from other sources of human interactions for 2007-2011 is 0.4 indivduals.

Records from NMFS Office of Law Enforcement indicate that there were two cases of illegal shootings of Steller sea lions in the Kodiak area in 1998, both of which were successfully prosecuted. There were no cases of successfully prosecuted illegal shootings between 1999 and 2003 (Allen and Angliss 2014).

Mortalities may occasionally occur incidental to marine mammal research activities authorized under MMPA permits issued to a variety of government, academic, and other research organizations. However, between 2006-2010, there were zero mortalities resulting from research on western DPS Steller sea lions (Allen and Angliss 2014).

Nutritional stress related to competition with commercial fisheries or environmental change, predation by killer whales, and environmental variability have been identified as potentially important stressors affecting recovery (Allen and Angliss 2014).

Critical Habitat. NMFS designated Steller sea lion critical habitat on August 27, 1993 (58 CFR 45269). Steller sea lion critical habitat in Western Alaska includes a 20 nautical mile buffer around all major haulouts and rookeries, as well as associated terrestrial, air and aquatic zones, and three large offshore foraging areas (Figure 12). Critical habitat in Southeast Alaska includes a terrestrial zone, an aquatic zone, and an air zone that extend 3,000 feet landward, seaward, and above, respectively, at each major rookery and haulout (Figure 13).

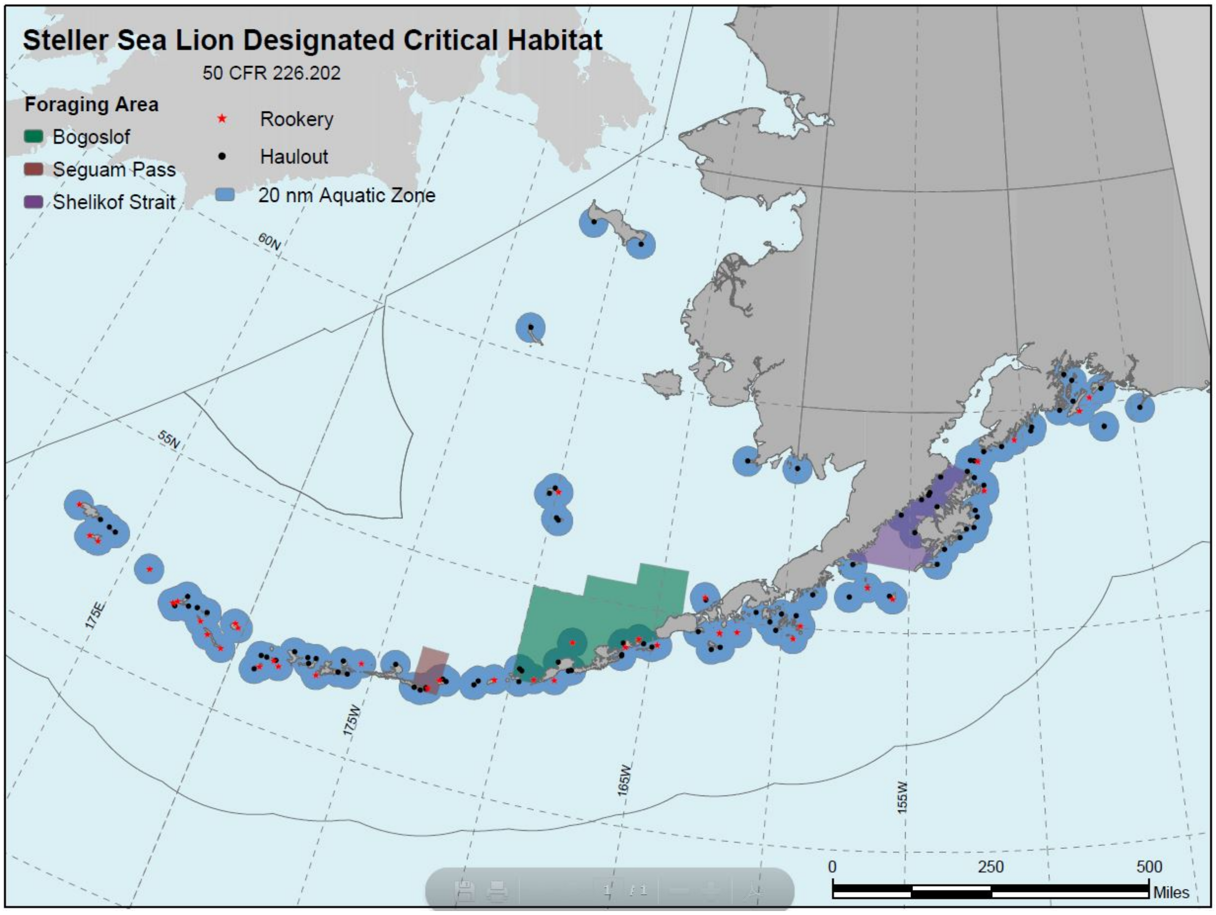


Figure 12. Designated Steller sea lion critical habitat in Western Alaska.

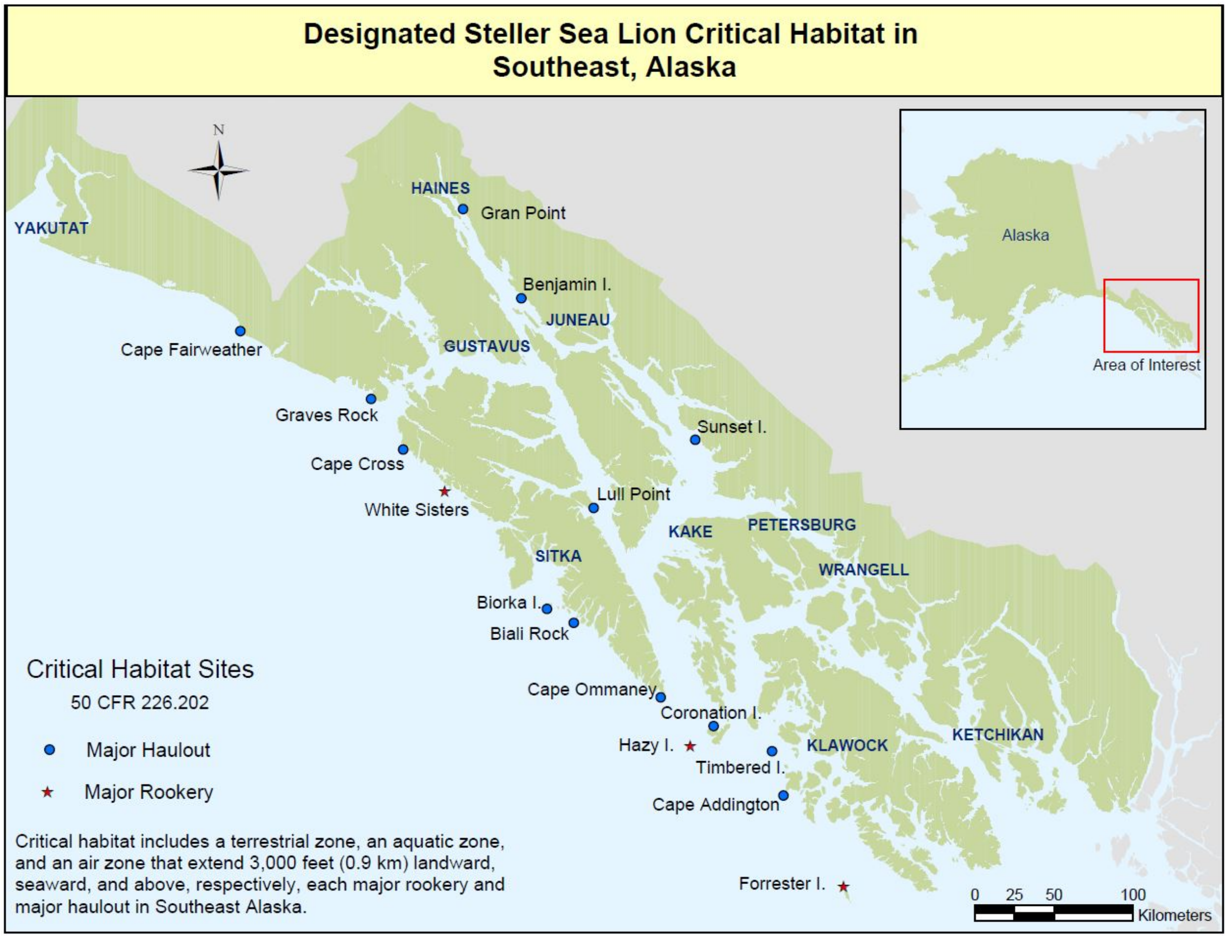


Figure 13. Designated Steller sea lion critical habitat in Southeast Alaska.

The areas designated as critical habitat for the Steller sea lion were determined using the best information available at the time, including information on land use patterns, the extent of foraging trips, and the availability of prey items. Particular attention was paid to life history traits and the areas where animals haul out to rest, pup, nurse their pups, mate, and molt.

3.6 BLUE WHALE (*BALAENOPTERA MUSCULUS*)

Population Structure/Status. NMFS listed blue whales as endangered in 1970 (35 FR 18319) following substantial depletion due to commercial whaling. Prior to commercial exploitation of blue whales, the worldwide population is estimated to have been over 300,000 (Sears and Calambokidis 2002), including 6,000 in the North Pacific (Rice 1974). Currently, blue whales are thought to number between 5,000-12,000 worldwide (Sears and Calambokidis 2002), with at least 3,000 individuals in the North Pacific (Calambokidis and Barlow 2004). Both the eastern and central stocks are present in Alaska waters. The best current estimate of the eastern stock, which ranges from the northern Gulf of Alaska to the eastern tropical Pacific, is 1,647 individuals (CV = 0.07) (Carretta et al. 2014). A 2010 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in a summer/fall central North Pacific blue whale stock abundance estimate of 81 (CV = 1.14) (Bradford et al. 2013). This is currently the best available abundance estimate for this stock within the Hawaii EEZ, but the majority of blue whales would be expected to be at higher latitude feeding grounds at this time of year (Carretta et al. 2014). Worldwide, populations of blue whales are thought to be increasing, including in the North Pacific (Branch et al. 2004).

Description/Natural History. Blue whales are present in every ocean except the Arctic Ocean, and three subspecies are described: *B. m. musculus,* in the Northern Hemisphere; *B. m. intermedia,* in the Antarctic; and *B. m. brevicauda,* in the sub-Antarctic zone of the southern Indian Ocean and southwestern Pacific Ocean. Blue whales that occur in Alaska waters (Gulf of Alaska and southern Bering Sea) are in two sub-populations; the eastern North Pacific and central North Pacific stocks.

Blue whales appear to migrate seasonally, depending on their food requirements. Alaska populations of blue whales are believed to travel north in the spring to access the higher-density zooplankton blooms and south toward Hawaii in the fall to take advantage of warmer waters for breeding (NMFS 1998). Therefore, blue whales are only present in Alaska waters during their non-breeding season. Blue whales are found in a variety of marine environments. They inhabit and feed in open water, both offshore coastal regions and open ocean areas, and are frequently found on the continental shelf and far offshore in deep water. Females with calves are routinely observed in the Gulf of California from December to March, leading to the belief that the area is used for nursing and calving (NMFS 1998).

The primary prey of North Pacific blue whales is krill (small euphausiid crustaceans, specifically *Euphausia pacifica*, several *Thysanoëssa* species, and *Nematoscelis megalops*) (NMFS 1998). Blue whales appear to spend most of their time in highly productive waters and are thought to feed year around (Carretta et al. 2014).

As is the case for all large baleen whales, direct information about the hearing abilities of blue whales is not available. Researchers studying *Mysticete* auditory apparatus morphology hypothesized that large *Mysticetes* have acute infrasonic hearing (Ketten 1997). Blue whales are categorized in the low frequency cetacean functional hearing group (Southall et al. 2007). This group has an estimated auditory bandwidth of 7 Hz to 22 kHz. Direct data on blue whale hearing sensitivity is not available but has been estimated based on behavioral responses to sounds at various frequencies, favored vocalization frequencies, body size, ambient noise levels at favored frequencies, and cochlear morphometry. Blue whales alter their behavior within hearing range of 1-10 kHz mid-frequency sonar (Goldbogen et al. 2013).

Stressors. The California swordfish drift gillnet fishery is the only fishery that is likely to take blue whales from the eastern North Pacific stock, but no fishery mortality or serious injuries have been observed since the observer program was initiated in 1990 (Carretta et al. 2014). There are currently two distinct longline fisheries based in Hawaii that overlap in time and space with the central North Pacific stock: a deep-set longline fishery that targets primarily tunas, and a shallow-set longline fishery that targets swordfish. Between 2007 and 2011, no blue whales were observed hooked or entangled in either fishery (Carretta et al. 2014).

Between 2007 and 2011, ship strikes were linked to the deaths of nine eastern North Pacific blue whales (Carretta et al. 2013). Five mortalities occurred in 2007, the highest number recorded for any year. The remaining four ship strike mortalities occurred in 2009 (2) and 2010 (2). One additional whale was seriously injured in 2010, and there were an additional four serious injuries of unidentified large whales attributed to ship strikes, some of which may have been blue whales (Carretta et al. 2013). Documented ship strike mortalities and serious injuries are derived from actual counts of whale carcasses, and should be considered minimum values.

Increasing levels of anthropogenic sound in the world's oceans (Hildebrand 2009) have been suggested to be a recovery concern for blue whales (NMFS 1998). Tagged blue whales exposed to simulated mid-frequency sonar and pseudo-random noise demonstrated a variety of behavioral responses, including no change in behavior, termination of deep dives, directed travel away from sound sources, and cessation of feeding (Goldbogen et al. 2013). One concern expressed by the authors is if blue whales did not habituate to such sounds near feeding areas that "repeated exposures could negatively impact individual feeding performance, body condition and ultimately fitness and potentially population health."

A high proportion of the blue whales in the Gulf of California have injuries or rake-like scars that are the result of encounters with killer whales (Sears 1990), and killer whales were observed attacking a blue whale off Baja California indicating that blue whales are vulnerable to killer whale predation (Tarpy 1979).

Other potential stressors of concern include exposure to pollution events (e.g., chronic or acute oil spills), and changes in prey availability due to climate change.

3.7 COOK INLET BELUGA WHALE (*DELPHINAPTERUS LEUCAS*)

Population Structure/Status. Beluga whales are distributed throughout Arctic and subarctic waters of the northern hemisphere (Gurevich 1980). NMFS recognizes 5 stocks of beluga whales in Alaska, and the Cook Inlet beluga whale is a distinct population restricted to the waters of Cook Inlet, Alaska (Figure 14). Some beluga populations migrate seasonally over long distances, but the Cook Inlet stock remains in the inlet year-round (Hobbs et al. 2008). Of the five stocks in

US waters, only the Cook Inlet stock is found south of the Alaska Peninsula; genetic analyses indicate that this stock is the most isolated of the five (O'Corry-Crowe et al. 2002).

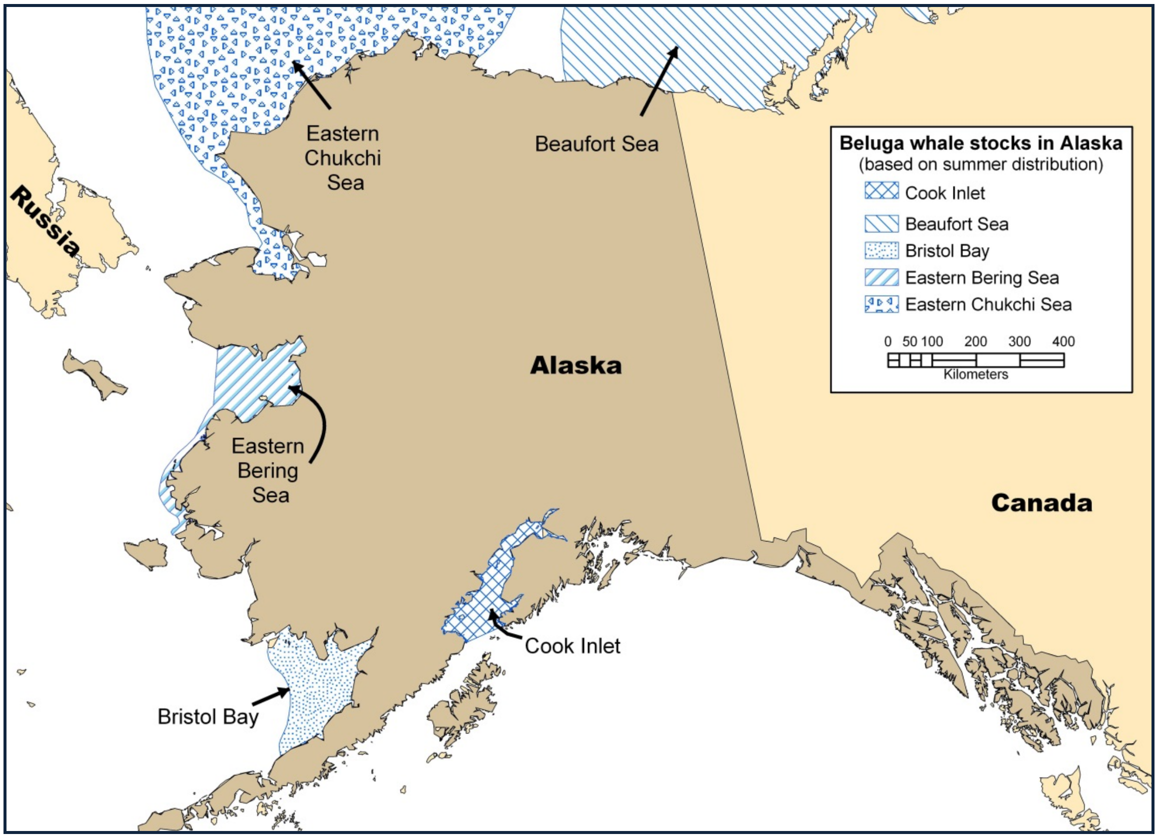


Figure 14. Map showing the range of the 5 beluga whale stocks in Alaska. The Cook Inlet beluga whale DPS is restricted to the waters of Cook Inlet.

NMFS listed the Cook Inlet beluga whale as endangered in 2008 (73 FR 62919). Cook Inlet belugas numbered as many as 1,300 whales in the 1970s. In 1994 NMFS initiated annual aerial counts of Cook Inlet beluga whales, when the population was estimated to be 653. Between 1994-2012 Cook Inlet beluga numbers declined to an estimated 312 individuals (Hobbs 2013, Allen and Angliss 2014). From 2002 to 2012, the rate of decline was -0.6% per year (Allen and Angliss 2014).

Description/Natural History. Beluga whales are relatively small (3.7 to 4.3 meters in length) *Odontocetes* (toothed whales). Beluga whales mate in the spring, usually in March or April, in small bays and estuaries. Gestation lasts about 14-15 months, and calves are born between March and September, mostly between May and July. Females give birth to single calves (on rare occasion, twins) every two to three years. Beluga calves nurse for at least 12 to 18 months, until their teeth emerge, at which point they supplement their diets with shrimp and small fishes. Most calves continue to nurse for another year after beginning to eat solid food. Female belugas begin to reproduce at 4 to 7 years of age and males at 7 to 9 years. Their lifespan is thought to be 35-50 years.

Although Cook Inlet beluga whales remain within the waters of Cook Inlet, seasonal patterns may exist in their annual movements within the inlet. During spring and summer months, Cook Inlet belugas are generally concentrated near river mouths in northern Cook Inlet (Rugh et al. 2010). Cook Inlet belugas may range more widely within the inlet in winter months, but their winter distribution is not well known (Allen and Angliss 2014).

Cook Inlet belugas feed on a wide variety of prey species, focusing on specific species when they are seasonally abundant. In the spring, eulachon and gadids were preferred prey (Hobbs et al. 2008). From late-spring and through summer, the majority of beluga stomachs contained Pacific salmon coincident with the timing of fish runs in the area (Hobbs et al. 2008). In the fall, as salmon runs begin to decline, belugas consume the fish species found in nearshore bays and estuaries. This includes cod species observed in the spring diet as well as other bottom-dwellers: Pacific staghorn sculpin and flatfishes such as starry flounder and yellowfin sole (Hobbs et al. 2008). Although diet information is not available for winter months, data from belugas tagged with satellite transmitters suggest that during the winter whales are feeding in deeper waters (Hobbs et al. 2005), possibly on such prey species as flatfish, cod, sculpin, and pollock.

Cook Inlet belugas are gregarious and are often found in pods of over 10 individuals. They have excellent hearing, acute vision, and are very vocal (Hobbs et al. 2008). Belugas use acoustic signals to communicate, navigate, locate prey, and sense their environment (Richardson et al. 1995). Anthropogenic noise has the potential to disrupt the behavior and even injure Cook Inlet belugas.

Stressors. No mortalities or serious injuries were observed in 1999 or 2000 programs observing the Cook Inlet salmon set and drift gillnet fisheries (Manly 2006). No observer data have been collected in these fisheries since 2000, however, two entanglements have since been reported: 1) on July 14, 2005, a set net fisherman near Nikiski reported a beluga was entangled and then released from his net and the whale’s condition was unknown; and 2) on May 7, 2012, a fisherman reported that a juvenile beluga was entangled in his salmon fishing net during a special use subsistence fishery near Kenai; the whale was dead, and necropsy findings reported this animal was in poor health prior to entanglement (Allen and Angliss 2014). In addition, in 2010, a Cook Inlet beluga with a rope entangled around its girth was observed and photo-documented during the period of May through August. The same whale was photographed in July and August 2011, and August 2012, still entangled in the rope (Allen and Angliss 2014). The estimated minimum mortality rate incidental to commercial fisheries is unknown, although probably low (Allen and Angliss 2014).

Subsistence harvest of beluga whales in Cook Inlet has been important to the village of Tyonek and the subsistence hunting community in Anchorage. In August 2004, an administrative hearing was held to determine a long-term harvest plan, which allowed for 8 whales to be harvested during 2005 - 2009. From 2010 until recovery, allowable harvest levels are established for a 5-year period, based on the average abundance in the previous 5-year period and the growth rate over the previous 10-year period; no harvest is allowed if the previous 5-year average abundance is less than 350 belugas. Because the 5-year average abundance during 2003-2007 was 336 (i.e., below 350 whales), no harvest was allowed during the subsequent 5- year period, 2008–2012 (73 FR 60976; 15 October 2008). Since the average abundance of Cook Inlet beluga whales remains below 350 whales, no harvest was allowed for 2013 (Allen and Angliss 2014).

Beluga whales are observed to live strand on the tidal flats of Cook Inlet when the tide goes out. Although many of these observed stranded individuals are expected to return to sea with in the incoming tide and survive, some mortalities are observed and some mortalities are likely missed by observers, including whales that may die later of stranding-related injuries. Between 1994 and 2012, at least 16 mortalities occurred as a result of live strandings (Vos and Shelden 2005, Hobbs and Shelden 2008, Allen and Angliss 2014).

Another source of Cook Inlet beluga whale mortality is killer whale predation. Although killer whale sightings are rare in the upper inlet, at least 21 belugas were confirmed to be killed by killer whales in Cook Inlet between 1985 and 2002 (Shelden et al. 2003). This suggests a minimum estimate of about one mortality per year not including at least three instances where beluga calves accompanied an adult that was attacked (Shelden et al. 2003). The most recent reported predation event in upper Cook Inlet occurred in June 2010; an adult beluga carcass discovered near Point Possession showed evidence of possible predation (Allen and Angliss 2014).

The very restricted range of the Cook Inlet beluga makes it vulnerable to human or natural perturbations in the inlet. A photogrammetric study recorded a few instances where belugas had likely been struck by boat propellers or ships (Kaplan et al. 2009). Projects planned that may alter the physical habitat include a highway bridge across Knik Arm; construction and operation of a coal mine near Chuitna River; oil and gas exploration and development, as well as planned 3-D seismic surveys; and expansion and improvements to the Port of Anchorage. Additional factors that have the potential to impact this stock and its habitat include: changes in prey availability due to natural environmental variability, ocean acidification, and commercial fisheries; climatic changes affecting habitat; competition with fisheries; increased predation by killer whales; contaminants; noise; vessel traffic; waste management; urban runoff; construction projects; and physical habitat modifications that may occur as Cook Inlet becomes increasingly urbanized (Moore et al. 2000, Hobbs 2006).

Critical Habitat. In April 2011, NMFS designated critical habitat for Cook Inlet beluga whales. Beluga whale critical habitat includes two geographic areas of marine habitat in Cook Inlet that comprise 7,800 km^2, excluding waters by the Port of Anchorage (76 FR 20180) (Figure 15).

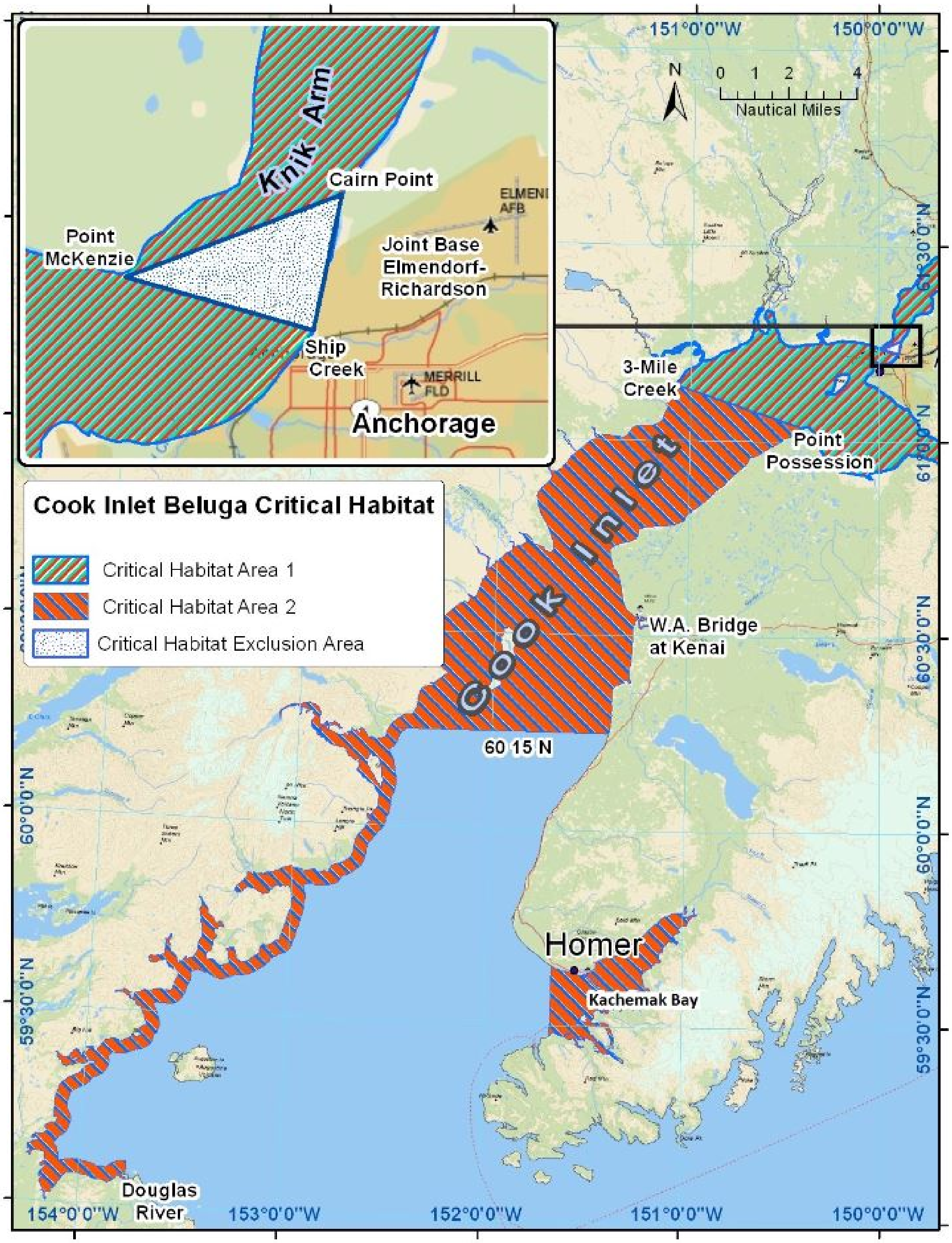


Figure 15. Designated critical habitat for the Cook Inlet beluga whale.

NMFS determined the following physical or biological features are essential to the conservation of the Cook Inlet beluga whale: (1) Intertidal and subtidal waters of Cook Inlet with depths less than 30 feet (MLLW) and within 5 miles of high and medium flow anadromous fish streams; (2) primary prey species consisting of four species of Pacific salmon (Chinook, sockeye, chum, and coho), Pacific eulachon, Pacific cod, walleye pollock (*Gadus chalcogrammus*), saffron cod, and yellowfin sole; (3) waters free of toxins or other agents of a type and amount harmful to Cook Inlet beluga whales; (4) unrestricted passage within or between the critical habitat areas; (5) waters with in-water noise below levels resulting in the abandonment of critical habitat areas by Cook Inlet beluga whales.

Critical Habitat Area 1 encompasses 1,909 km^2 of Cook Inlet northeast of a line from the mouth of Threemile Creek to Point Possession. The area contains shallow tidal flats and river mouths or estuarine areas, and it is important for foraging and calving. Mudflats and shallow areas adjacent to medium and high flow accumulation streams may also provide for other biological needs, such as molting or escape from predators (Shelden et al. 2003). Area 1 also has the highest density of beluga whales from spring through fall as well as the greatest potential for adverse impact from anthropogenic threats.

Many rivers in Area 1 habitat have large eulachon and salmon runs. Two such rivers in Turnagain Arm, Twentymile River, and Placer River are visited by beluga whales in early spring, indicating the importance of eulachon runs for beluga whale feeding. Beluga whale use of upper Turnagain Arm decreases in the summer and then increases again in August through the fall, coinciding with the coho salmon run. Intensive summer feeding by beluga whales occurs in the Susitna Delta area, Knik Arm, and Turnagain Arm.

Satellite telemetry data and long-term aerial survey data demonstrate beluga whales use Knik Arm year around, often entering and leaving the Arm on a daily basis (Hobbs et al. 2005, Rugh et al. 2005, Rugh et al. 2007). These surveys demonstrate high use of the Susitna Delta area (from the Little Susitna River to Beluga River) and Chickaloon Bay (Turnagain Arm), with frequent large scale movements between the delta area, Knik Arm, and Turnagain Arm.

Beluga whales are particularly vulnerable to impacts in Area 1 due to their high seasonal densities and the biological importance of the area. Because of their high use of this area (e.g., foraging, nursery, predator avoidance), activities that restrict or deter use of or access to Area 1 habitat could reduce beluga whale calving success, impair their ability to secure prey, and increase their susceptibility to predation by killer whales. Activities that reduce anadromous fish runs could also negatively impact beluga whale foraging success, reducing their fitness, survival, and recovery. Furthermore, the tendency for beluga whales to occur in high concentrations in Area 1 habitat predisposes them to harm from such events as oil spills.

Critical Habitat Area 2 consists of 5,891 km^2 of less concentrated spring and summer beluga whale use, but known fall and winter use areas. It is located south of Area 1, and includes nearshore areas along the west side of the Inlet and Kachemak Bay on the east side of the lower inlet. Area 2 is largely based on dispersed fall and winter feeding and transit areas in waters where whales typically occur in smaller densities or deeper waters. It includes both near and offshore areas of the mid and upper Inlet, and nearshore areas of the lower Inlet. Due to the role of this area for probable fall feeding, Area 2 includes Tuxedni, Chinitna, and Kamishak Bays on the west coast and a portion of Kachemak Bay on the east coast. Based on tracking data, important winter habitat concentration areas reach south of Kalgin Island (Hobbs et al. 2005).

3.8 HUMPBACK WHALE (*MEGAPTERA NOVAEANGLIAE*)

Population Structure/Status. Humpback whales are found in all ocean basins worldwide, and typically occur in tropical and subtropical waters during the winter and migrate seasonally to high latitudes during the summer (Allen and Angliss 2014). In the North Pacific, humpback whales are currently found throughout their historic summer feeding range, including coastal and inland waters around the Pacific Rim from Point Conception, California, north to the Gulf of Alaska and the Bering Sea, west through the Aleutian Islands to the Kamchatka Peninsula and the Sea of Okhotsk (Allen and Angliss 2014). Two stocks occur in Alaska waters; 1) the central North Pacific stock, and 2) the western North Pacific stock. NMFS listed the humpback whale as endangered in 1970 (35 FR 18319) following substantial declines due to commercial whaling.

Populations of humpback whales appear to be increasing worldwide and currently number at least 113,713, including 11,570 in the North Atlantic (data from 1992-93) (Stevick et al. 2003), 80 in the Arabian Sea (data from 2000-04) (Minton et al. 2011), 81,000 in the Southern Hemisphere (data from ~2007) (Cerchio et al. 2009, Andriolo et al. 2010, Collins et al. 2010, Barendse et al. 2011, Felix et al. 2011, Findlay et al. 2011, Hedley et al. 2011, Noad et al. 2011, Constantine et al. 2012), and the best current estimate for humpback whale abundance in the North Pacific is 21,063 animals (data from 2006-08), which exceeds some estimates of pre-whaling numbers (Barlow et al. 2011). Humpback whale populations were depleted in the twentieth century due to commercial exploitation, and numbers in the North Pacific following the cessation of whaling in 1966 have been estimated as low as 1,400 (Gambell 1976) and 1,200 (Johnson and Wolman 1984). Humpback whale abundance in the North Pacific has increased by at least an estimated 6.8% annually in the 39 years following the cessation of commercial whaling (Calambokidis et al. 2008).

Description/Natural History. Humpback whales forage on euphausiids and small schooling fishes in the North Pacific (Clapham and Mead 1999). The winter distribution of the central North Pacific stock of humpback whales is primarily in the Hawaiian Archipelago. In the summer months the majority of the central North Pacific humpback whales occur in the Aleutian Islands, Gulf of Alaska, and Southeast Alaska/northern British Columbia (Allen and Angliss

2014). Whales from the western North Pacific stock appear to overwinter in several island groups south of Japan, and spend the summer months feeding in the Bering Sea and Aleutians (Allen and Angliss 2014). Within the proposed action area, relatively high densities of humpbacks are found in the eastern Aleutian Islands, along the Bering Sea shelf edge and break north to the Pribilof Islands, in the Gulf of Alaska in the Shumagin Islands, east of Kodiak Island, and from the Barren Islands through Prince William Sound.

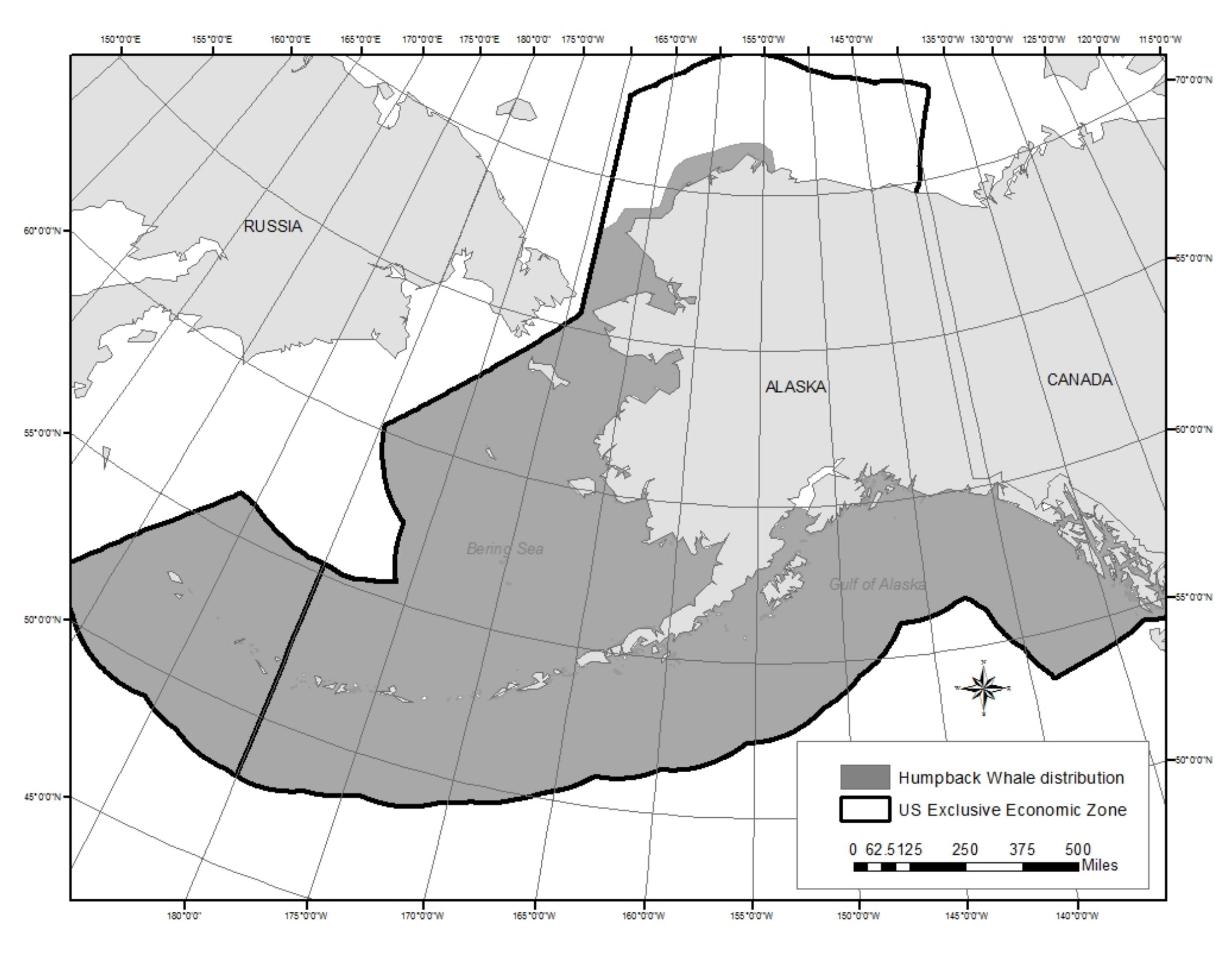


Figure 16. Approximate range of humpback whales in the Alaska EEZ in the central North Pacific and western Alaska (map created by K. Mabry, PRD AKR) (Allen and Angliss 2014).

As is the case for all large baleen whales, direct information about the hearing abilities of humpback whales is not available. Researchers studying *Mysticete* auditory apparatus morphology hypothesized that large *Mysticetes* have acute infrasonic hearing (Ketten 1997). Humpback whales are categorized in the low frequency cetacean functional hearing group (Southall et al. 2007). This group has an estimated auditory bandwidth of 7 Hz to 22 kHz.

Empirical data on humpback whale hearing sensitivity is not available but has been estimated based on behavioral responses to sounds at various frequencies, favored vocalization frequencies, body size, ambient noise levels at favored frequencies, and cochlear morphometry.

Stressors. Between 2007 and 2011, there were two incidental serious injuries and mortalities of central North Pacific humpback whales in the Bering Sea/Aleutian Islands flatfish trawl and one in the Bering Sea/Aleutian Islands pollock trawl. One humpback whale was injured in the Hawaii shallow set longline fishery (Allen and Angliss 2014). The overall U. S. commercial fishery-related minimum mortality and serious injury rate is 0.55 humpback whales per year, based on observer data from Alaska (0.40) and observer data from Hawaii (0.15). During the period 1995-1999, six humpback whales were reported as “bycatch” in Japanese and Korean commercial fisheries (Brownell et al. 2000). In addition, two strandings were reported during this period. Furthermore, analysis of four samples from meat found in markets indicated that humpback whales are being sold. At this time, it is not known whether any or all strandings were caused by incidental interactions with commercial fisheries; similarly, it is not known whether the humpback whales identified in market samples were killed as a result of incidental interactions with commercial fisheries. It is also not known which fishery may be responsible for the bycatch. Regardless, these data indicate a minimum mortality level of 1.1 per year (using bycatch data only) to 2.4 per year (using bycatch, stranding, and market data) in the waters of Japan and Korea (Allen and Angliss 2014).

The estimated annual human-caused mortality and serious injury rate for 2007-2011 based on fishery and gear entanglements in Alaska is 2.15 (Allen and Angliss 2014, Allen et al. 2014). The estimated annual mortality and serious injury for 2007-2011 due to entanglements reported in waters off Hawaii is 4.75 (Allen and Angliss 2014). An analysis of entanglement rates from photographs found a minimum entanglement rate of 31% for humpback whales from the Asia breeding grounds (Allen and Angliss 2014). The overall minimum estimate of mortality and serious injury rate due to fisheries of 8.55 (0.55 + 2.15 + 4.75+1.10) (Allen and Angliss 2014). These estimates are considered a minimum because not all entangled animals strand and not all stranded animals are found, reported, or cause of death determined.

Ship strikes and other interactions with vessels unrelated to fisheries can result in injury and mortality to humpback whales. The mean annual human-caused mortality and serious injury rate for 2007-2011 due to vessel collisions reported in Alaska (1.8) and Hawaii (2.43) is 4.23 (Allen and Angliss 2014). Most vessel collisions with humpbacks are reported from Southeast Alaska; however, there are also reports from the south-central and Kodiak areas of Alaska (Allen et al. 2014). It is not known whether the difference in ship strike rates between Southeast Alaska and the northern portion of this stock is due to differences in reporting, amount of vessel traffic, densities of animals, or other factors. Entanglements in unknown marine debris/ gear account for an estimated mortality and serious injury rate of 2.25 humpbacks annually (Allen and Angliss 2014).

Elevated levels of sound from anthropogenic sources (e.g., shipping, military sonars) are a potential concern for humpback whales in the North Pacific, as well as the growth of the whale watching industry in Hawaii and Alaska (preferred habitats may be abandoned if disturbance levels are too high). Other potential impacts include possible changes in prey distribution with climate change, increased fishing, and increased shipping in higher latitudes and through the Bering Sea with changes in sea ice coverage, as well as oil and gas activities in the Chukchi and Beaufort seas.

3.9 SEI WHALE (*BALAENOPTERA BOREALIS*)

Population Structure/Status. Two subspecies of sei whales are recognized; *B. b. schlegellii* in the southern hemisphere, and *B. b. borealis* in the northern hemisphere. NMFS listed the sei whale as endangered in 1970 (35 FR 18319) after commercial whaling decimated all known populations.

Sei whales are estimated to have numbered greater than 105,000 prior to commercial whaling, and are now thought to number 25,000 worldwide (Braham 1991). Sei whales in the North Pacific numbered about 49,000 whales in 1963, were reduced to 37,000-38,000 whales by 1967, and reduced again to 20,600-23,700 whales by 1973 (Ohsumi and Fukuda 1975). When commercial whaling for sei whales ended in 1974, the population in the North Pacific had been reduced to 7,260-12,620 animals (Tillman 1977).

Description/Natural History. Sei whales prefer subtropical, temperate, and subarctic waters, and can be found in low numbers in the Atlantic, Indian, and Pacific Oceans. Sei whales in the North Pacific have been reported primarily south of the Aleutian Islands, in Shelikof Strait and waters surrounding Kodiak Island, in the Gulf of Alaska, the inside waters of Southeast Alaska, and south to California in the east, and Japan and Korea to the west. Whaling data suggest that sei whales do not venture north of about 55°N (Gregr et al. 2000). Sei whales occur rarely in the Bering Sea, and an estimated 75-85% of the North Pacific population occurs east of 180° (Horwood 1987). Historically, sei whales were common in the northern Gulf of Alaska (Calkins 1986), but recent observations of sei whales in Alaska EEZ waters are rare (Matsuoka et al. 2013).

The migratory pattern of this species is thought to encompass long distances from high-latitude feeding areas in summer to low-latitude breeding areas in winter; however, the location of winter areas remains largely unknown (Perry et al. 1999). Sei whales are often associated with deeper waters and areas along continental shelf edges (Hain et al. 1985). The species appears to lack a well-defined social structure and individuals are usually found alone or in small groups of up to six whales (Perry et al. 1999). When on feeding grounds, larger groupings have been observed (Gambell 1985b).

Sei whales are primarily planktivorous, feeding mainly on euphausiids and copepods, although they are also known to consume fish. In the Northern Hemisphere, sei whales consume small schooling fish such as anchovies, sardines, and mackerel when locally abundant (Konishi et al. 2009). Sei whales in the North Pacific feed on euphausiids and copepods, which make up about 95% of their diet (Calkins 1986). The balance of their diet consists of squid and schooling fish, including smelt, sand lance, Arctic cod, rockfish, pollock, capelin, and Atka mackerel (Nemoto and Kawamura 1977).

Data on sei whale vocal behavior is limited, but includes records off the Antarctic Peninsula of broadband sounds in the 100-600 Hz range with 1.5 second durations and tonal and upsweep calls in the 200-600 Hz range of 1-3 second durations. Peak sound source levels of 156±3.6 decibels re 1 µPa at 1 meter have been observed in tonal calling of sei whales (McDonald et al. 2005).

Stressors. Although there is no conclusive evidence of sei whales being killed or seriously injured by fisheries activities, at least one sei whale was observed entangled in polypropylene line, dragging a bundle and 30 feet of line. The line could not be removed and was considered a serious injury. This serious injury record results in an average annual serious injury and mortality rate of 0.2 sei whales for the period 2007 to 2011 (Carretta et al. 2014).

The increasing level of anthropogenic noise in the world’s oceans is a potential concern for this species, as well in changes to prey availability due to climate change.

3.10 SPERM WHALE (*PHYSETER MACROCEPHALUS*)

Population Structure/Status. NMFS listed the sperm whale as endangered in 1970 (35 FR 18319) following widespread significant depletions due to commercial whaling. Prior to commercial whaling sperm whale abundance worldwide is estimated to have been 1,110,000. Worldwide abundance dropped to an estimated 788,100 by the 1880s, and to 355,200 in 1999 following the end of commercial whaling (Whitehead 2002). For management purposes, sperm whales are divided into 6 stocks. The only stock occurring in Alaska waters and in the proposed action area is the North Pacific stock. Although the number of sperm whales occurring in Alaska waters is unknown, 102,112 sperm whales are estimated to occur in the western North Pacific region (Kato and Miyashita 1998). Population trend information for sperm whales in the North Pacific stock is not available (Allen and Angliss 2014).

Description/Natural History. Sperm whales are the largest of the *Odontocetes* (toothed whales), inhabit all oceans worldwide, and can be observed along the pack ice edge in both hemispheres. They are most commonly found in deep ocean waters (typically deeper than 900 feet) between latitudes 60º N and 60º S. In the North Pacific the northernmost boundary for sperm whales extends from Cape Navarin, Russia (latitude 62º N) to the Pribilof Islands, Alaska (Omura 1955, Allen and Angliss 2014).

In the proposed action area sperm whales commonly occur in the Gulf of Alaska, Bering Sea, around the Aleutian Islands, and some parts of Southeast Alaska during the summer months (Allen and Angliss 2014). Sperm whales occur year around in the Gulf of Alaska, but appear to be more common during the summer months than winter months (Mellinger et al. 2004). Sperm whales are thought to migrate to higher latitude foraging grounds in the summer and lower latitudes in the winter (Allen and Angliss 2014).

Sperm whales feed primarily on large and medium-sized squids, and also eat other prey items including cephalopods (such as octopi) and medium- and large-sized demersal fishes (such as rays, and sharks) (Rice 1989, Allen and Angliss 2014).

Sound production and reception by sperm whales are better understood than in most cetaceans. Sperm whales produce broad-band clicks in the frequency range of 100 Hz to 20 kHz that can be extremely loud for a biological source (peak sound source levels of 200-236 decibels re 1μPa), although lower average source level energy has been suggested at around 171 decibels re 1 μPa (Weilgart and Whitehead 1993, Møhl et al. 2003). Most of the energy in sperm whale clicks is concentrated at around 2-4 kHz and 10-16 kHz (Weilgart and Whitehead 1993). The highly asymmetric head anatomy of sperm whales is likely an adaptation to produce the unique clicks recorded from these animals (Cranford et al. 1996).

Our understanding of sperm whale hearing stems largely from the sounds they produce. In addition, sperm whales have been observed to frequently stop echolocating in the presence of underwater pulses made by echo-sounders and submarine sonar (Watkins et al. 1985). Because they spend large amounts of time at depth and use low-frequency sound, sperm whales are likely to be susceptible to low frequency noise in the ocean.

Stressors. Between 2007 and 2011, there was one observed serious injury of a sperm whale in the Gulf of Alaska sablefish longline fishery. Thus, the mean annual estimated level of serious injury and mortality of the North Pacific stock of sperm whale stock from fisheries for 2007-2011 is 0.28 (Allen and Angliss 2014). In addition, from 2006-2010, there were 11 sperm whale mortalities reported to the Alaska Region Stranding Program, but the cause of these mortalities was not determined (Allen and Angliss 2014).

Other potential stressors for this species include impacts from ship strikes, entanglements in fishing gear, disturbance by anthropogenic noise (notably in areas of oil and gas activities, or high traffic shipping areas), and accumulation of pollutants (e.g. polycholorobiphenyls, chlorinated pesticides, polycyclic aromatic hydrocarbons, and heavy metals). The potential impact of coastal pollution may be an issue for this species in portions of its habitat, though little is known.

3.11 FIN WHALE (*BALAENOPTERA PHYSALUS*)

Population Structure/Status. There are two named subspecies of fin whale: *B. p. physalus* in the North Atlantic Ocean, and *B. p. quoyi* in the Southern Ocean. Most experts consider fin whales in the North Pacific to be part of a separate, unnamed subspecies.

NMFS listed the fin whale as endangered in 1970 (35 FR 18319) following large scale declines due to commercial whaling. The IWC recognizes seven stocks of fin whales in the North Atlantic Ocean and two in the North Pacific (East China Sea and the rest of the North Pacific). However, histological samples and tagging experiments suggest that there are five possible stocks of fin whales in the North Pacific: (1) East and West Pacific that intermingle around the Aleutian Islands, (2) East China Sea, (3) British Columbia, (4) Southern-Central California to Gulf of Alaska, and (5) Gulf of California (Mizroch et al. 1984).

Description/Natural History. Fin whales are found in deep, offshore waters of all major oceans, primarily in temperate to polar latitudes, and are less common in the tropics. They occur year-round in a wide range of latitudes and longitudes, but the density of individuals in any one area changes seasonally.

In the North Pacific Ocean, fin whales occur in summer foraging areas in the Chukchi Sea, the Sea of Okhotsk, around the Aleutian Islands, and the Gulf of Alaska (Figure 17); in the eastern Pacific, they occur south to California; in the western Pacific, they occur south to Japan. Fin whales in the eastern Pacific winter from California south; in the western Pacific, they winter from the Sea of Japan, the East China, Yellow, and Philippine Seas (Gambell 1985a).

Prior to exploitation by commercial whalers, fin whales are thought to have numbered greater than 464,000 worldwide, and are now thought to number approximately 119,000 worldwide (Braham 1991). Pre-whaling, approximately 42,000 fin whales occurred in the North Pacific basin, but had declined to approximately 16,600 post-whaling (Braham 1991). Over 9,053 km of tracklines were surveyed in coastal waters (as far as 85 km offshore) between the Kenai Peninsula (150^{o}W) and Amchitka Pass (178^{o}W) July-August 2001-2003. Fin whale sightings (n = 276) were observed from east of Kodiak Island to Samalga Pass, with high aggregations recorded near the Semidi Islands, and an abundance estimate of 1,652 (95% CI: 1,142-2,389) in that area (Zerbini et al. 2006) (Figure 17). Visual surveys of fin whales conducted on the eastern Bering Sea shelf during the summers of 2002, 2008, and 2010 (years when the entire pollock area was surveyed) provided provisional estimates of 419 (CV = 0.33), 1,368 (CV = 0.34) and 1,061 (CV = 0.38), respectively (Friday et al. 2013). The abundance of fin whales in Alaska waters appears to be increasing since at least 2002 (Friday et al. 2013).

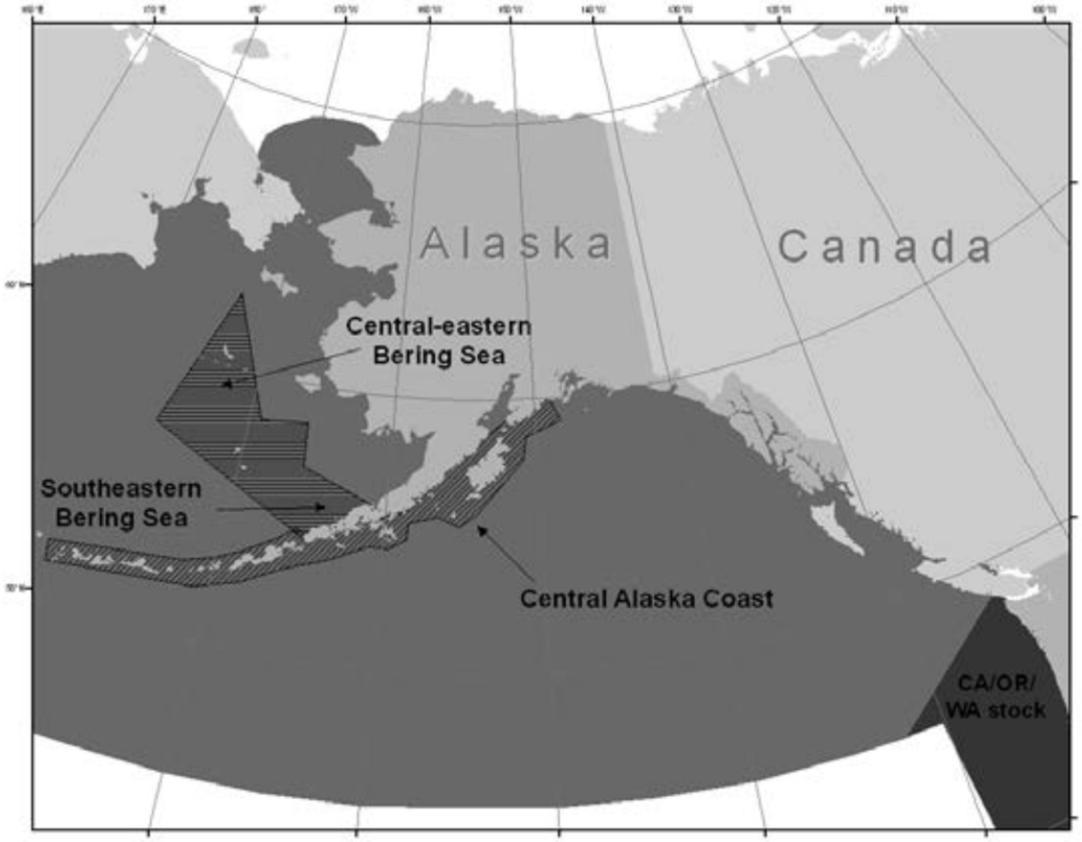


Figure 17. Approximate distribution of fin whales in the eastern North Pacific (shaded area) (Allen and Angliss 2014). Striped areas indicate where vessel surveys occurred in 1999-2000 (Moore et al. 2002) and 2001-2003 (Zerbini et al. 2006).

In the North Pacific, fin whales preferred prey is euphausiids (mainly *Euphausia pacifica*, *Thysanoessa longipes*, *T. spinifera*, and *T. inermis*) and large copepods (mainly *Calanus cristatus*), followed by schooling fish such as herring, walleye pollock, and capelin (Nemoto 1970).

Fin whales produce a variety of low-frequency sounds in the 10-200 Hz band (Thompson et al. 1992). The most typical signals are long, patterned sequences of short duration (0.5-2 second) infrasonic pulses in the 18-35 Hz range (Patterson and Hamilton 1964). Estimated source levels for fin whales are 140-200 decibels re 1 µPa at 1 meter (Patterson and Hamilton 1964, Thompson et al. 1992, Clark and Gagnon 2004).

Baleen whales have inner ears that appear to be specialized for low-frequency hearing. The morphology of the *mysticete* (baleen whale) auditory apparatus indicates they may have acute infrasonic hearing (Ketten 1997). Direct studies of fin whale hearing have not been conducted, but it is assumed that fin whales can hear the same frequencies that they produce (low) and are likely most sensitive to this frequency range (Richardson et al. 1995, Ketten 1997).

Stressors. Between 2007 and 2011, there were no observed incidental mortalities of fin whales in any Alaska commercial fishery (Breiwick 2013). Two ship strike mortalities of fin whales were reported to have occurred in Alaska waters between 2007-2011 (one in 2009 and one in 2010)(Allen et al. 2014), resulting in a mean annual mortality rate from ship strikes of 0.4 fin whales (Allen and Angliss 2014).

Potential impacts on fin whales include possible changes in prey distribution with climate change, range extension and increased shipping in higher latitudes with changes in sea ice coverage, as well as oil and gas activities in the Chukchi and Beaufort seas.

3.12 WESTERN NORTH PACIFIC GRAY WHALE (*ESCHRICHTIUS ROBUSTUS*)

Population Structure/Status. NMFS listed gray whales as endangered in 1970 (35 FR 18319) following severe declines in both populations due to commercial whaling. NMFS removed eastern North Pacific gray whales from the ESA list of endangered species in 1994 following recovery of the population, which is now estimated to number 21,911 (Punt and Wade 2010). The western North Pacific gray whale remains on the endangered list. It was thought to be extinct at one point, but was rediscovered and is now thought to number 140 individuals, of which only 36 are reproductive females (Cooke et al. 2013).

Description/Natural History. Gray whales typically occur only in the North Pacific and Arctic Ocean basins. The two populations of gray whales generally occur on opposite sides of the North Pacific with western North Pacific gray whales ranging as far south as Southeast Asia, and eastern North Pacific gray whales ranging as far south as central Mexico. Western North Pacific gray whales range as far north as the Bering Sea, and transit the Bering Sea and northern Gulf of Alaska en route to coastal British Columbia, Washington, and Oregon (Mate et al. 2011, Weller et al. 2012).

Gray whales are *Mysticetes*, or baleen whales, and forage on benthic invertebrates by sucking sediment from the sea floor through their baleen plates. They primarily forage in shallow coastal waters.

Researchers studying *Mysticete* auditory apparatus morphology hypothesized that large *Mysticetes* have acute infrasonic hearing (Ketten 1997). Gray whales are categorized in the low frequency cetacean functional hearing group (Southall et al. 2007). This group has an estimated auditory bandwidth of 7 Hz to 22 kHz. Direct data on gray whale hearing sensitivity is not available but has been estimated based on behavioral responses to sounds at various frequencies, favored vocalization frequencies, body size, ambient noise levels at favored frequencies, and cochlear morphometry.

Stressors. Potential stressors for gray whales include vessel collision, entanglement in fishing gear, habitat degradation, disturbance from ecotourism and whale watching, disturbance from low-frequency noise, and possible illegal whaling or resumed legal whaling at unsustainable levels.

Killer whales are the only known non-human predator of gray whales.

3.13 CHINOOK SALMON (*ONCORHYNCHUS TSHAWYTSCHA*)

Population Structure/Status. Many West Coast salmon (*Oncorhynchus* spp.) stocks have declined substantially from their historic numbers and now are at a fraction of their historical abundance. There are several factors that contribute to these declines, including: overfishing, loss of freshwater and estuarine habitat, hydropower development, poor ocean conditions, and hatchery practices. These factors collectively led to NMFS's listing of 28 salmon and steelhead stocks that spawn in California, Idaho, Oregon, and Washington under the ESA. Six Chinook salmon ESUs are considered in this Biological Opinion.

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

In 1990, NMFS received a petition to list Snake River Chinook; two ESUs from this river (the Spring/Summer ESU and the Fall ESU) were listed as threatened under the ESA in 1992 (57 FR 34639 and 57 FR 14653, respectively). The Spring/Summer Snake River Chinook ESU includes naturally spawned spring/summer-run Chinook salmon originating from the mainstem Snake River and the Tucannon River, Grande Ronde River, Imnaha River, and Salmon River subbasins. It also includes spring/summer-run Chinook salmon from 11 artificial propagation programs. Updated spawning abundance estimates were available from 1999-2008 for 12 of 31 populations, in. All populations with available data showed no trend in abundance, although there was considerable variability over the 10 year period. Typically spawning abundance of populations in this ESU are highly correlated. The Fall Snake River Chinook ESU includes naturally spawned fall-run Chinook salmon originating from the mainstem Snake River below Hells Canyon Dam and from the Tucannon River, Grande Ronde River, Imnaha River, Salmon River, and Clearwater River subbasins. Fall-run Chinook salmon from 4 artificial propagation programs are also included. Spawning estimates from 1998-2007 for this ESU were variable, but indicated no trend in abundance.

NMFS listed the Puget Sound Chinook ESU as threatened in 1999 (64 FR 14308). This ESU includes naturally spawned Chinook salmon originating from rivers flowing into Puget Sound from the Elwha River eastward, including rivers in Hood Canal, South Sound, North Sound, and the Strait of Georgia. It also includes Puget Sound Chinook salmon from 26 artificial propagation programs. Although there was considerable variability in spawning abundance between 1999-2008, the majority of populations showed no significant trend; therefore, the overall ESU status is "no trend."

NMFS listed the Upper Columbia River Spring Chinook ESU as endangered and the Lower Columbia River Chinook ESU as threatened in 1999 (64 FR 14308). The Upper Columbia River Spring Chinook ESU includes naturally spawned spring-run Chinook salmon originating from Columbia River tributaries upstream of the Rock Island Dam and downstream of Chief Joseph Dam (excluding the Okanogan River subbasin). In addition, spring-run Chinook salmon from 6 artificial propagation programs are included. Spawning abundance estimates for all 3 populations from 1999-2008 show considerable variability, but suggest no significant overall change in abundance. The Lower Columbia River Chinook ESU includes naturally spawned Chinook salmon originating from the Columbia River and its tributaries downstream of a transitional point east of the Hood and White Salmon Rivers, and any such fish originating from the Willamette River and its tributaries below Willamette Falls. This ESU also includes Chinook from 15 artificial propagation programs. Spawning abundance estimates from 11 of 32 populations suggest there was no significant trend in abundance of this ESU from 1999-2008.

NMFS listed the Upper Willamette River Chinook ESU as threatened in 1999 (64 FR 14308). This ESU includes naturally spawned spring-run Chinook salmon originating from the Clackamas River and from the Willamette River and its tributaries above Willamette Falls. Additionally, spring-run Chinook salmon from six artificial propagation programs are included. Spawning abundance estimates were only available for 1 of 7 populations for this ESU from 1999-2008. This limited data suggests no significant trend in abundance.

<u>Description/Natural History.</u> Chinook salmon, also called king salmon, are the largest (average 10-50 pounds, maximum 126 pounds) and least abundant species of Pacific salmon (Wahle et al. 1981). They are anadromous, spending most of their adult lives (2-6 years) in the ocean before returning to their natal streams to spawn and die. Juvenile fish spend 3 months to 2 years in the freshwater streams post-hatching before migrating to the ocean.

Chinook salmon range throughout the North Pacific as far west as waters off the coasts of Japan and Russia, and south to southern California. The six Chinook ESUs considered in this BiOp have all been documented in the Gulf of Alaska (GOA), including Southeast Alaska troll fisheries and GOA ground fisheries (Wahle and Vreeland 1978, Wahle et al. 1981, Crane et al. 2000, Templin and Seeb 2004). The Lower Columbia River and Upper Willamette River Chinook ESUs are also found in the Bering Sea (NMFS 2009). Chinook salmon from the six ESA-listed ESUs considered in this BiOp are potentially present in Alaska marine waters only as juveniles or adult because their spawning/egg and larval life stages occur exclusively in freshwater streams in Washington, Oregon, and Idaho.

They feed on terrestrial and aquatic insects, amphipods, and other crustaceans while young, and primarily on other fishes when older. Adult Chinook salmon have been found in marine waters with temperatures ranging from 1 to 15º C (USCG and EPA 2014). They tend to be found deeper in the water column than other Pacific salmon species, from 30 to 70 meters, and are commonly harvested by commercial troll fisheries at a depth of 30 meters (USCG and EPA 2014).

Stressors. Most threats to Chinook salmon occur within the freshwater spawning and rearing habitat. These threats include logging, hydropower, agriculture, predation, and urbanization. Chinook marine life stages (e.g., juvenile and adult) are vulnerable to overfishing and transitory pollution events such as oil spills. Climate change and other factors affecting ocean productivity have the potential to impact the marine life stages of Chinook salmon as well (Mueter et al. 2002).

3.14 COHO SALMON (*ONCORHYNCHUS KISUTCH*)

Population Structure/Status. Many West Coast salmon (*Oncorhynchus* spp.) stocks have declined substantially from their historic numbers and now are at a fraction of their historical abundance. There are several factors that contribute to these declines, including: overfishing, loss of freshwater and estuarine habitat, hydropower development, poor ocean conditions, and hatchery practices. These factors collectively led to NMFS's listing of 28 salmon and steelhead stocks that spawn in California, Idaho, Oregon, and Washington under the ESA. One coho salmon ESU is considered in this Biological Opinion.

NMFS listed the Lower Columbia River Coho ESU as threatened under the ESA in 2005 (70 FR 37160). This ESU includes naturally spawned coho salmon originating from the Columbia River and its tributaries downstream from the Big White Salmon and Hood Rivers (inclusive) and any such fish originating from the Willamette River and its tributaries below Willamette Falls. In addition, coho salmon from 21 artificial propagation programs are included. Spawning abundance estimates are only available for 2 of 25 populations from 1999-2008. These two populations showed significant variability in spawning abundance over the 10 year period, but no significant trend.

Description/Natural History. Coho salmon, also called silver salmon, are medium sized (average 8 pounds, maximum 35 pounds) and are the fourth most abundant salmon species in Alaska marine waters (after pink, chum, and sockeye salmon). Coho salmon smolts from the west coast of North America generally leave their freshwater streams in the spring (April – June) to spend their adult lives in marine waters. They return to the freshwater streams at 3-4 years of age to spawn (typically October – December).

Coho salmon are present in most major rivers of the Pacific Rim from Monterey Bay, California, north to Point Hope, Alaska, throughout the Aleutian Islands, and from the Anadyr River in Russia, south to Korea and northern Hokkaido, Japan (Laufle et al. 1986). During their ocean life stage, coho salmon generally do not migrate as far as the other species of Pacific salmon (Behnke 2010). Coho salmon that originate in the rivers of California, Oregon, and Washington tend to feed along the continental shelf associated with their region of origin (Sandercock 1991). However, distribution patterns of northern and southern stocks of coho salmon at sea vary with latitude. Northern stocks are found farther offshore compared with a more coastal distribution of southern stocks (including the Lower Columbia River coho ESU) (Quinn and Myers 2004).

Migration pathways mapped during coded wire tag studies show the consistent movement of coho salmon north along the continental shelf during their first year of ocean life and continued migration in a counter-clockwise direction around the rim of the Gulf of Alaska (Morris et al. 2007) aided by the Alaska current, which rotates in the same direction (Drinkwater et al. 2009). From 1995 to 2004, over 23 million Columbia River Basin coho salmon, including almost 14 million Lower Columbia River coho salmon, were implanted with coded wire tags and released. The tags were read manually using a microscope, and tagging, coding, or reading errors are possible. Only those coho salmon that were adipose fin-clipped (hatchery-origin) were examined for tags during the NMFS surveys in Alaska (Morris et al. 2007). Of the tagged Lower Columbia River-released coho salmon, 107 juvenile individuals were recaptured (7.7 per million fish), only 17 of which (1.2 per million fish) were recaptured in GOA waters (either in Southeast Alaska or central Alaska near Kodiak Island) over the 10-year period. The majority of these were recovered in the GOA from July through September, with few individuals recaptured from October to November (Morris et al. 2007). Lower Columbia River coho salmon are potentially present in Alaska marine waters only as juveniles or adults because their spawning/egg and larval life stages occur exclusively in freshwater streams in Washington and Oregon.

They feed on terrestrial and aquatic insects, amphipods, and other crustaceans while young, primarily on marine invertebrates when they first enter the ocean, and primarily on other fishes during their adult life stage (USCG and EPA 2014).

Stressors. Most threats to coho salmon occur within the freshwater spawning and rearing habitat. These threats include logging, hydropower, agriculture, predation, and urbanization. Coho marine life stages (e.g., juvenile and adult) are vulnerable to overfishing and transitory pollution events such as oil spills. Harvest rates of the Lower Columbia River Coho ESU declined from 50 percent in the mid-1990s to recent rates of 8-20 percent, suggesting that overfishing is becoming less of a threat to this ESU.

The magnitude of hatchery production of this ESU continues to pose significant genetic and ecological threats to the extant natural populations. However, at present, these hatchery stocks collectively represent a significant portion of the ESU's remaining genetic resources. The 25 hatchery stocks considered to be part of the ESU, if appropriately managed, could prove essential to the restoration of more widespread naturally spawning populations.

New information available since the last status review indicates there is an increase in the level of avian and pinniped predation on Lower Columbia River coho, but not enough information exists to quantify this potential stressor. (NMFS 2011). Climate change impacts to this ESU are uncertain and include potential changes to prey availability due to ocean acidification and shifts in distribution in response to changes in sea temperatures and upwelling (NMFS 2011).

3.15 STEELHEAD TROUT (*ONCORHYNCHUS MYKISS*)

Population Structure/Status. Many West Coast salmon (*Oncorhynchus* spp.) stocks have declined substantially from their historic numbers and now are at a fraction of their historical abundance. There are several factors that contribute to these declines, including: overfishing, loss of freshwater and estuarine habitat, hydropower development, poor ocean conditions, and hatchery practices. These factors collectively led to NMFS's listing of 28 salmon and steelhead stocks that spawn in California, Idaho, Oregon, and Washington under the ESA. Five steelhead trout ESUs are considered in this Biological Opinion.

NMFS listed the Upper Columbia River Steelhead ESU as endangered under the ESA in 1997 (63 FR 43937) and down-listed it to threatened in 2006 (71 FR 834). This ESU includes naturally spawned anadromous steelhead originating below natural and manmade impassable barriers from the Columbia River and its tributaries upstream of the Yakima River to the U.S.-Canada border. Steelhead from six artificial propagation programs are also included. All four populations of this ESU showed no trend in spawning abundance estimates between 2000 and 2009, although there was considerable variability over the 10 year period.

The Middle Columbia River Steelhead ESU was listed as threatened in 1999 (64 FR 14517). This ESU includes naturally spawned anadromous steelhead originating below natural and manmade impassable barriers from the Columbia River and its tributaries upstream of the Wind and Hood Rivers (exclusive) to and including the Yakima River. This ESU does not include steelhead originating from the Snake River basin, but does include steelhead from seven artificial propagation programs. Spawning abundance estimates for 14 of 17 populations from 1996 to 2004 or 2005 showed no trend or significant increase over this time period.

The Lower Columbia River Steelhead ESU was listed as threatened in 1998 (63 FR 13347). This ESU includes naturally spawned anadromous steelhead originating below natural and manmade impassable barriers from rivers between the Cowlitz and Wind Rivers (inclusive) and the Willamette and Hood Rivers (inclusive), but excludes such fish originating from the upper Willamette River basin above Willamette Falls. This ESU also includes steelhead from seven artificial propagation programs. Few data are available for the abundance of this ESU, but 4 of 23 populations remained stable between 1999 and 2008.

NMFS listed the Snake River Basin Steelhead ESU as threatened in 1997 (62 FR 43937). This ESU includes naturally spawned anadromous steelhead originating below natural and manmade impassable barriers from the Snake River basin, and steelhead from six artificial propagation programs. Spawning abundance estimates are available for only 2 of the 26 populations from 1997 to 2006. Although there was considerable variability in spawning abundance over that ten year period, the two populations showed no significant trend. A separate analysis of Lower Granite Dam counts of wild steelhead also showed no trend in spawning abundance.

The Upper Willamette River Steelhead ESU was listed as threatened in 1999 (64 FR 14517). This ESU includes naturally spawned anadromous winter-run O. mykiss (steelhead) originating below natural and manmade impassable barriers from the Willamette River and its tributaries upstream of Willamette Falls to and including the Calapooia River. Spawning abundance estimated for 4 of 5 populations showed considerable variability between 1999 and 2008, but no significant trend.

Description/Natural History. Steelhead trout are a medium to large sized salmonid and can weigh up to 55 pounds. Most juvenile steelhead spend 1 to 3 years in freshwater streams post-hatching before heading to sea. Some spend as long as 7 years in freshwater before migrating into marine waters. Most adult steelhead return to spawn in their natal freshwaters streams after 1 to 2 years in the ocean, but can remain in marine waters up to 3 years before they spawn for the first time. Unlike the other salmon species described above, steelhead trout are generally iteroparous and return to their natal freshwater streams multiple times to spawn. Eggs hatch approximately 3 to 4 weeks after spawning occurs, and maximum lifespan of steelhead trout is 11 years.

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, Russia. Steelhead trout hatched in freshwater streams in the Pacific Northwest are known to occur in Alaska marine waters during their juvenile or adult life stages. Steelhead tagged at the Skamania Hatchery in Washington were recovered 72 km (45 mi) south of Adak Island in the Aleutian Islands 3 years later (Sheppard 1972). In their first few years of life, North American steelhead trout were observed aggregated in the western GOA and off the coast of the eastern Aleutian Islands (Burgner et al. 1992). A more detailed study was conducted to assess the distribution of North American hatchery steelhead stock in the GOA and Aleutian Islands using coded wire tag mark and recapture data collected by the NMFS Auke Bay Laboratories in Juneau, Alaska, and the Pacific Biological Station in Nanaimo, British Columbia, from 1981 through 1994 (McKinnell et al. 1997). These data showed that tagged steelhead from hatcheries in the upper, middle, and lower Columbia River, the Snake River basin, and coastal Washington were recaptured in the northern and southern GOA and the Aleutian Islands. However, the total number of tagged steelhead recovered from the Columbia and Snake River basins was very low (i.e., fewer than 100 fish per year) (McKinnell et al. 1997). These studies indicate that although steelhead from the ESUs reviewed in this Biological Opinion are indeed present in Alaska waters, they do not comprise a large percentage of the steelhead found there.

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

Stressors. Most threats to steelhead trout occur within the freshwater spawning and rearing habitat. These threats include logging, hydropower, agriculture, predation, and urbanization. Steelhead trout marine life stages (e.g., juvenile and adult) are vulnerable to overfishing and transitory pollution events such as oil spills. Unlike other Pacific salmon species, steelhead trout are not commercially harvested, but the numbers of steelhead caught as bycatch are not commonly recorded or well understood.

In an attempt to mitigate for lost habitat and reduced fisheries, extensive hatchery programs have been implemented throughout the range of salmon on the west coast of the United States. While some of these programs have been successful in providing fishing opportunities, the impacts of these programs on wilds stocks are not well understood. Competition, genetic introgression, and disease transmission resulting from hatchery introductions may significantly impact the production and survival of wild salmon.

3.16 SPECIES NOT CONSIDERED IN THIS BIOLOGICAL OPINION

The USCG/EPA Biological Assessment included two species that are not considered in this Biological Opinion.

NMFS recently removed the eastern distinct population segment of Steller sea lions from the ESA threatened species list (November 4, 2013; 78 FR 66140), and NMFS recently determined that the Southeast Alaska Pacific herring (*Clupea pallasii*) will not be listed under the ESA, thereby removing it from the Candidate species list (April 2, 2014: 79 FR 18518).

4.0 ENVIRONMENTAL BASELINE

The Environmental Baseline is an analysis of the effects of past and ongoing human-caused and natural factors leading to the current status of the species or its habitat and ecosystem within the action area. Environmental baselines for Biological Opinions include past and present impacts of all state, federal, or private actions and other human activities in the action area, the anticipated impacts of all proposed federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions that are contemporaneous with the consultation in process (50 CFR 402.02). Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. For the purposes of this consultation, NMFS considered the "Environmental Baseline" to be the current state of the ecosystems in Alaska as we understand them. NMFS recognizes that there is no good way to predict when, where, or how big oil spills will be in the future, nor what the environmental baseline will look like under oiled conditions. However, the "Effects of the Proposed Action" section assesses the potential effects of oil spill response based on current environmental conditions and reasonable assumptions about oiled conditions in the event of a spill.

4.1 CLIMATE CHANGE

Since the 1950s the atmosphere and oceans have warmed, snow and sea ice have diminished, sea level has risen, and concentrations of greenhouse gases have increased (IPCC 2013). The time period 1983-2012 was likely the warmest 30-year period in the Northern Hemisphere in the last 1400 years (IPCC 2013). This warming is thought to lead to increased decadal and inter-annual variability, and increases in extreme weather events (IPCC 2013). The likelihood of further global-scale changes in weather and climate events is virtually certain (Overland and Wang 2007, IPCC 2013, Salinger et al. 2013).

Effects to marine ecosystems from increased atmospheric CO_2 and climate change include ocean acidification, expanded oligotrophic gyres, shifts in temperature, circulation, stratification, and nutrient input (Doney et al. 2012). Altered oceanic circulation and warming cause reduced subsurface oxygen (O_2) concentrations (Keeling et al. 2010). These large-scale shifts have the potential to disrupt existing trophic pathways as change cascades from primary producers to top level predators (Doney et al. 2012, Salinger et al. 2013).

The strongest warming is expected in the north, exceeding the estimate for mean global warming by a factor or 3, due in part to the "ice-albedo feedback," whereby as the reflective areas of Arctic ice and snow retreat, the earth absorbs more heat, accentuating the warming (NRC 2012). Climate change is projected to have substantial direct and indirect effects on individuals, populations, species, and the structure and function of marine, coastal, and terrestrial ecosystems in the foreseeable future (NRC 2013).

The effects of climate change could include changes in the distribution of temperatures suitable for rearing young, the distribution and abundance of prey, and the distribution and abundance of competitors or predators. Climate change will likely result in significant habitat alterations, including reduced availability of ice, a key feature in the Arctic region.

4.2 OCEANOGRAPHIC DYNAMICS AND PHYSICAL PROCESSES

Climate and other physical forcing can impact ecosystem functions through oceanic, atmospheric, and terrestrial processes, such as changes in ocean temperature, chemistry, currents, storminess, and freshwater runoff. Physical forcing changes may occur on interannual (El Niño and La Niña), decadal regime shifts, or longer (global climate change) timescales. These changes influence the distribution and abundance of marine mammals, salmon, and their prey species.

Ocean Currents: Large-Scale Circulation

Ocean currents are capable of regulating climate through transportation of large amounts of heat, fresh water, oxygen, and nutrients (Ganachaud and Wunsch 2000). A number of large-scale oceanic currents occur in Alaska: within and between the Bering Sea, Gulf of Alaska (GOA), and surrounding oceans. The primary current in the northern GOA is the Alaska Coastal Current (ACC), a wind- and buoyancy-forced current that follows the inner GOA shelf for 2500 km from British Columbia to the Bering Sea with numerous eddies and meanders (Drinkwater et al. 2009). Farther offshore, the Alaska Current flows to the west, advecting warm, lower-latitude water into the northern GOA, and becoming the Alaska Stream to the west of Kodiak Island (Drinkwater et al. 2009). The Alaskan Stream is a relatively strong current (reaches average speeds over 35 cm/s) along the south side of the Aleutian Chain, with significant through-flow, primarily northward into the Bering Sea, occurring through Unimak Pass and Amukta Pass (Clement Kinney et al. 2009). This northward flow through the Aleutian Chain initiates the Aleutian North Slope Current (ANSC) (Stabeno et al. 2009).

The ANSC is a narrow, fast-moving current that flows east along the north side of the Aleutian Chain, turning to the northwest in the southeast corner of the basin to join the Bering Sea Current (Stabeno et al. 2009). The marine environment of the Aleutian Islands is very dynamic and unique to the world’s oceans. The east-west orientation of the island chain forms a porous boundary between two ocean basins; the warmer North Pacific and the colder Bering Sea. The depths of the Aleutian Trench (greater than 7,000 m deep) to sea level or above, in a distance of less than 150 km, provides a huge variety of habitat and enables tighter coupling between onshore, nearshore, and offshore systems. The climate of the Aleutian Islands is wet and stormy with average summer temperatures of 7 to 14°C (45 to 57°F) and -3 to 3°C (27 to 37°F) in the winter. Precipitation is highly variable with annual averages between 75 and 160 cm per year depending on location.

The Bering Slope Current (BSC) starts north of the base of the Aleutian Chain and flows northwest along the shelf break with long term average speeds of approximately 12 cm/s (Clement et al. 2005, Clement Kinney et al. 2009). Eddy activity is greater near canyons along the shelf break, which lead to higher rates of on-shelf transport (Clement Kinney et al. 2009).

Due to a ~0.5 m difference in sea surface height between the North Pacific and Arctic Oceans, shelf flow north of St. Lawrence Island is primarily north through the Bering Strait (Danielson et al. 2012). Average northerly winter winds (blowing toward the south) reduce the northerly current, so the October-November flow north through the Bering Strait is typically one-half to two-thirds of the April-August flow (Danielson et al. 2012).

Ocean circulation in the Bering Sea varies by season, year, decade, and is also responsive to short-term atmospheric forcing (Clement et al. 2005, Danielson et al. 2012). North or northwesterly winds cause the BSC to flow to the central shelf from the north and northwest, replacing coastal waters that are carried south and west (Danielson et al. 2012).

Atmospheric Conditions

Atmospheric circulations and wind-driven patterns are capable of creating basin-scale variations in upwelling and driving large-scale oscillations (Di Lorenzo et al. 2008, Drinkwater et al. 2009, Anderson et al. 2013). It is the interaction between the atmosphere, ocean, and other climate-related factors that leads to significant climate variations, including triggering various oscillations (Trenberth and Hurrell 1994).

Oscillations and Indices

Decadal or multi-decadal fluctuations (i.e., oscillations) of atmospheric and oceanic conditions have the potential to cause transitions between different regimes in marine ecosystems (Di Lorenzo et al. 2010). Indices attempt to capture the triggers and relationships between oscillations and associated climate shifts.

The Pacific Decadal Oscillation (PDO) affects the pattern of sea surface temperatures (SST) throughout the Pacific Ocean north of 20º N (NRC 2003a). The warm phases of the PDO are characterized by cool SST in the central North Pacific and warm SST along the west coast of the Americas (Mantua and Hare 2002). On average, from November-March, warm PDO sea level pressure events have low pressures over the North Pacific which cause increased counterclockwise winds, and high pressure over the northern subtropical Pacific which cause increased clockwise winds (Mantua and Hare 2002). In the Northern Hemisphere, PDO circulation events extend through the troposphere, and are reflected as persistence in the Pacific-North American Pattern (PNA) (Mantua and Hare 2002). Climate patterns associated with cool phases of the PDO are opposites of warm phases, but the physical mechanisms that cause the PDO are unknown (Mantua and Hare 2002).

Teleconnection patterns are persistent and recurring large-scale patterns of pressure and circulation that span vast geographical areas. They are an identification of links between regional large-scale atmosphere and ocean dynamics that connect one global climate system (Leathers et al. 1991). The PNA is one of the strongest extratropical teleconnections (Wallace and Gutzler 1981, Leathers et al. 1991).

The El Niño-Southern Oscillation (ENSO) is a pattern of pressure, temperature, and rainfall fluctuations that can have a global climate impact (Rasmusson and Wallace 1983). The development of an ENSO is initiated by boreal winter near-surface atmospheric circulations over the Hawaiian region (Anderson et al. 2013). These same near-surface atmospheric circulations can also change the positioning of the ENSO pattern, resulting in modifications to climate responses (Anderson et al. 2013). The changes in SST over the equatorial Pacific associated with the ENSO results in significant shifts in global and regional climates (Anderson et al. 2013).

The North Pacific Oscillation (NPO) was first described by weather forecasters in 1916 who noticed that “pressure variations in Hawaii were opposed to those over Alaska and Alberta, and that high pressure in Alaska meant a more southerly track of ‘lows’ and more rains in parts of the United States and liability to cold weather east of the Rocky Mountains” (Walker and Bliss 1932). The NPO is influential over the Pacific basin and can impact the Pacific trade winds (Linkin and Nigam 2008).

The North Pacific Gyre Oscillation (NPGO) is a pattern of climate variability (fluctuations in salinity, nutrients, and chlorophyll) that remained unexplained by the PDO and ENSO (Di Lorenzo et al. 2008, Ceballos et al. 2009). The NPGO is directed by atmospheric circulation through the NPO resulting in wind-driven upwelling at a regional and basin-wide scale, which controls salinity and nutrient levels (Di Lorenzo et al. 2008, Ceballos et al. 2009). Nutrient levels determine phytoplankton concentrations, potentially leading to changes at higher trophic levels (Di Lorenzo et al. 2008). The amplification of the variance in the NPGO and in global warming simulation suggests that the NPGO could become an increasingly significant process in forcing global-scale decadal changes in marine ecosystems (Di Lorenzo et al. 2008, Di Lorenzo et al. 2010).

The Arctic Oscillation (AO) is a dominant atmospheric occurrence in the Northern Hemisphere (Nagato and Tanaka 2012). The AO is an atmospheric circulation index often associated with change in the Arctic, and was in a positive phase from 1989-1995 and a near-neutral or negative phase from 1996-2004 (Overland and Wang 2005). The AO covaries with the Aleutian low pressure system, which is thought to be a better predictor of zooplankton and salmon abundance than the PDO (Halfar et al. 2011). However, the ecological regime shifts observed in the Bering

Sea between 1970-2008 were coincident with significant changes in sea ice, sea surface temperature, and surface air temperature, which are correlated with the PDO, but not other climate indices (Arctic Oscillation, North Pacific Index, and ENSO), suggesting that the PDO may best explain regime shifts in the Bering Sea (Zhang et al. 2010).

The North Pacific Index (NPI) describes changes in the Aleutian low pressure system and is defined to quantify the decadal, interannual, and annual variation in North Pacific climate conditions (Trenberth and Hurrell 1994, Ceballos et al. 2009) which can affect chlorophyll, phytoplankton, and zooplankton, as well as migratory pathways and abundance of many fish species (Trenberth and Hurrell 1994).

Although oscillations have the potential to indicate climate variability in an ocean basin on a multidecadal scale, it should not be expected that a single indicator (such as the PDO) can serve to characterize the climate of an ocean basin (Bond et al. 2003). Various modelling efforts have found that different oscillations and indices better describe the changes in climate variables over the past century. Some modelling efforts have found that very different drivers can explain the level of variation observed in an ocean basin (Gaichas et al. 2011).

Bering Sea

Since 1915 there was a short warm event in the Bering Sea from 1935-1937, a cold event from 1971-1976, followed by a warm event from 1978-1983, another warm event from 2000-2005, and a cold event from 2007-2011 (Hunt Jr et al. 2011, Overland et al. 2012, Stabeno et al. 2012, Heintz et al. 2013). The two events in the 1970s appear to have an El Niño-Southern Oscillation (ENSO) influence, while the two events in the 2000s are likely linked to Arctic-wide warming (Overland et al. 2012). From 1972-2012 the middle shelf of the Bering Sea was characterized by extreme variability in sea ice extent and temperature (Stabeno et al. 2012). There was high interannual variability of sea ice extent in the spring (March-April) from 1972-2000, which shifted to a period of low sea ice extent (2001-2005), and transitioned to a period of extensive sea ice (2007-2010) (Stabeno et al. 2012). Low spring sea ice extent levels were associated with relatively warm water temperatures for the following 6-7 months, and vice versa (Stabeno et al. 2012). Ocean currents changed during these different events, flowing largely westward on average during cold years, while in warm years flowing northward from December-February, and flowing relatively weakly during the rest of the year (Stabeno et al. 2012).

During the winter of 2000-2001, oceanic flow reversed in some areas of the Bering Sea concurrent with significantly reduced sea ice cover (Clement et al. 2005). The Bering Sea Current (BSC) carries a significant amount of heat northwest and onto the shelf (Clement Kinney et al. 2009). Mean temperatures of the BSC were above average from 1979 to 1989, and below average from 1989 to 1998/99 (Clement Kinney et al. 2009).

Fish and zooplankton abundance on the middle shelf of the Bering Sea differed significantly between warm and cold years (Stabeno et al. 2012). The warm period was characterized by a lack of large copepods and euphausiids over the shelf, but their numbers rebounded during the cold period (Stabeno et al. 2012). Recruitment of walleye pollock and Pacific cod was low during the prolonged warm event, but increased during the following cold period (Stabeno et al. 2012). However, small crustacean zooplankton taxa and recruitment of arrowtooth flounder (*Atheresthes stomias*) apparently were not influenced by warm versus cold events (Stabeno et al. 2012). Fewer fin whales were observed on the middle shelf of the Bering Sea during warm years (Stabeno et al. 2012).

Each winter, seasonal sea ice creates a cold pool of water on the seafloor on the eastern Bering Sea shelf (Mueter and Litzow 2008). The southern edge of this cold pool retreated ~230 km northward from the 1980s to 2006 concurrent with a reorganization in the biological community composition and distribution in the southeastern Bering Sea (Mueter and Litzow 2008). Fish species have expanded their ranges north in the eastern Bering Sea over the past 30 years in response to warming conditions (Mueter et al. 2009), and continue to do so despite the recent (2006-2010) cooling trend (Kotwicki and Lauth 2013). Several community distribution measures suggest a warming climate is the primary cause of changing biogeography, but variability in distribution not explained by climate suggests that other factors (perhaps internal community dynamics) also contribute (Mueter and Litzow 2008).

Gulf of Alaska/North Pacific

The Gulf of Alaska and Bering Sea are strongly affected by drivers of global climate variability including the ENSO, PDO, and NPGO (Litzow et al. 2014). However, when taken together, modelling of 6 most important climate indices (PDO, NPGO, AO, PNA, NPI, ENSO) can explain a significant portion, but not all, of the biological variability in the North Pacific (Litzow et al. 2014).

The North Pacific experienced a climate regime shift during the winter of 1976/77 (Yeh et al. 2011), that led to a decade-long change in the North Pacific atmosphere and ocean (Trenberth and Hurrell 1994). During the abrupt shift in the atmosphere-ocean climate over the North Pacific in the winter of 1976/77, the Aleutian low pressure system deepened significantly, the PNA teleconnection pattern changed, and the observed SST prior to and following that winter is characterized by a cooling over the western and central North Pacific, concurrent with a warming of the coastal northeastern Pacific (Yeh et al. 2011). A second climate regime shift occurred in the North Pacific during the winter of 1988/89 (Yeh et al. 2011). While the 1976/77 regime shift appears to be related to changes in SST in the tropics, the 1988/89 shift appears to be restricted to changes (i.e., warming) in the North Pacific (Yeh et al. 2011). The three regime shifts (1976/77, 1988/89, and 2007/08) all involved PDO/NPGO variability of similar magnitude, but while the 1976/77 shift was followed by a period of stability, the 1988/89 shift was not (Litzow and Mueter 2014). Data through 2013 suggest that the 2007/08 shift was more similar to the 1976/77 shift, and therefore may be more ecologically significant than the 1988/89 shift (Litzow and Mueter 2014).

Climatic shifts in the Gulf of Alaska in the twentieth century are often correlated with significant changes in species distribution and abundance, which can affect fisheries and industry and other species that depend on fish (Overland and Wang 2007, Hollowed et al. 2013). Fish species have expanded their ranges north in the Gulf of Alaska in response to warming conditions (Mueter et al. 2009). Ecosystem modelling of the relative effects of fishing, climate conditions, and predator-prey interactions on species in different trophic levels has not led to clear determination of the relative impacts of drivers on species abundance (Gaichas et al. 2011). No single forcing mechanism (fishing history, climate conditions, or predator-prey interactions) explains all species dynamics simultaneously, suggesting that there is no single primary driver of the ecosystem (Gaichas et al. 2011).

4.3 PREY RESOURCES WITHIN THE ACTION AREA

Marine mammals and salmon rely on a seasonally abundant and annually predictable prey base in Alaska. Many of the species included in this consultation return to the same areas year after year because they are located near predictable prey resources. Ephemeral prey resources, such as spawning salmon or herring, or concentrations of zooplankton, are important predictable food sources. In areas where the diet is less diverse, a decrease in the availability or predictability of a single prey species for a prolonged period of time or during a critical stage of the life cycle (e.g. weaning), could compromise the survival or reproductive success of individuals. Prey can be affected by the proposed action, resulting in indirect effects to the ESA-listed species considered in this consultation.

4.3.1 Herring

Pacific herring are a small, mobile, planktivorous forage fish belonging to the Clupeidae family. The range of Pacific herring includes coastal regions along the eastern and western Pacific, with a northerly range extending into the Beaufort Sea and Arctic Ocean (NMFS 2014).

Pacific herring play a “key role in subarctic Pacific pelagic ecosystems by being in an intermediary trophic position between plankton and consumers of herring such as other fishes, birds and mammals” (Kline Jr 2001). Pacific herring are an important nutritional resource for several species of marine mammals, supporting the nutritional needs of Steller sea lions, humpback whales, and other species through direct consumption as well as secondary consumption, when the mammals feed on other fish species such as pollock and salmon, which also feed on herring. Herring are an important prey resource for marine mammals due to their high lipid concentrations and energy content, measured at around 4.5 to 8.1 kJ/g wet mass (Paul and Paul 1998, Anthony et al. 2000). During their different life stages, herring are also an important prey resource for several marine mammal prey species, including: pollock, salmon, and Pacific cod.

Herring serve as a vital link between lower trophic levels, including crustaceans and small fish, and higher trophic levels, including a diversity of predators such as marine mammals, birds, invertebrates, and piscivorous fish (NMFS 2014). Natural mortality of herring is significant throughout all life stages, primarily from predation, disease, and unfavorable environmental conditions. Several herring commercial fisheries occur in Alaska. Herring have been used for human food and commerce for centuries, but it was only been within the last 100 years that herring have been subject to intense commercial fishing. During this time, most of the stocks have displayed marked fluctuations in abundance, and most have collapsed at least once, with the most severe declines preceded or accompanied by intense fishing.

Worldwide, declines in herring populations are believed to be the result of a number of factors, including overharvest, habitat loss and/or degradation (particularly spawning habitat), depensatory predation pressures, disease, water pollution, and unfavorable oceanographic conditions (Pearson et al. 1999). Regional declines in herring subpopulations have the potential to affect population dynamics of predator populations, including a number of species included in this consultation.

In general, the diet of Pacific herring is predominantly comprised of zooplankton, including euphausiids and barnacle larvae (Coyle and Paul 1992). Pacific herring are winter-spring spawners, and typically, adult herring congregate near spawning grounds for several weeks to months before spawning, then disperse to the ultimate spawning site a few days to a few weeks prior to spawning initiation (Haegele and Schweigert 1985). The specific timing of spawn initiation is believed to be dependent on environmental triggers such as temperature, light, and/or chemical cues from other herring (Haegele and Schweigert 1985). Differences in spawn timing of Pacific herring stocks might also be explained by local zooplankton production cycles, and particularly by the timing of production of copepod eggs, which are the predominant prey resource for larval herring (Hay 1990).

Hatch timing is temperature and light dependent. Pacific herring eggs hatch in 11 to 12 d at 10.7º C, 14 d at 8.5º C and 28 to 40 d at 4.4º C (Outram 1955). In the warmer climate of British Columbia, herring eggs hatch after approximately 2 weeks; in Prince William Sound, where water temperature and climate are similar to Southeast Alaska, herring eggs hatch in 24 days (Brown and Carls 1998). Pacific herring larvae remain at the site where they hatched unless swept away by ocean currents (Norcross et al. 2001), and they metamorphose into juveniles when they reach a size of 25 to 30 mm, which can take from 2 to 3 months (Hay 1985). Many herring may remain inshore until their first spawning (Hay 1985).

4.3.2 Eulachon

Eulachon (*Thaleichthys pacificus*) are an anadromous semelparous smelt in the Osmeridae family (Beacham et al. 2005). They range along the west coast of North America from northern California to the eastern Bering Sea (Hay and McCarter 2000), and forage on zooplankton, fish eggs, and plankton.

Eulachon are an important prey for marine mammals and piscivorous fish because they are numerous [in some areas in Alaska they are one of the most abundant neritic fish species (Wilson 2009)], and high energy, with fat content between 15-50%, considerably higher than most species of fish (Anthony et al. 2000, Iverson et al. 2002).

Eulachon spawn in a subset of rivers within their range, typically rivers with a significant spring runoff (Beacham et al. 2005). In general, eulachon spawn in the spring, extending later into the year in the northern parts of its range (as late as June in northern Alaskan rivers). The environmental factors affecting spawning times are not clear, but it appears that within a specific river system, eulachon have a characteristic spawning time (Beacham et al. 2005). Mature fish spawn a short distance upriver and then probably die. The eggs adhere to substrate and vegetation and generally hatch within 2 to 4 weeks. The fry are washed downstream where they may remain in estuarine waters for several weeks before moving to nearshore waters, where they remain until they become sexually mature at 3 years of age (Hay and McCarter 2000, Beacham et al. 2005). Prior to migrating into rivers to spawn, eulachon aggregate at depths of 40 to 150 meters. It is possible that eulachon imprint on their home estuary rather than their home streams, which means that the estuarine residence of early life stages of eulachon is important in maintaining population integrity.

4.3.3 Capelin

Capelin (*Mallotus villosus*) are a small, planktivorous, pelagic smelt in the Osmeridae family (Rose 2005, Mueter et al. 2009). Capelin range in the circumboreal Arctic, including from the Beaufort Sea to the Strait of Juan de Fuca in the eastern Pacific, across Southern Arctic Canada, south in the western Atlantic to Cape Cod, MA, and in Japan, Korea, and the Sea of Othosk in the western Pacific (Mecklenburg et al. 2002, Rose 2005).

Capelin are an important food resource for pollock and other apex marine predators due to their high energy content and seasonal abundance (Hunt Jr et al. 2002, Rose 2005). Juvenile capelin have a particularly high energy content relative to other small fish, with a mean fat content of 18% (Anthony et al. 2000). Adult capelin have a similar energy to content to Pacific herring with a mean fat content of 25% (Anthony et al. 2000). Capelin have the greatest energy and lipid contents in June, following the spring zooplankton blooms; after that, energy stores decreased dramatically throughout the summer, probably in association with decreasing prey availability and greater energy investment in reproductive requirements (Anthony et al. 2000). Because the peak in mean energy content is tied to the spring zooplankton bloom, capelin provides the greatest nutritional value to predators in late spring.

Capelin respond quickly to changes in climatic conditions, and the colonizing abilities of capelin have been documented in historical anecdotes (Rose 2005). Prior to the 1977 regime shift, Pacific capelin were abundant in the Gulf of Alaska and Bering Sea (Hunt Jr et al. 2002), and their rapid decline may be linked to warming ocean temperatures (Arimitsu et al. 2008). Across their range, capelin move to areas within their preferred oceanic temperature range (Frank et al. 1996, Rose 2005), which can vary significantly between years.

Spawning occurs in the late spring and summer in Alaska. Capelin concentrate in nearshore bays and estuaries and spawn at night in the intertidal portion of sandy beaches (Pahlke 1985, Arimitsu et al. 2008).

The diet of capelin is predominantly comprised of euphausiid eggs, *Pseudocalanus,* barnacle nauplii, *Calanus* spp., *Metridia* spp., and *Centropages abdominalis.* Coyle and Paul (1992) found that in the spring, prior to stabilization of the water column, herring and capelin shared similar foraging habitats and prey resources within the water column. However, as the surface waters warm, a pycnocline develops and a zooplankton assemblage develops near the surface. At this time, herring begin to actively forage on the zooplankton gathered in the surface layer as they move into the intertidal zone. Capelin, on the other hand, continued to forage in the water column and any seasonal variability in diet is linked to prey availability and abundance within that zone.

During the summer feeding period off the coast of Alaska and northeastern Russia, adult capelin distribution appears to be related to the width of the continental shelf (Naumenko 1996). Capelin are found several hundred kilometers offshore over the broad shelf of the eastern Bering Sea, while they appear to be confined to bays in northeastern Russia where the continental shelf is very narrow (Naumenko 1996). In regions of the Gulf of Alaska and Southeast Alaska where the shelf is relatively narrow, capelin are widely distributed nearshore and in bays and fjords during the summer (Pahlke 1985).

4.3.4 Salmon

Five Pacific salmon species spawn and have directed fisheries in Alaska: *Oncorhynchus nerka,* commonly known as sockeye or red salmon; *O. gorbuscha.* commonly known as pink salmon; *O. keta,* commonly known as chum or dog salmon; *O. tshawytscha,* commonly called king or Chinook salmon; and *O. kisutch,* commonly known as coho or silver salmon.

Salmon have a complex life cycle that involves a freshwater rearing period, followed by a period of ocean feeding prior to their spawning migration back to freshwater. Salmon from individual brood years can return as adults to spawn over a 2 to 6 year period. As a result, a single year class can be vulnerable to fisheries for several years. Salmon migrate and feed over great distances during their marine life stage. While there is great diversity in the range and migratory habits among different species of salmon, there also is a remarkable consistency in the migratory habit within stock groups, which greatly facilitates stock-specific fishery planning. Most salmon stocks are vulnerable to harvest by numerous commercial and sport fisheries in marine areas. Many are also taken in rivers and streams during their spawning migration by subsistence, sport, commercial, and personal use fishermen.

The Fishery Management Plan for the Salmon Fisheries in the EEZ off the Coast of Alaska (Salmon FMP) is unique in that it closes a majority of Alaska EEZ waters to commercial salmon fishing, and facilitates State management of the few salmon fisheries in the EEZ. The Salmon FMP is designed this way to be responsive to the complex life cycle of salmon species. The State manages Alaska salmon stocks throughout their range using a management approach that is designed to specifically address the life cycle of salmon, the nonselective nature of fishing in a mixed stock fishery, and the fact that a given salmon stock is subject to multiple fisheries through its migration from marine to fresh waters. The State’s first priority for management is to meet spawning escapement goals in order to sustain salmon resources for future generations. The highest priority use is for subsistence, under both state and federal law.

No species of Pacific salmon originating from freshwater habitat in Alaska are listed under the ESA. West coast salmon species currently listed under the ESA originate in freshwater habitat in Washington, Oregon, Idaho, and California. At least some of the listed salmon and steelhead are presumed to range into marine waters off Alaska during ocean migration and growth to maturity phases of their anadromous life history (see detailed description of ESA-listed salmonid ESUs that have been documented in Alaska waters in the “Status of the Species” section above). During ocean migration to the Pacific marine waters a small (undetermined) portion of the ESA-listed ESUs go into the Gulf of Alaska as far east as the Aleutian Islands. In that habitat they are mixed with hundreds to thousands of other stocks originating from the Columbia River, British Columbia, Alaska, and Asia. The listed fish are not visually distinguishable from the other, unlisted, stocks.

Of the species considered in this Biological Opinion, western DPS Steller sea lions, humpback whales, and Cook Inlet beluga whales are known to eat salmon in significant quantities (NMFS 1991, Merrick et al. 1997, Hobbs et al. 2008). Changes in the abundance and distribution of salmon in Alaska waters could affect the health and distribution of these three marine mammal species.

NMFS has identified more than one third of Cook Inlet as critical habitat (see “Status of the Species” section above). Pacific salmon constitute one of the primary constituent elements for the Cook Inlet beluga whale’s critical habitat. When designating critical habitat under the ESA, NMFS is required to identify specific areas within the geographical area occupied by the species on which are found those physical or biological features (i) essential to the conservation of the species and (ii) which may require special management considerations or protection. As a primary constituent element, NMFS concluded that salmon are essential to the conservation of the Cook Inlet beluga whale and may require special management considerations or protection in the future. The term "special" does not necessarily mean "beyond existing." This conclusion does not mean that salmon are presently impaired or limiting, or that existing laws and regulations managing salmon are not sufficient. NMFS continues to work with the State to ensure that Cook Inlet beluga whales are considered in fish management planning for Cook Inlet.

4.3.5 Other Fish

Walleye pollock, Pacific sand lance, and Atka mackerel (*Pleurogrammus monopterygius*) have also been identified as important prey species for marine mammals considered under the Biological Opinion in Alaska (Merrick et al. 1997, Iverson et al. 2002). The diet of Steller sea lions in the Gulf of Alaska and the Aleutian Islands is mostly walleye pollock or Atka mackerel (Merrick et al. 1997).

Several species of sand lance (*Ammodytes* spp.) occur in the boreo-Arctic regions of the North Atlantic and North Pacific Oceans. All species are zooplanktivorous and semi-demersal in that they alternately burrow in the seafloor or intertidal sediment or school pelagically in waters less than 60 meters deep (Robards et al. 1999, Ostrand et al. 2005). Only one species, *A. hexapterus* or Pacific sand lance, occurs in Alaska waters, and is a principal food source for marine mammals and seabirds in nearshore Gulf of Alaska and Bering Sea areas (Robards et al. 1999). Sand lance are a high lipid source of energy for piscivorous species, with lipid content similar to capelin, but lower than herring and eulachon (Anthony et al. 2000, Iverson et al. 2002). In Alaska, Pacific sand lance spawn once a year in September and October on intertidal sandy beaches (Robards et al. 1999). Pacific sand lance are not commercially harvested in Alaska.

Walleye pollock is a key species in the eastern Bering Sea ecosystem and is currently a target species for one of the world’s largest fisheries. It is a semipelagic schooling fish widely distributed in the North Pacific Ocean. Their geographic range extends from Japan to the Bering Sea and as far south as northern California (Mueter et al. 2011). In the eastern Bering Sea, walleye pollock are an important component in the foodweb and serve as primary prey for many piscivores, including other fish, seabirds, and marine mammals (Mueter et al. 2011). However, walleye pollock are considered to have relatively low energy content by weight (Anthony et al. 2000).

Young pollock feed on krill, zooplankton, and other crustaceans. As they increase in size, their diet begins to include juvenile pollock and other small fish. Walleye pollock are considered a relatively fast growing and short-lived species. Warm spring conditions may enhance the survival of early larvae, but high temperatures in late summer and autumn are associated with poor feeding conditions for young-of-year pollock and reduced recruitment in the following year, suggesting that predicted changes in climate will lead to in declines in recruitment of walleye pollock (Mueter et al. 2011).

Atka mackerel occur from the east coast of the Kamchatka Peninsula, Russia, throughout the Komandorskiye and Aleutian Islands, north to the Pribilof Islands, and east through the Gulf of Alaska to Southeast Alaska. Their center of abundance is in the Aleutian Islands, particularly from Buldir Island to Seguam Pass. Atka mackerel are a substrate-spawning fish with male parental care. Single or multiple clumps of adhesive eggs are laid on rocky substrates in individual male territories within nesting colonies where males brood eggs for a protracted period (Lowe et al. 2013). Nesting colonies are widespread across the continental shelf of the Aleutian Islands and western GOA down to bottom depths of 144 m (Lauth et al. 2007). In the eastern and central Aleutian Islands, larvae hatch from October to January with maximum hatching in late November (Lauth et al. 2007).

Adult Atka mackerel in the Aleutians consume a variety of prey, but principally calanoid copepods and euphausiids (Yang 1999). At times, the Atka mackerel is the most abundant fish species in the Aleutians and is an important food resource for marine mammals and other fish (Nemoto 1957, Kawakami 1980, Merrick et al. 1997, Yang 1999).

There is a directed trawl fishery for Atka mackerel in the Bering Sea/Aleutian Islands. The patterns of the Atka mackerel fishery generally reflect the behavior of the species: (1) the fishery is highly localized and usually occurs in the same few locations each year; (2) the schooling semi-pelagic nature of the species makes it particularly susceptible to trawl gear fished on the bottom; and (3) trawling occurs almost exclusively at depths less than 200 m (Lowe et al. 2013). The most recent Aleutian Islands biomass estimate from the 2012 Aleutian Islands bottom trawl survey is 276,877 tons, down 70% relative to the 2010 survey estimate (Lowe et al. 2013). This variation in survey biomass and low estimates for 2012 may be affected by colder than average temperatures in the region and their effects on fish behavior (Lowe et al. 2013).

4.3.6 Zooplankton

Zooplankton species composition and distribution on the northern Gulf of Alaska shelf is likely influenced by the rugged submerged topography (e.g., canyons, ridges) and strong tides and currents (Coyle and Pinchuk 2003). Abundance and biomass of zooplankton in this region shows a strong seasonal pattern in the spring/summer growing months (March – September), with a peak in abundance in May in 1998-2000, and double biomass peaks in May and August in those same years (Coyle and Pinchuk 2003). The May abundance and biomass peaks were primarily comprised of calanoid copepods, while cnidarian and pteropod abundance and biomass increased through the summer months to peak in August (Coyle and Pinchuk 2003). Euphausiid biomass and abundance remained fairly constant throughout the production period in the 1998-2000 summer months (Coyle and Pinchuk 2003).

As discussed in the "Oceanographic Dynamics" section above, abundance of zooplankton on the middle shelf of the Bering Sea was associated with changes in mean temperatures of the Bering Sea Current. During a warm period from 1979 to 1989, there were few large copepods and euphausiids over the shelf, but their numbers rebounded during the cold period from 1989 to 1999 (Stabeno et al. 2012).

Zooplankton biomass in the Arctic Ocean north of Alaska varies spatially, seasonally, and based on hydrographic characteristics (e.g., temperature and salinity)(Ashjian et al. 2003). Much of the seasonal component affecting zooplankton abundance is primary production, or the presence of algae or other food (Campbell et al. 2009).

The abundance and distribution of zooplankton can affect the distribution and behavior of their marine mammal predators, including species in Alaska considered in this Biological Opinion (Wade et al. 2011a, Mocklin et al. 2014, Warren et al. 2014). Abundant zooplankton is a primary constituent element of designated critical habitat for the North Pacific right whale, as described above in the "Status of the Species" section.

4.4 HUMAN IMPACTS TO LISTED SPECIES IN THE ACTION AREA

In addition to climate change (described above) there are ongoing human activities in the action area that impact ESA-listed species considered in this Biological Opinion. These human-caused stressors include marine vessels, pollution, noise (aircraft, pile driving, seismic operations, blasting, dredging, etc.), and land-based disturbance. Stressors are described in more detail for each individual species above in the "Status of Listed Species Section."

4.4.1 Marine Vessel Activity

Ferries, cruise ships, tankers, ore carriers, commercial fishing vessels, and recreational vessels transit or operate within Alaska state and EEZ waters. Marine vessels are a known source of injury and mortality to marine mammals in Alaska, including to some of the species considered in this Biological Opinion (Laist et al. 2001, Neilson et al. 2012). From 1978-2011, 108 whale-vessel collisions were reported within 200 miles of Alaska's coastline (Neilson et al. 2012). Most of these (86%) were humpback whales. Other species included fin whale, Cuvier's beaked whale, Stejneger's beaked whale, gray whale, and beluga whale (Neilson et al. 2012). In 15 of the 108 cases, whales struck anchored or drifting vessels, indicating that whales cannot always detect vessels (Neilson et al. 2012). Two ship-strike injuries were documented to bowhead whales out of a total of 236 bowhead whales examined from the Alaskan subsistence harvest between 1976 and 1992 (George et al. 1994).

Another stressor associated with marine vessel activity is noise. Some vessels can exceed NMFS's thresholds of concern. This is addressed in more detail below in the "Existing Noise Levels in the Action Area."

4.4.2 Pollution

A number of intentional and accidental discharges of contaminants pollute the marine waters of Alaska annually. Accidental discharges reported to ADEC or the USCG from 1995 to 2012 are included in the “Historic Spills in Alaska” section above. Intentional sources of pollution discharge include drill cuttings (e.g., drilling muds), wastewater of various treatment levels, stormwater runoff, and vessel discharges.

Although drilling fluids and cuttings can be disposed of through onsite injection into a permitted disposal well, or transported offsite to a permitted disposal location, some drilling fluids are discharged at the sea floor before well casings are in place. Drill cuttings and fluids contain relatively high concentrations of contaminants that have high potential for bioaccumulation, such as dibenzofuran and PAHs (Fang 1990). Historically, drill cuttings and fluids have been discharged from oil and gas developments in Alaska, and residues from historical discharges may be present in the affected environment (Brown et al. 2010).

Domestic, municipal, and industrial wastewater discharges in Alaska are managed and permitted (Alaska Pollutant Discharge Elimination System) by the State of Alaska Department of Environmental Conservation.

Stormwater runoff has the potential to carry numerous pollutants from communities in coastal Alaska into the marine waters nearby. Runoff can include pollution coming from streets, construction and industrial areas, and airports. Runoff can also carry hazardous materials from spills and contaminated sites into coastal marine waters.

The principal regulatory method for controlling pollutant discharges from vessels (grey water, black water, coolant, bilge water, ballast, deck wash, etc.) into waters of the U.S. is the Clean Water Act (CWA) of 1972. Section 402 establishes the National Pollution Discharge Elimination System (NPDES). The Environmental Protection Agency (EPA) issued an NPDES Vessel General Permit (VGP) for “Discharges Incidental to the Normal Operation of a Vessel” for Alaska in February 2009. The final VGP applies to owners and operators of non-recreational vessels that are 79 feet and greater in length, as well as to owners and operators of commercial vessels of less than 79 feet which discharge ballast water.

4.4.3 Existing Noise Levels in the Action Area

Shipping sounds are often at source levels of 150-190 dB re 1 µPa at 1 meter. Shipping traffic is mostly at frequencies from 20-300 hertz (Greene and Moore 1995). Sound produced by smaller boats typically is at a higher frequency, around 300 hertz (Greene and Moore 1995). In shallow water, vessels more than 6.2 miles away from a receiver generally contribute only to background-sound levels (Greene and Moore 1995). Icebreaking vessels used in the Arctic for activities including research and oil and gas activities produce louder, but also more variable, sounds than those associated with other vessels of similar power and size. The greatest sound generated during ice-breaking operations is produced by cavitation of the propeller as opposed to the engines or the ice on the hull; estimated source levels for icebreakers to range from 177-191 dB re 1 μPa 1 meter (Greene and Moore 1995). Even with rapid attenuation of sound in heavy ice conditions, the elevation in noise levels attributed to icebreaking can be substantial out to at least 3 miles. In some instances, icebreaking sounds are detectable from more than 31 miles away (Greene and Moore 1995).

Levels of anthropogenic (human-caused) sound can vary dramatically depending on the season, type of activity, and local conditions. These noise sources include transportation, dredging, and construction; oil, gas, and mineral exploration in offshore areas; geophysical (seismic) surveys; sonars; explosions; and ocean research activities (Richardson et al. 1995). Geophysical seismic activity has been described as one of the loudest man-made underwater noise sources, with the potential to harass or harm marine mammals. Seismic surveys use high energy, low frequency sound in short pulse durations to determine substrates below the seafloor, such as oil and gas deposits (Richardson et al. 1995). Oil and gas exploration, associated seismic surveys, and drilling occur within the range of many of the species included in this Biological Opinion.

Several investigators have argued that anthropogenic sources of noise have increased ambient noise levels in the ocean over the last 50 years (Richardson et al. 1995, NRC 2003b, Horowitz and Jasny 2007). Much of this increase is due to increased shipping as ships become more numerous and of larger tonnage (NRC 2003b).

Even though sound is attenuated by the water surface, aircraft noise can be loud underwater when jet aircraft are directly overhead (Blackwell and Greene 2002). And aircraft can potentially harass pinnipeds at haulouts and rookeries.

4.4.4 Land Disturbance

Disturbance from land-based human activities can result in harm and harassment of marine mammals at haulouts, rookeries, and in nearshore waters. Coastal development and recreational activities are two potential sources of land-based disturbance to marine mammals.

Coastal development has resulted in both the loss and alteration of nearshore marine mammal habitat and changes in habitat quality due to vessel traffic, noise, and pollution. There is concern that increased development may prevent marine mammals from reaching or using important feeding, breeding, and resting areas. Pile driving is a common source of marine in-water noise that is a potential acoustic stressor for marine mammals in Alaska. Harbor and dock construction and maintenance are also sources of acoustic noise that rise above the thresholds of concern for NMFS.

Humans engaged in recreational activities on or in Alaska’s marine waters and shorelines can result in disturbance and other impacts to ESA-listed marine mammals and fish. Groups of foraging or resting marine mammals are particularly vulnerable to harassment.

5.0 EFFECTS OF THE PROPOSED ACTION

Pursuant to Section 7(a)(2) of the ESA (16 U.S.C. §1536), federal agencies are directed to ensure that their activities are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of their critical habitat.

In this section of the Biological Opinion, NMFS assesses the direct and indirect effects of the proposed action on ESA-listed species and their respective critical habitats, if applicable. The purpose of the assessment is to determine the direct and indirect effects on threatened and endangered species that may appreciably reduce their likelihood of surviving or recovering in the wild, or appreciably diminish the value of designated critical habitat for the survival or recovery of threatened and endangered species in the wild.

5.1 APPROACH TO THE ASSESSMENT

NMFS generally approaches jeopardy analyses through several steps. The first step identifies the direct and indirect effects of the proposed action on the physical, chemical, and biotic environment of an action area. As part of this step, we identify the spatial extent of these direct and indirect effects, which includes changes in the spatial extent over time. The second step identifies the listed resources that are likely to co-occur with these effects in space and time and the nature of that co-occurrence (our *exposure analyses*). In this step of our analyses, we try to identify the number, age (or life stage), and gender of the individuals that are likely to be exposed to an action's effects and the populations or subpopulations those individuals represent. Once we identify which listed resources are likely to be exposed to an action's effects and the nature of that exposure, we evaluate the available literature to determine how those listed resources are likely to respond given their exposure (our *response analyses*).

The final steps of our analyses — establishing the risks those responses pose to listed resources — are different for listed species and designated critical habitat (our *risk analyses*). Because individual organisms are the entities that live, die, develop, mature, migrate, and reproduce (or fail to do so), our assessments begin by identifying the risks to the individual organisms that are likely to be exposed to an action's effects (we measure these risks using an individual's "fitness" or the individual's probability of surviving and reproducing).

When listed animals exposed to an action's effects are expected to experience reductions in fitness, we would expect the action to reduce the abundance, reproduction rates, or growth rates (or variance in these measures) of the populations the individuals represent (Stearns 1992). Reductions in one or more of these variables (or one of the variables we derive from them) is a necessary condition for reductions in a population's viability, which is itself a necessary condition for reductions in a species' viability. On the other hand, when listed animals exposed to an action's effects are not expected to experience reductions in fitness, we would not expect the action to have adverse consequences on the viability of the populations those individuals represent (Stearns 1992, Anderson 2000).

If we conclude that listed animals are not likely to experience reductions in their fitness, we would conclude our assessment. If, however, we conclude that listed animals are likely to experience reductions in their fitness, we would analyze the consequences of this reduction on the viability of the populations the individuals represent (measured using changes in the populations' abundance, reproduction, spatial structure and connectivity, growth rates, or variance in these measures). In this step of our analyses, we use the population's base condition (established in the *Environmental Baseline* and *Status of Listed Species* sections of this opinion) as our point of reference. Finally, we consider the consequences of any changes in population viability on the viability of the species those populations comprise. Changes in a species' reproduction, numbers, or distribution are used to estimate the species' viability. In this step of our analyses, we use the species' status (established in the *Status of the Species* section of this opinion) as our point of reference.

We begin this assessment by determining whether the ESA-listed species considered in this Opinion are likely to experience reductions in fitness as result of their exposure to individual stressors produced by the proposed action or the entire suite of stressors the proposed action represents (that is, hazardous materials spill response in Alaska). If we conclude that the ESA-listed animals exposed to the action's effects are likely to experience reductions in fitness, we need to analyze the consequences of this reduced fitness on the populations those animals represent (at the level they are listed under the ESA; species, sub-species, DPS, ESU). If we conclude that the ESA-listed species exposed to the action's effects are not likely to experience reductions in fitness, we will conclude our analyses because we would not expect the action to have adverse consequences on the viability of the populations those animals represent if the action is not likely to affect the fitness of the animals themselves.

For designated critical habitat, our analyses will depend on whether the critical habitat designation identifies primary constituent elements. If a designation contains primary constituent elements, our analyses begin by identifying whether and how those elements are likely to respond to an action's direct and indirect effects on the environment (if a designation does not contain primary constituent elements, our analyses begin by identifying the habitat variables that give the designated area conservation value for the listed species). Once we identify the responses of the habitat's constituent elements, we identify the consequence of those responses on the conservation value of the designated area; for the purposes of consultation, 'conservation value' means the value of the designated area for the 'conservation' (as it is defined by section 3 of the Endangered Species Act of 1973, as amended) of the listed species. The conservation value of this critical habitat is established in the Status of Listed Species section above, and provides the point of reference for this step of our analyses.[**]

5.2 POTENTIAL EFFECTS OF THE PROPOSED ACTION

Several elements of the activities that result from the decision-making process under the Unified Plan will likely produce direct and indirect effects on the natural environment of the action area that are relevant to this effects analysis. These elements include risk of collisions from response vessels and equipment (e.g., skimmers), noise associated with marine vessel and aircraft traffic and deployment of response equipment, alteration of the prey base and increased bioavailability of oil from dispersant use, inhalation of particulates from *in situ* burns, harassment and habitat alteration from shoreside response work, and a risk of additional petroleum spills from increased vessel traffic.

The following descriptions summarize aspects of the potential stressors resulting from oil spill response activities as directed by the Unified Plan that pose direct potential risks to ESA-listed species under NMFS's authority. We follow these summaries by identifying the co-occurrence of listed species with these direct effects and the nature of that co-occurrence (our *exposure analyses*). Once we identify which listed resources are likely to be exposed to an action's effects and the nature of that exposure, we evaluate the available literature to determine how those listed resources are likely to respond given their exposure (our *response analyses*). After we complete our exposure and response analyses for these direct effects, we will repeat this process to examine the potential indirect effects of the response activities directed under the Unified Plan.

5.2.1 Risk of Collisions

Vessels transiting the marine environment have the potential to collide with, or strike, marine mammals (Laist et al. 2001, Jensen and Silber 2003). The probability of strike events depends on the frequency, speed, and route of the marine vessels, as well as distribution of marine mammals in the area. Individuals of all of the whale species included in this section 7 consultation have been killed and/or injured in collisions by ship traffic.

Sperm whales have been killed by ship traffic and some individuals show scars from propeller injuries (Laist et al. 2001, Douglas et al. 2008, Notarbartolo di Sciara 2014). Between 1980 and 1993, four to six blue whales died as a result of collisions with ships (NMFS 1998). Of three sei whales that stranded along the U.S. Atlantic coast during 1975-1996, two showed evidence of collisions (Laist et al. 2001). Humpback and fin whales are especially susceptible to ship strike injury and mortality in narrow bottleneck passages (Williams and O'Hara 2010).

[**] This analysis does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 C.F.R. 402.02, at issue in Gifford Pinchot Task Force v. U.S. Fish and Wildlife Service, 378 F.3d 1059 (9th Cir. 2004).

Bowhead whales are among the slowest moving of whales, which may make them particularly susceptible to ship strikes although records of strikes on bowhead whales are rare (Laist et al. 2001). About 1% of the bowhead whales taken by Alaskan Inupiat hunters bore scars from ship strikes (George et al. 1994). Until recently, few large ships have passed through most of the bowhead whale's range but this situation may be changing as northern sea routes become more navigable with the decline in sea ice. Cook Inlet beluga whales are vulnerable to death and injury due to ship strike as well, and have been observed with scars and significant injuries from propeller wounds (Hobbs 2006).

Ship strikes may affect North Pacific right whales and western North Pacific gray whales. Little is known of the nature or extent of this problem in the North Pacific. Other species of right whales are highly vulnerable to ship collisions (Kraus et al. 2005). Gray whales are struck by ships and injured or killed in areas of relatively high abundance, such as California and Washington (Laist et al. 2001, Douglas et al. 2008). Because of the rarity of North Pacific right whales and eastern North Pacific gray whales, the impact to the species from even low levels of interaction could be significant.

Seals can be impacted by ship strike or propeller injuries, although these injuries appear infrequently (Goldstein et al. 1999, Bexton et al. 2012). Dead seals have been recovered with severe propeller injuries, and live seals have been observed with propeller blade scars (Goldstein et al. 1999, Bexton et al. 2012). The NMFS Alaska Region Stranding Network Database reports only eight ship strike/collision harbor seal mortalities and one spotted seal mortality in Alaska since the late 1980s (database queried on June 19, 2014). Although no bearded or ringed seal ship strike/collision injuries have been reported in Alaska, the harbor seal and spotted seal mortalities suggest that ringed and bearded seals could be injured or killed by this stressor.

In addition, icebreakers pose risks to ringed and bearded seals because they are capable of operating year-round in all but the heaviest ice conditions and may be used to escort other types of vessels (e.g., tankers and bulk carriers) through ice-covered areas. The loud noise associated with icebreakers could disturb hauled out ringed or bearded seals, and icebreakers could potentially crush ringed seal pups in their ice lairs. Most mariners in the Arctic purposefully avoid areas of ice and thus prefer periods and areas that minimize the chance of encountering ice. There are few ships with icebreaking capabilities available worldwide for the purpose of spill response. This helps mitigate the risk of ship strike or propeller injuries to ringed and bearded seals, since they are closely associated with ice throughout the year.

Although risk of ship strike has not been identified as a significant concern for Steller sea lions (Loughlin and York 2000), the Recovery Plan for this species states that Steller sea lions may be more susceptible to ship strike mortality or injury in harbors or in areas where animals are concentrated (e.g., near rookeries or haulouts) (NMFS 2008). The California sea lion, a similar species, has been observed with propeller strike injuries (Goldstein et al. 1999), indicating that individual Steller sea lions could be impacted as well.

There is no evidence to suggest that injury or mortality of salmon or steelhead from collisions with ships or propellers is a significant stressor. Salmon and steelhead are highly mobile and can remain subsurface to avoid contact with marine vessels and propellers.

There are a large variety of possible types of marine vessels that could be used during oil spill response in Alaska, operating at significantly different speeds based on their capabilities or activities. Generally, there is a direct relationship between the occurrence of a whale strike and the speed of the vessel involved in the collision. Most collisions that killed or severely injured whales involved vessels greater than 80 meters in length traveling at speeds in excess of 13 knots (Laist et al. 2001), but slower, smaller vessels have also injured and/or killed marine mammals.

Mitigation Measures. As part of emergency ESA section 7 consultations, NMFS expects these standard mitigation measures to be incorporated into the IAP, when applicable, to lessen potential ship strike impacts to ESA-listed species.

1. All vessel operators should be made aware of the potential presence of whales and pinnipeds during marine responses, and should take steps to avoid close approach (e.g., 300-500 foot in-water buffer).

2. Use of protected species observers on response vessels and aircraft engaged in oil spill response or transiting the action area to engage in response (e.g., carrying response personnel or supplies, conducting surveys, deploying response equipment, etc.), particularly on vessels operating at speeds greater than 13 knots. Observers are expected to notify vessel and aircraft operators of nearby marine mammals in order to modify the response activity to minimize impacts to wildlife (either through changing direction, slowing vessel speed, or not deploying equipment until marine mammals have departed the area of their own volition). Note: vessels assigned to dispersant application are expected to have protected species observers automatically assigned to that activity.

3. All responders will provide the Unified Command (e.g., Wildlife Branch in the Operations Division, and/or Environmental Unit in the Planning Division) with reports of any sightings of healthy or potentially oiled/injured marine mammals in or near the response area in real time. These sightings can be distributed throughout the response effort inform responders of marine mammal locations and reduce the chance of ship strike.

4. Create restricted use zones around areas of high marine mammal concentrations (e.g., feeding areas, migration pathways, haulouts, or rookeries) where pre-authorized vessel

and personnel access is prohibited. The USCG/EPA can work with NMFS prior to spill events to develop maps of high concentration areas and specific restricted use zone distances for inclusion in Subarea Contingency Plans. Buffers can be established for specific incidents, but 1,500 feet is a typical buffer around haulouts and rookeries.

5.2.2 Acoustic Disturbance/Noise

Possible impacts to marine mammals exposed to loud underwater or in-air noise include mortality (directly from the noise, or indirectly from a reaction to the noise), injury, and disturbance ranging from severe (e.g., abandonment of vital habitat) to mild (e.g., startle response).

Since 1997 NMFS has used sound exposure thresholds to determine whether an activity produces underwater and in-air sounds that might result in impacts to and take of marine mammals (70 FR 1871). The current in-water Level A (injury) threshold [see section 3(18)(C) of the MMPA] for impulse noise is 180 decibels re 1 µPa for cetaceans and 190 decibels re1 µPa for pinnipeds. The current in-water Level B (behavioral disruption) threshold [see section 3(18)(D) of the MMPA] for impulse noise (e.g., impact pile driving) is 160 decibels re 1 µPa for cetaceans and pinnipeds. The current in-water Level B threshold for continuous noise for cetaceans and pinnipeds is 120 decibels re 1 µPa. In-air acoustic thresholds for pinnipeds are 90 decibels re 1 µPa for harbor seals, and 100 decibels re 1 µPa for all other pinnipeds.

Although sound source levels of oil spill response activities are not available from past responses, there is sound source information for in-air and in-water activities similar to those employed during spill response (Table 3).

Table 3. Sound source levels from equipment/activities that may occur, or may be similar to activities that occur, during spill response (URS 2007, NMFS 2013a) (sound source levels also provided by USCG/EPA to supplement the Biological Assessment).

Source	Received Level dB re 1 µPa	Distance (meters)	Frequency (hertz)
In-Air Sound Level			
C-130 Cargo Plane	140	0	-
C-130 Cargo Plane	120	~30	-
Fixed wing aircraft	162	0	68-102
Rotary aircraft	151	0	68-102
In-Water Sound Level			
Tug	150-160	30	-
Tug, pushing gravel barge	149	100	-

Tug, pushing gravel barge	135	200	-
Small boat (Boston Whaler skiff)	138	13	-
Small rubber boat (skiff)	142	8.5	-
Vessels (skiffs, outboards, barges)	190	0	20-300
Icebreakers (cavitation)	171-205	0	10-10,000
Small vessels (boats and ships)	145-170	-	37-6,300
Single beam EchoSounder	205	0	3,500-1,000,000
Double beam EchoSounder	242	0	180,000-500,000

The significance of potential impacts of noise to marine mammals is dependent on a number of factors including the magnitude of sound pressure levels, species receiving the sound, exposure type (e.g., continuous vs. pulse), duration, site characteristics, species' auditory characteristics, and individual marine mammal characteristics (e.g., habituation, season, motivation) (Dazey et al. 2012, Ellison et al. 2012).

Some of the sound source levels presented above (Table 3) are capable of injuring marine mammals at short distances. Many oil spill response activities will generate noise loud enough to harass, or change the behavior of ESA-listed marine mammals. The marine mammals included in this Biological Opinion depend on acoustic signals to communicate, navigate, locate prey, and sense their environment. Noise has the potential to disrupt theses essential behaviors, resulting in highly variable impacts on individuals, groups, or populations. Acoustic disturbance can harass marine mammals and cause them to alter their behavior and move away from preferred habitat (Baker and Herman 1989, Parks et al. 2007a), potentially resulting in increased energy expenditure and elevated stress to individuals. However, an ancillary benefit of harassing marine mammals away from the impact zone could be the lessening of the risk of exposure of individuals to oil, ship strikes, etc.

Mitigation Measures. As part of emergency ESA section 7 consultations, NMFS expects these standard mitigation measures to be incorporated into the IAP, when applicable, to lessen potential acoustic disturbance/noise impacts to ESA-listed species.

1. All vessel and aircraft operators should be made aware of the potential presence of whales and pinnipeds during marine responses, and should take steps to avoid close approach. Typically, incident specific buffers are 1,500 feet around haulouts and rookeries, and 300-500 feet from marine mammals in-water.

2. Create buffer zones around areas of high marine mammal concentrations (e.g., haulouts or rookeries) where pre-authorized aircraft and vessel access is prohibited. The USCG/EPA can work with NMFS prior to spill events to develop maps of high

concentration areas for inclusion in Subarea Contingency Plans. A commonly implemented example of this is maintaining a 1,500 foot no access buffer in all directions around Steller sea lion haulouts and rookeries.

3. Avoid revving engines or other loud activities exceeding 180 decibels in or near the marine environment when marine mammals are present. Use quieter equipment when possible (e.g., use 4-stroke motors instead of 2-stroke motors).

5.2.3 Dispersant Use

The baseline condition assumes that for dispersant use to be considered, a spill has occurred and fresh, or slightly weathered, crude petroleum is in the water. A description of the intended purpose and guidelines for use of dispersants is located above in the "Description of the Proposed Action."

When an oil slick is sprayed with dispersants and exposed to mixing energy (typically from wave action), some of the oil is broken into small droplets, which may become entrained in the water column (NRC 2013). Dispersants do not reduce the total amount of oil entering the environment. Instead, dispersants change the chemical and physical properties of oil, resulting in changes to the transport, fate, and potential effects (NRC 2005). Because the chemically dispersed oil droplets may be small enough to be neutrally buoyant, diffusion and advection transport processes are expected to dilute the plume into the water column to concentrations below toxicity threshold limits. Microbial degradation of oil spilled at sea primarily occurs at the oil-water interface; therefore, biodegradation rates should be enhanced provided the dissolved oil concentration is not so large as to be toxic to the microbes. At the large scale, the overall biodegradation rate is increased when dispersants are used effectively (NRC 2013).

Dispersants reduce the potential for oil to contact wildlife and the shoreline, but increase the potential exposure of pelagic and benthic biota to dispersed oil (NRC 2005;2013). The decision to use dispersants represents a choice to increase the hydrocarbon load on one part of the ecosystem (e.g., the water column) and reduce it in another part (e.g., the shoreline and surface waters). That decision is influenced by a number of covariates, including water depth, distance from shore, size of spill, weather conditions, degree of mixing, and relative abundance and life stage of organisms in the area (NRC 2005).

The effectiveness of a dispersant for the treatment of oil spilled at sea is largely dependent on a number of physicochemical factors such as oil properties, turbulence (e.g., waves for dispersant applied at the surface), temperature, oil weathering, salinity of the sea water, and the hydrophilic-lipophilic balance of the dispersant (Chandrasekar et al. 2005;2006, Mukherjee and Wrenn 2009).

Chemical dispersion of oil is expected to mitigate the acute toxic effects of oil by reducing exposure duration and concentration through increased dilution (USCG and EPA 2014). In general, biodegradation tests indicate that chemical dispersant use increases the rate of oil removal from the water column under a variety of conditions (USCG and EPA 2014). Although biodegradation is expected to increase under the influence of chemical dispersants, the process is often incomplete, and the various chemical components of Corexit are expected to degrade 52-98% within 28 days (USCG and EPA 2014).

Since dispersants cause oil to be broken into small droplets, mixed oil and dispersants leads to enhanced dissolution of soluble and semi-volatile compounds into surrounding waters, resulting in fewer airborne volatiles (NRC 2013, USCG and EPA 2014). This leads to another trade-off between decreased exposure and toxicity to air-breathing animals, and increased exposure to animals that do not need to surface to breathe (e.g., fish).

Dispersants have been shown to be toxic to embryonic fish exposed at early life stages (USCG and EPA 2014). Although this is not directly applicable to the salmon and steelhead ESUs included in this consultation, which do not spawn or undergo embryonic stages in Alaska waters, it could apply indirectly to the prey of marine mammal and fish species included in this Biological Opinion (e.g., herring, non-ESA-listed salmonids, capelin, eulachon). However, oil by itself is also toxic to embryonic fish, and dispersant use may reduce the overall toxic effects to this age class (USCG and EPA 2014).

Effects of chemically dispersed oil on fish include abnormal growth, reduced growth, reduced hatch, and mortality (USCG and EPA 2014). However, these same effects are observed from oil alone. PAHs in fish can lead to mortality in all life stages, decreased growth, lower condition factor, edema, cardiac dysfunction, a variety of deformities, lesions and tumors of the skin and liver, cataracts, damage to immune systems and compromised immunity, estrogenic effects, bioaccumulation, bioconcentration, trophic transfer, and biochemical changes (Logan 2007). One study found more extensive impairment of gill ion regulation, in addition to changes in plasma ion levels and blood parameters, from dispersed oil, with lesser effects from oil or dispersants alone (Duarte et al. 2010). However, a different study found reduced acute toxicity in Chinook salmon from dispersed oil (Corexit 9500 + Prudhoe Bay crude oil) relative to oil alone (Van Scoy et al. 2010).

In general, fish do not bioaccumulate components of oil to the same degree that invertebrates do. Fish can metabolize and excrete oil components, and are therefore thought to be less of a long term threat to species that prey on fish (relative to zooplankton) (USCG and EPA 2014).

Zooplankton are an important prey for many of the species considered in this Opinion. Dispersant use can lead to increased exposure of zooplankton to oil by entraining the smaller oil droplets deeper into the water column where zooplankton occur. A number of studies have shown greater impacts to invertebrates from dispersed oil relative to oil alone (USCG and EPA 2014). Exposure of invertebrates to oil, especially in early-life stages, can lead to developmental impacts, reduced growth, and mortality (USCG and EPA 2014). These acute effects would likely be localized to the area where dispersants were used, and would not have a population level effect (USCG and EPA 2014).

Exposure of marine mammals to oil, either through ingestion of oil or indirectly through prey with bioaccumulated PAHs (known carcinogens that cause oxidative stress and DNA damage in mammals) may include digestive system distress, narcosis, lesions, developmental deformities, decreased growth, and mortality (USCG and EPA 2014). Other known impacts to marine mammals from oil include irritation of the eyes, skin, and other sensitive tissues or mucous membranes; reduced body weight of pups; altered maternal care for pups (potentially due to olfactory damage); altered swimming behaviors; and reduced resilience to stress (USCG and EPA 2014).

The toxicity of chemical dispersants is typically less than that of oil alone; however, the combination of oil and dispersants can be more toxic to biological organisms than oil alone (NRC 2005, USCG and EPA 2014), likely due to the increased bioavailability of oil when dispersed. Dispersants increase the solubility of the components of oil (e.g., PAHs) and redistribute oil droplets into the water column (USCG and EPA 2014).

Inhalation of dispersant fumes is a possible route of exposure that could negatively impact marine mammals through inflammation of tissues (e.g., eyes and respiratory tract), chemical pneumonia, increased difficulty breathing, injury to kidneys, liver, and blood cells, acute neurological impacts (e.g., altered neurotransmitter signaling potentially leading to short term memory loss and lack of motor coordination), nausea, vomiting, narcosis, and defatting and drying of skin (USCG and EPA 2014). However, many of these same symptoms and impacts are potential consequences of inhalation of fumes from oil alone as well.

Oil and dispersed oil can mat down and destroy the thermoregulatory properties of marine mammal fur. However, studies suggest no significant difference in the effects of loss of the thermoregulatory properties of fur due to oil versus dispersed oil (USCG and EPA 2014). In addition, most of the marine mammals under NMFS's authority considered in this Opinion rely on a subcutaneous layer of fat/blubber for insulation, and have only short (e.g., Steller sea lion) or little (whales) fur.

Horizontal transport of dispersants and dispersed oil is largely driven by ocean currents. Vertical transport is limited by density gradients in the water column that are controlled by temperature and salinity. Vertical transport is expected to be limited, with dispersed oil remaining primarily in the top 10 meters of the water column (USCG and EPA 2014). From a physical perspective, dispersants reduce oil concentrations at the surface by increasing horizontal and vertical movement of oil droplets (NRC 2013). This tends to increase biodegradation and mitigate the adverse effects of oil, including reduction of vapors, but at the expense of increased exposure of subsurface biota (NRC 2013).

In the literature review conducted for the Unified Plan Biological Assessment examining the toxic effects of dispersed oil on the environment relative to oil or dispersants alone, approximately half of the studies showed an increase in the acute toxicity (lethality) to biological organisms when dispersants were used; the other half of the studies showed that chemical dispersants decrease the lethality of the oil (USCG and EPA 2014).

A clear difference in the effect of dispersed oil versus oil alone is that dispersant use increases oil exposure of subsurface, relatively pelagic species, and their prey, including all of the species considered in this Opinion. Further discussion of exposure and expected responses of ESA-listed species are detailed in sections below.

There are many unknowns regarding the effectiveness of dispersant use and its acute and long-term effects on marine mammals and fish, especially at the population level. The environment in Alaska offers a suite of conditions for which little testing of dispersant effectiveness and effects has been conducted, including cold ice-covered waters, and waters with high sediment loads.

Mitigation Measures. As part of emergency ESA section 7 consultations, NMFS expects these standard mitigation measures to be incorporated into the IAP, when applicable, to lessen potential dispersant use impacts to ESA-listed species.

1. Protected species observers will be on all aircraft and vessels associated with dispersant application to ensure that dispersant is not deployed on or near marine mammals. The Dispersant Use Plan states that dispersants will not be applied within 500 meters of marine mammals. Incident specific buffers for dispersant application may be larger if needed.

2. Create buffer zones around areas of high marine mammal concentrations (e.g., haulouts or rookeries) where pre-approved dispersant use is prohibited. The USCG/EPA can work with NMFS prior to spill events to develop maps of high concentration areas for inclusion in Subarea Contingency Plans.

3. Limit the total amount of dispersant used in a single incident to minimize the risk to pelagic species (e.g., species considered in this Biological Opinion and their prey).

5.2.4 *In Situ* Burn

The burning of oil produces both airborne and residual solids that can have acute and long term effects. Smoke and burned residues may have different effects in different locations due to their divergent chemical composition, fate, and transport (USCG and EPA 2014).

In-water burning can have thermal impacts on species that occur close to the water surface (e.g., surfacing marine mammals, invertebrates, some fish). Although the noise and activity associated with an in-water burn may deter some wildlife from entering the area, air-breathing wildlife can get trapped within the *in situ* burn booming equipment and suffer severe burns and even death as a result of this method of oil spill response.

Terrestrial or in-water burns result in significant smoke plumes that introduce particulates into the air which can be inhaled and embedded in lung tissue. Solid particulates and pyrogenic PAHs (which may have a higher mutagenicity than the original PAH components in oil) are emitted during *in situ* burning (Sheppard et al. 1983, USCG and EPA 2014). However, the majority of PAHs and volatiles in oil are destroyed by burning, leading to a net benefit of burning under the right circumstances (USCG and EPA 2014). Smoke may also impair visibility, affecting those animals that rely on sight to navigate or communicate (USCG and EPA 2014).

In-water burn residues, which are also composed of mutagenic PAHs, have been shown to be as mutagenic as weathered crude oil and somewhat more mutagenic than fresh crude oil, but much less mutagenic than aerially deposited smoke particulates and PAHs (Sheppard et al. 1983, USCG and EPA 2014). Residues can sink into the water column to the sea floor following an in-water burn, and can be ingested by pelagic species and benthic organisms. Residues represent a trade-off between a much larger oil slick on the surface of the water, and the reduced volume, but more concentrated (in terms of mutagenicity) residues in the water column (USCG and EPA 2014).

If conducted in shallow marine waters and wetlands, burning of oil may lead to destruction of aquatic vegetation and habitat, which could impact the prey resources of species under consideration in this Biological Opinion. High heat from terrestrial burns can destroy terrestrial vegetation which could lead to erosion and sedimentation of the nearby marine environment from runoff.

Mitigation Measures. As part of emergency ESA section 7 consultations, NMFS expects these standard mitigation measures to be incorporated into the IAP, when applicable, to lessen potential *in situ* burn impacts to ESA-listed species.

1. Do not conduct *in situ* burns near marine mammal concentration areas (e.g., pinniped haulouts or whale migratory routes) when large numbers or marine mammals are

expected to be present, unless wind conditions are steady and directing the smoke plume away from the area of concern.

2. Protected species observers will be present to locate any marine mammals near a proposed burn site, and monitor throughout the activity to ensure that no individuals approach or become entrained in the fire booming. These observers should document all marine mammals sighted near the burn, and report any injured, sick, or dead marine mammals in real time to the Wildlife Branch (Operations Section) or Environmental Unit (Planning Section).

5.2.5 Shoreside Activities (Harassment and Habitat Modification)

People and equipment engaged in shoreside activities associated with oil spill response can potentially inadvertently chase pinnipeds from their haulouts or rookeries (land- or ice-based) into the water where the animals can come into contact with oil. The toxic effects of marine mammals being exposed to oil is detailed above under the "Potential Effects of Dispersant Use" section.

Shoreline cleaning can introduce the spilled materials back into the marine environment in addition to sedimentation from erosion caused by cleaning activities (see description of "Flushing and Flooding" under the "Proposed Action" section). Shoreside activities also have the potential to negatively alter marine mammal habitat when animals are not present in such a way that animals are impacted when they return (e.g., damage to a haulout or rookery site).

Mitigation Measures. As part of emergency ESA section 7 consultations, NMFS expects these standard mitigation measures to be incorporated into the IAP, when applicable, to lessen potential impacts from shoreside activities to ESA-listed species.

1. Create buffer zones around areas of high marine mammal concentrations (e.g., haulouts or rookeries) where pre-authorized shoreside access is prohibited. The USCG/EPA can work with NMFS prior to spill events to develop maps of high concentration areas for inclusion in Subarea Contingency Plans. Typically, incident specific buffers are 1,500 feet around haulouts and rookeries, and 300-500 feet from marine mammals in-water.

2. Inform all shoreside responders that pinnipeds may be hauled out on beaches and in the response area. Shoreside responders should avoid disturbing marine mammals, and should report all sightings (including photos when possible) back to Unified Command/Environmental Unit/NMFS PRD.

5.2.6 Interrelated/Interdependent Effects

An action associated with oil spill response but not directed by the Unified Plan is the influx of people and supplies into the response area during an event. Depending on the size of a spill, this associated movement of people and supplies can be the equivalent of a small community. Potential interrelated/interdependent effects of the establishment of a small community for the purposes of spill response would include increased flights or marine vessel traffic to the area to transport people and supplies, increased water and energy consumption, increased waste management, and increased human activity in the vicinity of the community (which could have a marine coastal component). Although some of these effects could be detectable, the short term, ephemeral nature of spill response, would result in short term, relatively localized effect.

Another interrelated/interdependent effect of oil spill response activities is increased risk of additional hazardous materials spills. Oil spill response activities will potentially engage heavy equipment, aircraft, and marine vessels, which will introduce the risk of an accident, potentially leading to a secondary hazardous materials spill. The effects of an additional spill would likely fall under the other categories described in the "Potential Effects of the Proposed Action" section.

5.2.7 Cumulative Effects

Cumulative effects are defined in 50 CFR 402.02 as effects that are likely to occur as a result of future state or private activities, not involving federal activities, that are reasonably certain to occur within the action area of the federal action subject to consultation. The purpose of this section is to discuss the implications of activities in the action area that are reasonably certain to occur in the foreseeable future, but that do not have a federal nexus (via federal permitting, approval, or funding). Effects associated with federal actions that are unrelated to the proposed action contribute to the environmental baseline and current status of the species evaluated in this Opinion. Past and present impacts of non-federal actions are part of the "Environmental Baseline" section. Non-federal actions that are reasonably likely to continue into the foreseeable future include:

- State-managed commercial, sport, subsistence, and tribal fisheries
- Commercial or private marine or air traffic
- Commercial or residential development
- State-permitted wastewater or stormwater discharges
- Recreational and subsistence hunting

<u>State-Managed Commercial, Sport, Subsistence, and Tribal Fisheries</u>

Fisheries managed by the State of Alaska are an important source of income and sustenance for many people, and they are known to impact marine mammals through bycatch/entanglement mortality, injury, and food removals. As long as fish stocks are sustainable, commercial, sport, subsistence, and tribal fishing will continue to take place in Alaska. As a result there will be continued prey competition, risk of ship strikes, potential harassment, potential for entanglement in fishing gear, potential displacement from important foraging habitat, and increased risk of oil spills from fishing vessels. ADF&G will continue to manage fish stocks and monitor and regulate fishing in to maintain sustainable stocks.

Commercial or Private Marine or Air Traffic

Boating on marine waters may contribute contaminants to the water column through leaks and spills of fuel or waste products, or to the air from fuel combustion. In addition, boating and air traffic may exclude marine mammals from preferred habitat due to disturbance, resulting in a degradation of habitat quality. Ship strikes of whales and pinnipeds by non-federally regulated boats are known to occur in Alaska. These ship strikes may result in serious injury and even death. Effects would be similar to those presented above in this section.

Commercial or Residential Development

Continued increasing human population growth in Alaska will lead to continued expansion and commercial and residential development of the coastline. This could lead to increased shoreline harassment, increased transportation and energy needs, and increased noise in the marine environment. The effects of these activities are described in this section above.

State-permitted Wastewater or Stormwater Discharges

The State of Alaska assumed the administration and implementation of the majority of Clean Water Act (CWA) requirements pertaining to the National Pollutant Discharge Elimination System (NPDES). Therefore, most discharges into Alaska waters are authorized by ADEC [††], and do not have a federal nexus. The ADEC NPDES program meets CWA standards, and will not alter the quality of the discharges that were permitted under the previous federal program. However, neither the federal or state programs regulate all manufactured chemicals that could be discharged into the marine environment (e.g., personal care products). The number of permitted discharges is likely to increase with continued human population growth and expansion of industry and commerce in Alaska.

Effects of a poorly regulated discharge program may include habitat degradation and toxicity to individual animals. It is unclear if exposure to low level contaminants (regulated or unregulated) will cause adverse effects on an ESA-species or the resources it uses (USCG and EPA 2014).

Recreational and Subsistence Hunting

Recreational and subsistence hunting in or near the marine environment of Alaska will typically require boat or aircraft to access sites. Effects of marine transportation are described above in the “Risk of Collision,” “Acoustic Disturbance,” and “Interrelated/Interdependent Effects” sections. The presence of hunters and transportation equipment may exclude marine mammals from preferred habitat and could negatively alter their short-term or long-term behavior.

[††] EPA retained CWA 301(h) permits for publically owned treatment works, vessel discharges covered by EPA general permits, permits for discharges to federal waters (typically oil and gas, and seafood processors), and general permits for pesticide wastewater discharges.

Subsistence hunting of ESA-listed marine mammals is sustainably co-managed by NMFS and the relevant Alaska Native organizations under Section 119 of the Marine Mammal Protection Act. Alaska Natives have a long history of self-regulation, based on the need to ensure a sustainable take of marine mammals for food and handicrafts, and co-management has been a successful tool for conserving marine mammal populations in Alaska. The best available scientific information, and traditional and contemporary Alaska Native knowledge and wisdom are used for decisions regarding Alaska marine mammal co-management. Under Section 119 agreements, marine mammal stocks should not be permitted to diminish beyond the point at which they cease to fulfill their role in their ecosystem or to levels that will not allow for sustainable subsistence harvest.

5.3 POTENTIAL EXPOSURE OF ESA-LISTED SPECIES

Exposure analyses have three purposes in consultations. First, we conduct exposure analyses to identify the physical, chemical, and biotic phenomena produced by an action. Second, we conduct these analyses to estimate the spatial and temporal distribution of those phenomena in the environment. Third, we conduct exposure analyses to estimate any overlap between threatened and endangered species and designated critical habitat in space and time. To fulfill the purposes of this last part of these analyses, we try to identify the number, age, gender, and condition of the individuals that are likely to be exposed, the populations those individuals represent, the duration of any exposure, the frequency of that exposure, and exposure concentrations.

5.3.1 Listed Resources Not Likely to be Adversely Affected by the Proposed Action

The USCG/EPA determined that 7 of the ESA-listed species that may overlap in time and space with oil spill response activities are not likely to be adversely affected by the proposed action due to their rarity in nearshore areas where spill response occurs most frequently. In addition, the USCG/EPA determined that oil spill response activities may overlap in time and space with designated critical habitat for the North Pacific right whale, but that the critical habitat is not likely to be adversely affected by the response activities.

The blue whale, fin whale, sperm whale, North Pacific right whale, and sei whale are present in Alaska waters seasonally. During the summer months when they are in Alaska, they generally spend their time foraging offshore in deep waters. From 1995-2012, only two oil spills occurred in Alaska >350 gallons in size in the offshore waters where these large whales spend most of their time (USCG and EPA 2014). During this same time period, 10 spills >100 gallons occurred in offshore Alaska waters, only two of which occurred during summer months, when these large whales are expected to be present in Alaska (USCG and EPA 2014) (Figure 6). These whales are relatively uncommon and occur in Alaska waters in low densities (see Status of the Species section). In addition, mitigation measures put in place during the response (e.g., observers onboard response vessels and aircraft, vessel speed limits and area restrictions, and whale avoidance measures) will minimize potential impacts to these large whales. Therefore, NMFS concurs with the USCG/EPA determination that it is extremely unlikely that individuals of these species will interact with oil spill response activities and these effects are discountable.

The Western North Pacific gray whale occurs in Alaska waters even less frequently than the five species listed in the paragraph above. They are known to transit Alaska waters when moving between the Far East (Russia) and the West Coast of the United States (Mate et al. 2011). Western North Pacific gray whales are very rare, and it is believed that the few that do move between Russia and the West Coast do not spend long in Alaska waters. Therefore, NMFS concurs with the USCG/EPA determination that it is extremely unlikely that individuals of this species will interact with oil spill response activities and these effects are discountable.

The four ESA-listed steelhead trout ESUs considered in this Opinion do not spawn in Alaska and likely spend little time in nearshore waters. Steelhead trout are more oceanic than the salmon ESUs considered in this Opinion, often migrating directly offshore and into the Gulf of Alaska, bypassing the coastal corridor where oil spill response occurs more frequently (Hartt and Dell 1986, Pearcy et al. 1990). Therefore, NMFS concurs with the USCG/EPA determination that it is extremely unlikely that individuals of these four ESA-listed steehead trout ESUs will interact with oil spill response activities and these effects are discountable.

The USCG/EPA determined that the critical habitat designated for the North Pacific right whale may be affected, but is not likely to be adversely affected by oil spill response activities directed by the Unified Plan. North Pacific right whale critical habitat, as detailed above in the “Status of the Species” section, is located fairly far offshore (i.e., greater than 4 miles from shore near Kodiak) and was defined using sightings of the species, including observations of foraging (Figure 9). As described in the “Status of the Species” section above, the primary constituent elements of North Pacific right whale critical habitat are the presence of dense aggregations of four species of zooplankton that are the main prey of right whales. Therefore, the primary concern for any action that may affect North Pacific right whale critical habitat is effects to these zooplankton species or the physical and biological features in the area that influence the health of the zooplankton populations.

Due to the offshore locations of the two critical habitat areas, most hazardous spill responses are not expected to occur in or near North Pacific right whale critical habitat. Between 1995-2012, only one reported spill was confirmed within North Pacific right whale critical habitat; a diesel spill approximately 1,000 gallons in size (USCG and EPA 2014) (Figure 18).

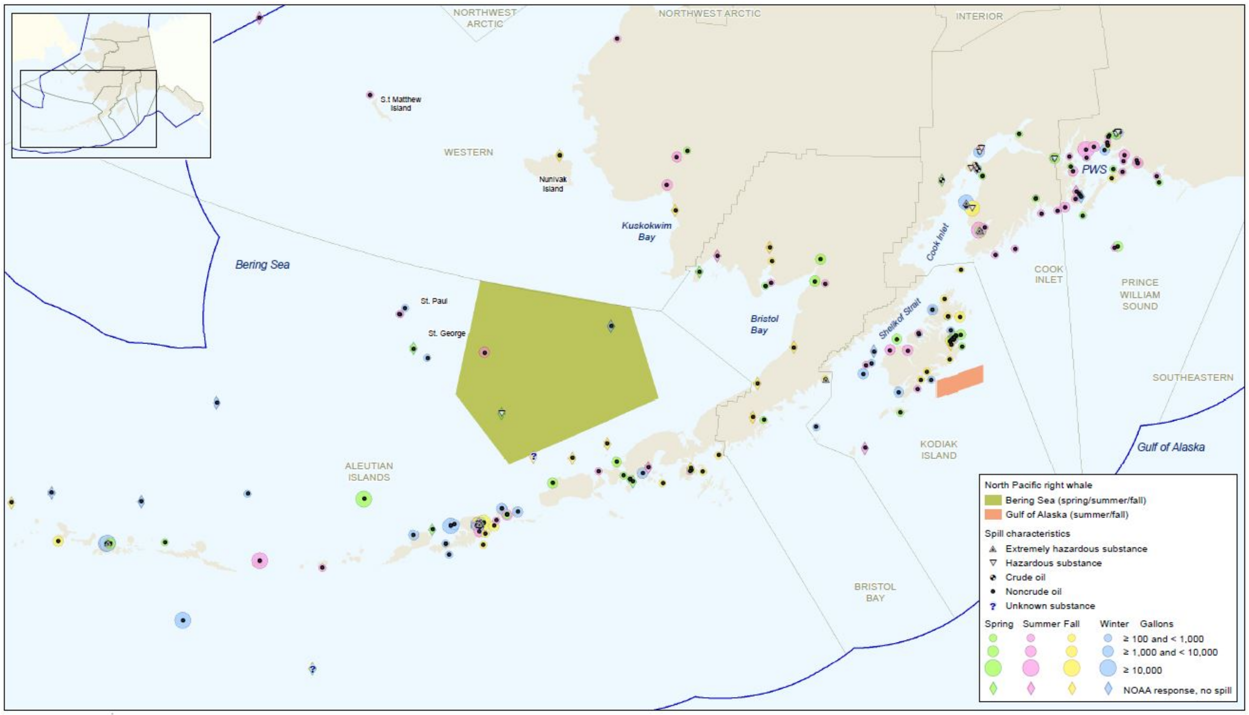


Figure 18. Characteristics of oil and hazardous material spills between January 1995 and August 2012 in the marine waters of southwestern Alaska, including critical habitat designated for North Pacific right whales. Two of the incidents reported in the Bering Sea critical habitat area did not result in a spill. Only one spill (approximately 1,000 gallon diesel spill) occurred in North Pacific right whale critical habitat during this time period (USCG and EPA 2014).

Based on this historical spill record and known actions in the foreseeable future, the risk of future spills within North Pacific right whale critical habitat is relatively low. There are no oil and gas exploration or development activities in these areas, and there is little chance of vessels transporting large amounts of hazardous materials breaking apart within these two designated areas (e.g., there is no land for vessels to ground on within the critical habitat). Vessels transiting North Pacific right whale critical habitat currently do not carry large crude oil cargoes, and any spills would likely be diesel, or other light fuels that would weather relatively quickly. If mechanical recovery was possible in these areas, it would not be expected to significantly affect zooplankton.

In situ burning and dispersant use are the two response methods that could have the largest impact on zooplankton health and survival. Detailed descriptions of potential effects from these two methods are provided above in the "Potential Effects of the Proposed Action" section. However, protocols within the Dispersant Use Plan and the *In Situ* Burning Guidelines for Alaska of the Unified Plan, and decision-making processes described by the Unified Plan (described in the "Description of the Action" section above) mitigate the potential effects of these two methods on the PCEs of North Pacific right whale critical habitat. North Pacific right whale critical habitat is not within the Pre-Authorization Zone of the Dispersant Use Plan; therefore, dispersant use in North Pacific right whale critical habitat would be evaluated on a case-by-case basis as described in the “Description of the Proposed Action” section above. The USCG/EPA determined that take of North Pacific right whales and critical habitat is not likely to occur due to actions directed by the Unified Plan; therefore, NMFS assumes that a case-by-case evaluation of dispersant use would not result in approval near this species’ critical habitat. Any take of this species or its designated critical habitat would trigger reinitiation of the ESA section 7 consultation for the Unified Plan.

In situ burning and dispersant use within the areas designated as critical habitat for the North Pacific right whale require incident-specific approval from the ARRT. In addition, because these two methods may affect ESA-listed species in marine waters, the USCG would need to work with NMFS PRD to initiate an emergency section 7 consultation under the ESA. Under one or both of these decision-making processes, NMFS PRD biologists would be able to inform the Unified Command and recommend against use of *in situ* burning or dispersant use if it was determined that either method would negatively affect ESA-listed species greater than the benefits of use.

5.3.2 Bowhead Whale Exposure

Western Arctic bowhead whales are primarily present in the Beaufort and Chukchi Seas during the summer months, migrate through the Bering Strait in the spring (north) and fall (south), and are primarily present in the Bering Sea during the winter months. Therefore, these are the areas where bowhead whales could be exposed to oil spill response activities during the seasons that they are present.

Most oil spill response activities occur nearshore, limiting most potential exposure to the months when bowhead whales move closer to shore. To date, very few spills have been reported in the North Slope and Western Alaska regions where Western Arctic bowhead whales spend most of their time. The spills that occurred in those two regions between January 1995-August 2012 were each less than 1,000 gallons (USCG and EPA 2014).

Small spills, or even an incident with the potential for a spill, may result in spill response activities directed by the Unified Plan that could impact bowhead whales. Aircraft or marine vessels may be used to survey the incident site, even if a spill has not yet occurred, resulting in exposure of bowhead whales to harassment level noise, or an increased risk of vessel strike. Although a large spill (greater than 42,000 gallons) did not occur in the 1995-2012 historic spill record within the range of Western Arctic bowhead whales, large spills may potentially occur in the future. Response activities triggered by a large spill within the range of bowhead whales are likely to expose bowhead whales and/or their food to negative effects, as detailed above in the “Potential Effects of the Proposed Action” section.

Year-round presence of bowhead whales in Arctic waters (Beaufort, Chukchi, and Bering Seas) in areas with ongoing and increasing anthropogenic activity increases the likelihood of exposure to response activities (USCG and EPA 2014).

The unpredictability of oil spill response activities (e.g., timing, location, magnitude) does not allow for an estimate of number of bowhead whales that would be exposed to oil spill response activities as directed by the Unified Plan, but we think that some individuals would be exposed to oil spill response activities in the Arctic Ocean and/or northern Bering Sea should they occur when this species is seasonally present. Exposures would be reduced by implementing mitigation measures through the ESA Section 7 emergency consultation with NMFS.

5.3.3 Ringed Seal Exposure

Ringed seals generally remain closely associated with ice throughout the year in the Beaufort, Chukchi, and Bering Seas. Therefore, these are the areas where ringed seals could be exposed to oil spill response activities during the seasons that they are present. Their regional movements are not well documented and are likely tied to ice and prey availability so from one year to the next it is difficult to know where the high concentration areas will be.

Response actions that occur in the ringed seal’s open-water or sea ice habitat could have negative impacts on the species. Between 1995 and 2012, there were approximately 15 spills in the central and northern portions of the Bering Sea and the Arctic Ocean where ringed seals could have been present (North Slope, Northwest Arctic, and Western Alaska). About half of the spills were during ice-free periods. Of those spills that occurred when ice (and therefore seals) could have been present, only one was not in the nearshore area. Materials spilled during these incidents included diesel and other refined petroleum products, drilling muds, antifreeze, and process water. Spill sizes ranged from 100 to 6,300 gallons including five spills greater than 1,000 gallons (USCG and EPA 2014).

Small spills, or even an incident with the potential for a spill, may result in spill response activities directed by the Unified Plan that could impact ringed seals. Aircraft or marine vessels may be used to survey the incident site, even if a spill has not yet occurred, resulting in exposure of ringed seals to harassment level noise, or an increased risk of vessel strike. Although a large spill (greater than 42,000 gallons) did not occur in the 1995-2012 historic spill record within the range of ringed seals, large spills may potentially occur in the future. Response activities triggered by a large spill within the range of ringed seals are likely to expose ringed seals and/or their food to negative effects, as detailed above in the “Potential Effects of the Proposed Action” section.

Year-round presence of ringed seals in Arctic waters (Beaufort, Chukchi, and Bering Seas) in areas with ongoing and increasing anthropogenic activity increases the likelihood of exposure to response activities (USCG and EPA 2014).

The unpredictability of oil spill response activities (e.g., timing, location, magnitude) does not allow for an estimate of number of ringed seals that would be exposed to oil spill response activities as directed by the Unified Plan, but we think that some individuals would be exposed to oil spill response activities in the Arctic Ocean and/or northern Bering Sea should they occur when this species is seasonally present. Exposures would be reduced by implementing mitigation measures through the ESA Section 7 emergency consultation with NMFS.

5.3.4 Bearded Seal Exposure

Bearded seals are an ice-dependent species and have a distribution similar to that of ringed seals. In winter, sea ice might extend as far south as the southern Bering Sea; in summer, the ice retreats north into the Arctic Ocean. Bearded seals use broken pack ice, ice edges, and ice floes (typically over water < 200 meters deep) for resting, molting, birthing, and nursing, as well as refuge from predators. Bearded seals may also use coastal haulouts. Due to the large home ranges of bearded seals and their use of drifting pack ice, the effects of spill response activities will vary by season, location, and habitat(s), depending on the type and duration of the spill response actions.

Response actions that occur in the bearded seal’s open-water or sea ice habitat could have negative impacts on the species. Between 1995 and 2012, there were approximately 15 spills in the central and northern portions of the Bering Sea and the Arctic Ocean where bearded seals could have been present (North Slope, Northwest Arctic, and Western Alaska). About half of the spills were during ice-free periods. Of those spills that occurred when ice (and therefore seals) could have been present, only one was not in the nearshore area. Materials spilled during these incidents included diesel and other refined petroleum products, drilling muds, antifreeze, and process water. Spill sizes ranged from 100 to 6,300 gallons including five spills greater than 1,000 gallons (USCG and EPA 2014).

Small spills, or even an incident with the potential for a spill, may result in spill response activities directed by the Unified Plan that could impact bearded seals. Aircraft or marine vessels may be used to survey the incident site, even if a spill has not yet occurred, resulting in exposure of ringed seals to harassment level noise, or an increased risk of vessel strike. Although a large spill (greater than 42,000 gallons) did not occur in the 1995-2012 historic spill record within the range of bearded seals, large spills may potentially occur in the future. Response activities triggered by a large spill within the range of bearded seals are likely to expose bearded seals and/or their food to negative effects, as detailed above in the “Potential Effects of the Proposed Action” section.

Year-round presence of bearded seals in Arctic waters (Beaufort, Chukchi, and Bering Seas) in areas with ongoing and increasing anthropogenic activity increases the likelihood of exposure to response activities (USCG and EPA 2014).

The unpredictability of oil spill response activities (e.g., timing, location, magnitude) does not allow for an estimate of number of bearded seals that would be exposed to oil spill response activities as directed by the Unified Plan, but we think that some individuals would be exposed to oil spill response activities in the Arctic Ocean and/or northern Bering Sea should they occur when this species is seasonally present. Exposures would be reduced by implementing mitigation measures through the ESA Section 7 emergency consultation with NMFS.

5.3.5 Steller Sea Lion Exposure

Steller sea lions are a relatively common marine mammal species found in most Alaska waters year around. They do not typically range north of the Bering Strait so they would not be exposed to oil spill response activities in the Arctic. Offshore and nearshore oil spill response activities may interact with Steller sea lions in the Aleutian Islands region, Gulf of Alaska, Prince William Sound, and Southeast Alaska throughout the year. Steller sea lions are also found in the Bering Sea, and are present on St. Lawrence Island in the spring and fall/winter. Oil spill response activities could potentially overlap with Steller sea lions in the Bering Sea during these high use months.

Approximately 400 spills greater than 100 gallons occurred in Alaska marine waters from 1997-2012. Most of these occurred within the range of the western DPS Steller sea lion, many within designated critical habitat (Figure 19). Almost all of the spills were diesel. Only 1% of spill occurrences were crude oil. Spill sizes ranged from 100 to over 300,000 gallons. The spills occurred year-round, but were more common during ice free periods. Mechanical containment, recovery, and/or cleanup was the primary method of reported spill response.

Steller sea lions would be most vulnerable to spill response activities in nearshore environments. Haulout and rookery disturbance is a primary concern, and Steller sea lions are more concentrated nearshore. Steller sea lions are vulnerable to disturbance, particularly at haulouts and rookeries. Spill response activities could expose Steller sea lions to harassment from aircraft, marine vessels, and responders on the beach near haulouts or rookeries.

Steller sea lions may be exposed to dispersed oil in the water column. However, sea lions spend a great deal of time at the surface of the water and on land, so dispersants may decrease overall exposure of Steller sea lions to oil. Steller sea lion prey may be exposed to dispersed oil in the water column.

In situ burns could potentially expose Steller sea lions to airborne particulates. Stationary sea lions (e.g., at rookeries or haulouts) could experience lengthier exposure to the smoke plume downwind of *in situ* burns.

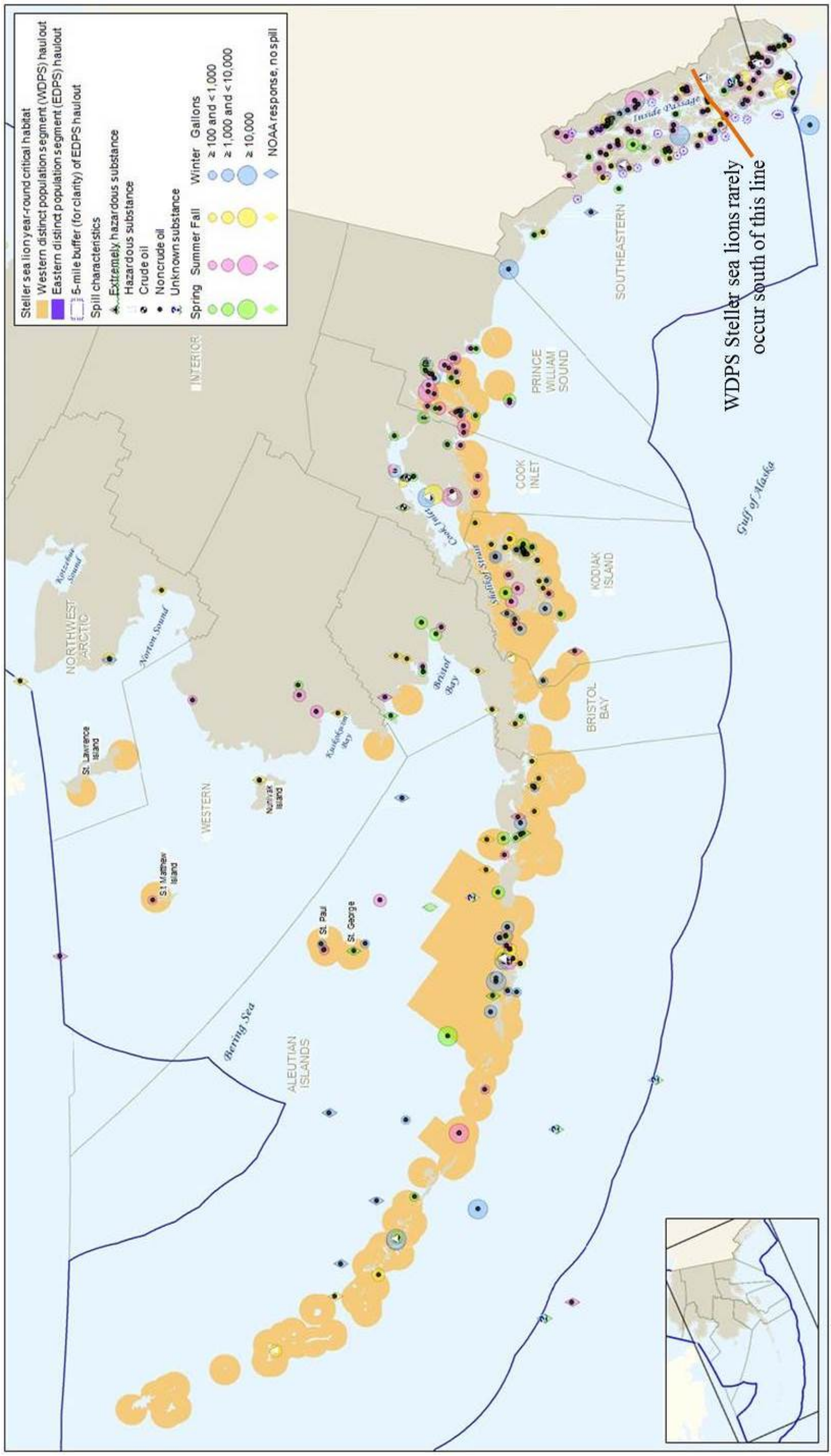


Figure 19. Characteristics of oil and hazardous material spills between January 1995 and August 2012 within the range of western DPS Steller sea lions in Alaska (USCG and EPA 2014).

The unpredictability of oil spill response activities (e.g., timing, location, magnitude) does not allow for an estimate of number of western DPS Steller sea lions that would be exposed to oil spill response activities as directed by the Unified Plan, but we think that some individuals would be exposed to oil spill response activities in coastal Alaska waters. Exposures would be reduced by implementing mitigation measures through the ESA Section 7 emergency consultation with NMFS.

Steller sea lion critical habitat was selected based on features that support the reproduction, foraging, rest, and refuge of the species, including proximity to abundant prey, and consistent haulouts and rookeries. Impacts to prey, disturbance to Steller sea lions, and destruction of rookery and haulout sites would deteriorate the value of designated critical habitat for this species. Oil spill response activities are likely to occur in Steller sea lion critical habitat in the future, and have the potential to impact this designated habitat. Dispersant use and *in situ* burns could impact prey abundance, and marine vessels and mechanical recovery of spilled materials could cause harassment or disturbance within critical habitat. However, with the use of expected mitigation measures, disturbance and impacts to prey would be minimized. We do not expect any of the response activities to be long-lasting or cause permanent modifications to Steller sea lion critical habitat.

5.3.6 Cook Inlet Beluga Whale Exposure

Cook Inlet beluga whales occur only in Cook Inlet, Alaska. High levels of shipping to the Port of Anchorage and oil and gas development occur in the same waters inhabited by this endangered population. The close proximity of large vessels and drill rigs makes it likely that oil spill response activities will overlap with Cook Inlet beluga whales should a spill occur.

Cook Inlet beluga whales are more concentrated in the northern part of Cook Inlet during the spring and summer months. They are thought to expand their range to the mouth of Cook Inlet during the fall and winter months. Therefore, spill response activities in Kachemak Bay and near the mouth of Cook Inlet are more likely to overlap with Cook Inlet beluga whales during the winter months, whereas spill response activities in northern Cook Inlet are likely to overlap with endangered beluga whales year-round.

There were 30 reported spills greater than 100 gallons in Cook Inlet marine waters from 1997-2012, most of which occurred in Cook Inlet beluga whale critical habitat (USCG and EPA 2014). Four spills were of crude oil, each less than 500 gallons. Spills occurred in Cook Inlet year-round, with most spills mid-inlet or near Homer (i.e., Kachemak Bay).

Marine vessel traffic associated with spill response could expose Cook Inlet beluga whales to harassment level noise and the risk of ship strike injury and mortality. Shoreline or nearshore response activities could impact Cook Inlet beluga whale critical habitat through sedimentation or impacts to prey. Dispersant use could be approved in Cook Inlet to respond to crude oil spills, potentially exposing beluga whales and their prey to dispersed oil in the water column. However, dispersants may reduce the toxic volatiles in surface oil slicks, thereby reducing inhalation risk to Cook Inlet beluga whales. Dispersant use within the range of Cook Inlet beluga whales will be evaluated by the USCG and NMFS ESA section 7 biologist on a case-by-case basis. *In situ* burns could potentially exposure Cook Inlet beluga whales to airborne particulates.

The unpredictability of oil spill response activities (e.g., timing, location, magnitude) does not allow for an estimate of number of Cook Inlet beluga whales that would be exposed to oil spill response activities as directed by the Unified Plan, but we think that some individuals would be exposed to oil spill response activities in Cook Inlet. Exposures would be reduced by implementing mitigation measures through the ESA Section 7 emergency consultation with NMFS.

Cook Inlet beluga whale critical habitat was defined based on the physical and biological features essential to the conservation of the DPS. These features, including prey, toxin-free waters, and low noise levels could be impacted by oil spill response activities in Cook Inlet. Dispersant use and *in situ* burns could increase the level of toxins in the water column, while reducing the overall amount of oil on the surface. These trade-offs would be examined on a case-by-case basis to determine if those response methods would have a net benefit. Noise from marine vessels, aircraft, and mechanical recovery operations would decrease the value of Cook Inlet beluga whale critical habitat, but would likely benefit the DPS more than a non-response option. Mitigation measures expected to be applied on a case-by-case basis would decrease the overall impacts to critical habitat. Any impacts are expected to be relatively short-term and not permanent.

5.3.7 Humpback Whale Exposure

Humpback whales are relatively common throughout most of Alaska marine waters, and present in some regions year-round. Offshore and nearshore oil spill response activities may interact with humpback whales in the Aleutian Islands region, Gulf of Alaska, Prince William Sound, and Southeast Alaska throughout the year. Exposures could also occur in the Chukchi Sea and Bering Sea during the summer months when humpback whales are known to be present.

Approximately 400 spills greater than 100 gallons occurred in Alaska marine waters from 1997-2012. Most of these occurred within the range of the humpback whale in Alaska. Almost all of the spills were diesel. Only 1% of spill occurrences were crude oil. Spill sizes ranged from 100 to over 300,000 gallons. The spills occurred year-round, but were more common during ice free periods. Mechanical containment, recovery, and/or cleanup was the primary method of reported spill response.

During spill response, humpback whales could be exposed to harassment levels of noise from response vessels and increased risk of ship strike. Humpback whales are vulnerable to entanglement with underwater lines and could be injured or killed if they become badly entangled in underwater response equipment (e.g., boom lines or anchoring systems), particularly if the equipment is left unattended.

Humpback whales and their prey could be exposed to dispersed oil in the water column. However, dispersants may reduce the toxic volatiles in surface oil slicks, thereby reducing inhalation risk to humpback whales. *In situ* burns could potentially exposure humpback whales to airborne particulates.

The unpredictability of oil spill response activities (e.g., timing, location, magnitude) does not allow for an estimate of number of humpback whales that would be exposed to oil spill response activities as directed by the Unified Plan, but we think that some individuals would be exposed to oil spill response activities in coastal Alaska waters should they occur when this species is seasonally present. Exposures would be reduced by implementing mitigation measures through the ESA Section 7 emergency consultation with NMFS.

5.3.8 Chinook and Coho Salmon Exposure

Chinook and coho salmon are presumed to be present year-round in all of the coastal waters of Alaska except the Arctic Ocean, however, their seasonal abundance and densities are unknown. Therefore, Chinook and coho salmon could be exposed to oil spill response activities in most of Alaska waters year-round. Exposure is more likely in nearshore areas where shallower waters and topography will concentrate salmon closer to the surface.

Most mechanical recovery methods, ship and marine vessel traffic, and booming activities are not likely to result in long term exposure to salmon in any life stage. Dispersant use will make oil more bioavailable in the water column, increasing exposure of fish and their prey to oil. However, adult salmon are highly mobile and can easily move to an unaffected area with available prey. Exposure of individual adult salmon to oil spill response activities is likely to be a short duration.

Juvenile salmon are less mobile and more sensitive to oil toxicity than adults. Juvenile salmon are more likely to remain close to shore where oil spill response activities may occur, and could be susceptible to ingestion of oil or oiled prey as a result of chemical dispersant use. Additionally, juvenile salmon may ingest the residue materials resulting from *in situ* burning of oil at the water’s surface.

Approximately 400 spills greater than 100 gallons occurred in Alaska marine waters from 1997-2012. Most of these occurred within the range of Chinook and coho salmon in Alaska. Almost all of the spills were diesel. Only 1% of spill occurrences were crude oil, and therefore candidates for chemical dispersant use. Spill sizes ranged from 100 to over 300,000 gallons. The spills occurred year-round, but were more common during ice free periods. Mechanical containment, recovery, and/or cleanup was the primary method of reported spill response.

The unpredictability of oil spill response activities (e.g., timing, location, magnitude) does not allow for an estimate of number of ESA-listed Chinook and coho salmon that would be exposed to oil spill response activities as directed by the Unified Plan, but we think that some individuals would be exposed to oil spill response activities in coastal Alaska waters. Exposures would be reduced by implementing mitigation measures through the ESA Section 7 emergency consultation with NMFS.

5.4 RESPONSE ANALYSES TO THE EFFECTS OF THE PROPOSED ACTION

Response analyses determine how listed species are likely to respond after being exposed to an action's effects on the environment or directly on listed species themselves. Potential responses are described above in the "Potential Effects of the Proposed Action" section. Our assessments try to detect the probability of lethal responses, physical damage, physiological responses (particular stress responses), behavioral responses, and social responses that might result in reducing the fitness of listed individuals. Ideally, our response analyses consider and weigh evidence of adverse consequences, beneficial consequences, or the absence of such consequences.

5.4.1 Responses of Pinnipeds to the Proposed Action

As described in detail in the "Potential Effects of the Proposed Action" section above, bearded seals, ringed seals, and western DPS Steller sea lions are susceptible to harassment/disturbance from auditory and visual detection of oil spill response activities. During oil spill response activities, we would expect to see all three species respond behaviorally to loud noise by moving away from it. At the least, this response will result in increased energy expenditure and movement away from a preferred resource (e.g., resting, feeding, or breeding area). At the worst, large groups of pinnipeds of varying sizes can trample each other when responding severely to a disturbance. If response personnel, an aircraft, or marine vessel approached too near to a pinniped haulout or rookery, we would expect herds of pinnipeds could trample or injure each other in their scramble to depart. Restrictions on human access to the shore, air, and water near pinniped aggregations will be important to mitigate this stressor.

Very loud noise, greater than 190 decibels, can physically harm pinnipeds, possibly leading to deafness and an inability to function properly. Most oil spill response equipment is not likely to generate sound levels greater than 190 decibels, and can be operated at quieter levels if marine mammals are present (e.g., NMFS recommends not revving or starting engines when marine mammals are nearby).

In addition to noise, marine vessels also pose a collision risk to pinnipeds during oil spill response. However, rates of pinniped ship strike injuries and mortalities are low in Alaska, and as long as expected mitigation measures are followed (including speed restrictions and use of observers), we do not expect oil spill response vessels to strike pinnipeds.

Bearded and ringed seals are seasonally fairly common in the Beaufort, Chukchi, and Bering Seas, and western DPS Steller sea lions are present in the Bering Sea, Aleutian Islands region, Prince William Sound, the Gulf of Alaska, and northern Southeast Alaska year-round. Therefore, it is likely that the use of dispersant will overlap in time and space with ESA-listed pinnipeds. Pinnipeds spend much of their time at or above the water's surface hauled out on land or ice, resting or at breeding/pupping sites, but they descend through various depths of the water column to forage and transit. Dispersant use will increase the exposure of pinnipeds and their prey to oil in the water column.

Bearded seals, ringed seals, and Steller sea lions have relatively short fur and rely more on their blubber layer for thermoregulation than their fur, therefore, increased exposure to oil due to chemical dispersant use is not likely to significant decrease the fitness of individuals due to thermoregulation issues. Increased ingestion of oil directly or through prey due to chemical dispersant use could impact individual fitness.

Dispersant effects are likely to be restricted to pinnipeds and their prey in a localized area, and are not likely to have significant population level effects. Largest effects would likely occur near high density foraging areas, haulouts, and rookeries, where a greater number of pinnipeds and/or prey would be exposed. However, the use of chemical dispersants could reduce the inhalation exposure route of volatiles and the duration of overall exposure to oil. In general, dispersant use is expected to be better for air-breathing animals than leaving oil undispersed on the water's surface. The trade-offs of chemical dispersants will be evaluated at each appropriate incident, with input from the NMFS section 7 biologist and NOAA Scientific Support Coordinator. For this reason, we expect that chemical dispersants will only be used when a determination is made that it is better for ESA-listed pinnipeds than not using dispersants, and not likely to have a population level effect.

Inhalation of smoke from the plume of an *in situ* burn will likely affect a few individual pinnipeds, even with mitigation measures in place. Mitigation measures will limit the number of exposures by avoiding *in situ* burns upwind of large aggregations of seals and sea lions. However, individuals may swim through the plume downwind of a burn. Or, in the case of the Arctic seals, individuals may be more dispersed, and haulout out on the ice downwind of a burn. Swimming animals will be mobile and exposure time will be limited. Hauled out animals may endure longer exposures to smoke inhalation. However, the smoke plume will be restricted both temporally and spatially, and the effect of smoke inhalation is not expected to be significant at the population level for Steller sea lions, ringed seals, or bearded seals.

The influx of responders into coastal areas in Alaska is an expected interrelated/interdependent effect of oil spill response activities directed by the Unified Plan. Small numbers of hauled out pinnipeds could be harassed as a result of increased human activity in communities and camps housing responders. We expect this impact to be limited to small sections of shorelines, some of which are already regularly accessed by recreationists, over a limited time frame (e.g., the length of the response effort). Therefore, this effect is not likely to be significant at the population level of these three pinnipeds.

5.4.2 Responses of Cetaceans to the Proposed Action

As described in detail in the “Potential Effects of the Proposed Action” section above, humpback, bowhead, and Cook Inlet beluga whales are susceptible to harassment/disturbance from auditory and visual detection of oil spill response activities. During oil spill response activities, we would expect to see all three species respond to loud noise by moving away from it. At the least, this response will result in increased energy expenditure and movement away from a preferred resource (e.g., resting, feeding, or breeding area). At worst, this behavioral response could result in endangered whales being driven/herded into an obstruction, equipment, or shallow water where individual whales could be seriously injured or stranded. Very loud noise, greater than 180 decibels, can physically harm cetaceans, possibly leading to deafness and an inability to function properly. Marine mammal observers and avoidance of loud operations near cetaceans will be important to mitigate this stressor. If expected mitigation measures are taken, it is unlikely that these three cetacean species will be harmed, but it will be difficult to avoid harassment. Due to the year-round presence of bowhead whales, humpback whales, and Cook Inlet beluga whales in Alaska waters in areas with high likelihood of future spills, some individuals are likely to be exposed to harassment levels of noise (120-180 decibels for continuous noise, 160-180 decibels for impulse noise) from response operations. However, the response effort will be limited in geographic scope and time, so we do not expect harassment to affect the long term fitness of individuals or populations.

In addition to noise, marine vessels also pose a collision risk to humpback, bowhead, and Cook Inlet beluga whales. These three species are susceptible to ship strike and responders will need to follow avoidance measures to reduce the likelihood of serious injury or mortality to cetaceans. As long as expected mitigation measures are followed (including speed restrictions and use of observers), we expect the risk of oil spill response vessels striking a whale will be greatly reduced. However, whales can surface unexpectedly; therefore, ship strike may occur. If the response vessel is moving slowly, the injury is not expected to be serious or lethal.

Due to the year-round presence of these three species of whales in their respective regions of Alaska, dispersant use will likely overlap in time and space with at least one of these species at any time of the year. Cook Inlet beluga whales, bowhead whales, and humpback whales must return to the water’s surface regularly to breathe, but spend much of their time moving through the water column. Dispersant use will likely decrease their exposure to volatile hydrocarbons at the surface during spill response, but will increase the exposure of whales and their prey to chemically-dispersed oil in the water column.

Humpback, bowhead, and Cook Inlet beluga whales do not have a layer of fur, and rely on their blubber layer for thermoregulation, therefore, increased exposure to oil due to chemical dispersant use is not likely to significant decrease the fitness of individuals due to thermoregulation issues. Increased ingestion of oil directly or through prey due to chemical dispersant use could impact individual fitness. Dispersant effects are likely to be restricted to small numbers of whales and their prey in a localized area, and are not likely to have significant population level effects. Largest effects would likely occur near high density foraging and migration areas, where a greater number of the species and their prey would be exposed. The trade-offs of using chemical dispersants will be evaluated at each appropriate incident, with input from the NMFS section 7 biologist and NOAA Scientific Support Coordinator. For this reason, we expect that chemical dispersants will only be used when a determination is made that it is better for ESA-listed cetaceans than not using dispersants, and not likely to have a population level effect.

Inhalation of smoke from the plume of an *in situ* burn will likely affect small numbers of cetaceans, even with mitigation measures in place. Mitigation measures will limit the number of exposures by avoiding *in situ* burns upwind of large aggregations of cetaceans. Individuals or groups of whales may swim through the plume downwind of a burn. However, the smoke plume will be restricted both temporally and spatially, and the effect of smoke inhalation is not expected to be significant at the population level for humpback whales, bowhead whales, or Cook Inlet beluga whales. Individual level effects are expected to be minor, and not long lasting or lethal.

The influx of responders into coastal areas in Alaska is an expected interrelated/interdependent effect of oil spill response activities directed by the Unified Plan. This may lead to increased marine vessel traffic within the range of bowhead, humpback, and/or Cook Inlet beluga whales due to an increased need for supplies and waste disposal. This may lead to an increased risk of ship strike and/or accidental hazardous substance discharge. However, commercial vessel captains are expected to follow the Alaska humpback whale approach regulation (50 CFR 224.103) and avoid approaching within 100 yards or changing the behavior of whales. Current marine shipping to and from Alaska is not having a population level effect on these three species, and the additional shipping due to oil spill response is not expected to significantly increase the rate of ship strike.

5.4.3 Responses of Chinook and Coho Salmon to the Proposed Action

ESA-listed Chinook or coho salmon may be exposed to in-water noise from oil spill response activities in nearshore waters. Any response by ESA-listed Chinook or coho salmon due to noise from oil spill response activities is not likely to rise to the level of take if marine mammal mitigation measures to reduce noise in the marine environment are properly followed. Oil spill response activity noise will be temporary, localized to small portion of salmonid habitat, and will not reach levels that can cause physical harm to fish. Therefore, oil spill response related noise is not likely to affect ESA-listed salmonids in Alaska.

The use of chemical dispersants may increase juvenile salmonid exposure to oil in the water column through ingestion or indirectly through prey. This exposure can lead to negative impacts through decreased individual fitness and mortality. However, dispersant use will be limited to applications to oil on waters deeper than 60 feet, for less than 96 hours at a time. These factors will reduce the exposure and response of juvenile salmonids. If these measures are followed we do not expect a significant portion of ESA-listed Chinook or coho salmon populations to experience long term impacts to overall fitness.

Juvenile salmon may be negatively affected by ingestion of residues from *in situ* burns. The use of *in situ* burns will be limited by the conditions described in detail above in the “Description of the Proposed Action” section, including required approval by the ARRT. The NMFS section 7 biologist and NOAA Scientific Support Coordinator will advise the decision and consider trade-offs between potential exposure pathways. *In situ* burns will be localized and temporary so are unlikely to have a population level effect on ESA-listed Chinook and coho salmon.

Interrelated/interdependent effects from an influx of responders to coastal communities and camps will not likely have a significant impact on ESA-listed salmonids. Increased marine vessel traffic due to an increased need for supplies and waste disposal may overlap in time and space with ESA-listed Chinook and coho salmon, but any exposure is expected to be negligible and not rise to the level of take.

5.5 EFFECTS OF THE PROPOSED ACTION ON CRITICAL HABITAT

5.5.1 Steller Sea Lion Critical Habitat

Critical habitat designated for Steller sea lions includes a large swath of marine waters along the Aleutian Chain, Kodiak Island, and Prince William Sound (Figure 12); an area heavily trafficked by marine vessels transporting large amounts of hazardous substances and hydrocarbons, either to market, waste disposal, or for propulsion purposes. It is likely that oil spill response activities in this region may affect Steller sea lion critical habitat. Critical habitat for the Steller sea lion is defined by the physical and biological features that support reproduction, foraging, rest, and refuge. These features are essential to the conservation of the Steller sea lion.

Oil spill response activities may affect the attributes of the habitat to make it a good place to rest, reproduce, and raise young. Direct effects to individual western DPS Steller sea lions through harassment are described above.

Additionally, oil spill response activities may affect the quality of designated Steller sea lion critical habitat by negatively impacting prey. Decreases in the availability of high quality prey will decrease the conservation value of critical habitat.

Marine vessel traffic, aircraft, dispersant use, *in situ* burns, and shoreline work are among the oil spill response activities that may negatively impact Steller sea lion critical habitat by decreasing its conservation value. NMFS expects that applicable mitigation measures will be put in place to avoid and/or minimize potential impacts to critical habitat. We expect that some impacts to critical habitat from response activities directed by the Unified Plan are likely, but will be localized and relatively short term.

5.5.2 Cook Inlet Beluga Whale Critical Habitat

Critical habitat designated for Cook Inlet beluga whales includes most of the nearshore waters in Cook Inlet, and all marine waters in the northern half of the inlet, excluding one triangular area of waters directly in front of the Port of Anchorage (Figure 15). The 5 primary constituent elements (PCEs) of Cook Inlet beluga whale critical habitat (the essential features that define the designation) are described in detail above in the Status of the Species section for this species. All 5 of the PCEs could potentially be negatively impacted by oil spill response activities as follows:

1. *Intertidal and subtidal waters of Cook Inlet with depths <30 feet (MLLW) and within five miles of high and medium flow anadromous fish streams.*

   Spill response activities could occur in waters as described by this PCE. Response activities are expected to be temporary in nature. Booming, skimming, and marine vessel and aircraft traffic could generate noise and could temporarily alter the quality of shallow habitats for Cook Inlet beluga whales. However, effects from these activities on critical habitat are expected to be temporary.

2. *Primary prey species consisting of four species of Pacific salmon (Chinook, sockeye, chum, and coho), Pacific eulachon, Pacific cod, walleye pollock, saffron cod, and yellowfin sole.*

   Spill response activities in Cook Inlet may impact the beluga whale prey species listed in this PCE. Oil spill response tactics are designed to lessen impacts of oil spills on fish and are expected to have a beneficial overall effect. However, dispersant use and *in situ* burning will likely increase the presence of burn residuals and oil in the water column, which may be ingested by fish. Small and juvenile fish are more susceptible to the toxic effects of ingested oil and burn residuals. Minimum water depths will restrict the use of dispersants to waters deeper than 20 meters, which will minimize exposure of nearshore fishes. In addition, dispersants will not be applied within 500 meters of schooling fishes.

For these reasons, and the expected temporary nature of spill response, these activities are not expected to have a long term impact on this PCE.

3. *Waters free of toxins or other agents of a type and amount harmful to Cook Inlet beluga whales.*

Two oil spill response tactics in particular would likely temporarily increase toxins or other agents in the water column in Cook Inlet beluga whale critical habitat should a large oil spill occur in Cook Inlet. The use of dispersants and *in situ* burning would likely increase the presence of burn residuals and oil in the water column in the short term, which may increase beluga whale exposures in the water column. However, the use of these response tactics is a trade-off to leaving greater amounts of oil on the surface, leading to prolonged exposure to wildlife and an increased risk of shoreline oiling. Use of dispersants or *in situ* burning would occur if it was determined by Unified Command, with input from the Environmental Unit, that these tactics would lead to an overall benefit to the environment. In addition, oil spill response activities are expected to be temporary and lead to a shorter duration of exposures of Cook Inlet beluga whales to toxins or other agents. For these reasons, these activities are not expected to have a long term negative impacts on this PCE.

4. *Unrestricted passage within or between the critical habitat areas.*

Spill response activities in Cook Inlet could potentially impact beluga whale passage between the critical habitat areas. Noise from marine vessel and aircraft traffic could lead to disturbance of beluga whales and temporary displacement from preferred areas. Booming in front of salmon streams for the purpose of oil exclusion is often a high priority in response efforts, and the associated equipment and noise may lead to temporary displacement, or restricted passage of Cook Inlet beluga whales. Any restrictions to beluga whale passage from oil spill response activities would be temporary and localized to the area in the pathway of the spill, and are not expected to have long term impacts on this PCE.

5. *Waters with in-water noise below levels resulting in the abandonment of critical habitat areas by Cook Inlet beluga whales.*

Spill response activities in Cook Inlet would likely generate noise levels above NMFS's threshold of concern for harassment of whales. It is possible that Cook Inlet beluga whales may avoid noisy areas during a response effort, leading to temporary displacement from preferred habitat. However, response efforts are expected to be temporary in nature and not lead to abandonment of any portion of critical habitat by beluga whales. For these reasons, response activities are not expected to have long term impacts on this PCE.

With expected applicable mitigation measures in place limiting sound and the amount and location of dispersant use, these impacts to the PCEs of Cook Inlet beluga whale critical habitat are expected to be relatively localized and short term, and are not expected to adversely modify critical habitat or have permanent or long-lasting effects.

5.6 CUMULATIVE EFFECTS

Although ESA-listed species in Alaska under NMFS's authority experience a number of stressors as described in the "Potential Effects of the Proposed Action" section above, most of the species (e.g., bowhead whale, ringed seal, bearded seal, humpback whale, Chinook salmon, and coho salmon) are experiencing increasing or stable population levels under current stressor regimes. Cook Inlet beluga whales are experiencing declines for reasons that are not well understood, and western DPS Steller sea lions are declining in the western Aleutian Islands although the population as a whole is increasing. It is not expected that oil spill response activities as directed by the Unified Plan will increase the overall effects to any of these species to a level that will jeopardize the species or adversely modify critical habitat.

Oil spill response activities are undertaken in an effort to protect and conserve the environment, including endangered and threatened species and their habitat. The Unified Plan is designed to incorporate the best available current and historic information in order to prioritize the response effort as efficiently as possible, while considering how to avoid or minimize potential impacts of response activities on wildlife and habitat. The Unified Plan is intended to establish the protocols and coordination procedures to ensure that the impacts of the response will have been agreed to after full consideration of the trade-offs of other options, including non-response, and will be a net environmental benefit. With mitigation measures described above applied to oil spill response activities, these activities should not increase the cumulative effects experienced by these ESA-listed species, and should instead be beneficial.

5.7 INTEGRATION AND SYNTHESIS

The Integration and Synthesis section is the final step of NMFS's assessment of the risk posed to the species as a result of implementing the proposed action. In this section, we add the effects of the action to the environmental baseline and the cumulative effects to formulate the agency's Biological Opinion as to whether the proposed action is likely to: (1) result in appreciable reductions in the likelihood of survival of the species in the wild by reducing its numbers, reproduction, or distribution; (2) result in appreciable reductions in the likelihood of recovery of the species in the wild by reducing its numbers, reproduction, or distribution; or (3) result in the adverse modification or destruction of critical habitat as measured through potential reductions in the value of designated critical habitat for the conservation of the species. These assessments are made in full consideration of the current status of the species.

As discussed in the *Approach to the Assessment* section of this Biological Opinion, we begin our risk analyses by asking whether the probable physical, physiological, behavioral, or social responses of endangered or threatened species are likely to reduce the fitness of endangered or threatened individuals or the growth, annual survival or reproductive success, or lifetime reproductive success of those individuals. If we would not expect listed species exposed to an action's effects to experience reductions in the current or expected future survivability or reproductive success (e.g., fitness), we would not expect the action to have adverse consequences on the viability of the populations those individuals represent or the species those populations comprise. Therefore, if we conclude that listed species are not likely to experience reductions in fitness, we would conclude our assessment because we would not expect the effects of the action to affect the performance of the populations those individuals represent or the species those populations comprise. If, however, we conclude that listed species are likely to experience reductions in their fitness as a result of their exposure to an action, we then determine whether those reductions would reduce the viability of the population or populations the individuals represent and the species those populations comprise.

As part of our risk analyses, we consider the consequences of exposing endangered or threatened species to the stressors associated with the proposed actions, individually and cumulatively, given that the individuals in the action areas for this consultation are also exposed to other stressors in the action area and elsewhere in their geographic range. These stressors or the response of individual animals to those stressors can produce consequences — or "cumulative impacts"— that would not occur if animals were only exposed to a single stressor.

The exposure and response analyses above lead us to conclude that endangered and threatened individuals that are likely to be exposed to oil spill response activities directed by the Unified Plan are likely to experience disruptions in their normal behavior patterns and/or be injured by response operations through increased exposure to oil[‡‡] (directly or indirectly through prey resources) and risk of ship strike and disturbance. However, individuals are not likely to be killed or experience significant reduction in their current or expected future reproductive success as a result of that exposure relative to a "no-response" option. The magnitude of take will be influenced by the time of year, location, size of the spill and associated response, and the implementation of effective mitigation measures.

It is impossible to accurately predict the exact timing and size of oil/hazardous materials spills in Alaska's marine waters. The following risk analyses were quantified using information from the "Status of Listed Species" section regarding presence, abundances, densities, seasonal migration patterns, concentration areas, hearing capabilities, and critical habitat areas for each species. These numerical estimates were compared to hypothetical very large oil spills (>42,000 barrels)

[‡‡] The use of chemical dispersants could decrease the long term exposure of marine mammals and their prey to oil overall, at the expense of increased short term exposure of marine mammals and their prey to oil in the water column.

in high risk areas (e.g., a tanker collision in Prince William Sound, northern Bering Sea, or the Aleutian Islands; a well blowout in Cook Inlet, Beaufort Sea, or Chukchi Sea; a fuel barge collision in Southeast Alaska) to assess and quantify potential overlap. We analyzed the historical spill record and current and future predicted activities that introduce risk of oil spills in the Alaska marine environment to determine reasonable hypothetical incidents that could overlap in time and space with the species included in this Biological Opinion.

5.7.1 Bowhead Whale Risk Analysis

Oil spill response activities in the Beaufort, Chukchi, or Bering Seas during the months that bowhead whales are present are likely to overlap in time and space with this species. Of particular concern would be a large magnitude spill during peak migration in a migration corridor (e.g., approximately September – October and April – May in the Beaufort and Chukchi Seas, and October – November and March – April in the Bering Strait), or near a high density foraging area where large numbers of bowhead whales and their prey would be present.

Dedicated marine mammal observers on vessels and aircraft to monitor/implement minimum approach distances will greatly reduce the risk of ship strike, acoustic harm and harassment, and application of chemical dispersant on or near bowhead whales. However, some harassment will still occur in response to noise produced by marine vessels, aircraft, and other oil spill response equipment operating in or transiting waters where bowhead whales are present, and whales may be more exposed to oil as a result of chemical dispersant use (albeit for a reduced period of time compared to not using dispersants).

For a large and/or long-lasting (greater than one month) response in a bowhead whale migration route, we would expect that up to half (~8,500 whales) would be exposed to potential stressors from response activities. However, considering the use of mitigation measures, we would not expect more than 500 bowhead whales to respond behaviorally to acoustic stressors in a way that negatively affects individual fitness (e.g., temporary displacement from a foraging ground, disruption of important social interactions, increased energy expenditure). In addition, we would not expect more than 1,000 bowhead whales to be exposed to chemically dispersed oil through ingestion or indirectly through reductions in zooplankton prey, or ingestion of prey exposed to chemical dispersed oil. We expect less than 250 bowhead whales would be exposed to smoke plumes from *in situ* burns to a degree that would significantly affect individual fitness. These effects to fitness are not expected to be permanent or have a population-level effect. It is possible that up to 2 bowhead whales may be injured via entanglement or collision with oil spill response equipment if individuals surface unexpectedly.

5.7.2 Ringed Seal Risk Analysis

Oil spill response activities in the Beaufort and Chukchi Seas are likely to overlap in time and space with ringed seals year-round. The seasonal presence of ringed seals in the Bering Sea is highly variable between years, and while they are typically associated with ice, ringed seals are sometimes present in the Bering Sea during the open-water months. Ringed seals do give birth and raise their pups on ice in the Bering Sea. Therefore, oil spill response activities in the Bering Sea may overlap in time and space with this species. Of particular concern would be a large magnitude spill in the Arctic or sub-Arctic ice lead system during the pupping season.

Dedicated marine mammal observers on the ice, marine vessels, and aircraft to look for subnivean lairs and monitor/implement minimum approach distances, will greatly reduce the risk of ship strike, acoustic harm and harassment, harmful *in situ* burns, and application of chemical dispersant on or near ringed seals. However, some harassment will still occur in response to noise produced by marine vessels, aircraft, and other oil spill response equipment and personnel operating in or transiting waters where ringed seals are present, and seals may be more exposed to oil as a result of chemical dispersant use (albeit for a reduced period of time compared to not using dispersants).

Large numbers of ringed seals are widely distributed throughout the Bering, Chukchi, and Beaufort Seas, and their range and distribution vary widely within and between years. Oil spill response activities will be localized to one relatively small area within the overall range of the species, and occur over a relatively short temporal scale. Therefore, we would not expect more than 5,000 ringed seals to be exposed to visual or audio disturbance resulting from oil spill response activities to the level that causes them to behaviorally respond in a way that negatively impacts individual fitness (e.g., reduced feeding, social interactions, increased energy expenditure, temporary displacement from preferred habitat). In addition, we would not expect more than 10,000 ringed seals to be exposed to chemically dispersed oil through ingestion or indirectly through reductions in prey, or ingestion of prey exposed to chemically dispersed oil. We expect less than 10,000 ringed seals would be exposed to smoke plumes from *in situ* burns to a degree that would affect individual fitness. These effects to fitness are not expected to be permanent or have a population-level effect. It is possible that up to 2 ringed seals may be injured via entanglement or collision with oil spill response equipment if individuals remain out of sight of observers.

5.7.3 Bearded Seal Risk Analysis

Oil spill response activities in the Beaufort and Chukchi Seas are likely to overlap in time and space with bearded seals year-round. The winter presence of bearded seals in the Bering Sea is variable between years and dependent on the presence of ice. Therefore, oil spill response activities in the Bering Sea may overlap in time and space with this species, especially near the ice edge, or in heavy ice. Of particular concern would be a large magnitude spill in the Bering Strait when most of the bearded seals in the Alaska stock migrates north in the spring and south in the fall, following the growth and recession of the ice edge.

Dedicated marine mammal observers on the ice, marine vessels, and aircraft to look for subnivean lairs and monitor/implement minimum approach distances, will greatly reduce the risk of ship strike, acoustic harm and harassment, harmful *in situ* burns, and application of chemical dispersant on or near bearded seals. However, some harassment will still occur in response to noise produced by marine vessels, aircraft, and other oil spill response equipment and personnel operating in or transiting waters or ice where bearded seals are present, and seals may be more exposed to oil as a result of chemical dispersant use (albeit for a reduced period of time compared to not using dispersants).

Large numbers of bearded seals are widely distributed throughout the Bering, Chukchi, and Beaufort Seas, and their range and distribution vary widely within and between years. Oil spill response activities will be localized to one relatively small area within the overall range of the species, and occur over a relatively short temporal scale. However, their numbers are more concentrated in the Bering Strait region during their peak migration periods. We would not expect more than 1,000 bearded seals to be exposed to visual or audio disturbance resulting from oil spill response activities to the level that causes them to behaviorally respond in a way that negatively impacts individual fitness (e.g., reduced feeding, social interactions, increased energy expenditure, temporary displacement from preferred habitat). In addition, we would not expect more than 5,000 bearded seals to be exposed to chemically dispersed oil through ingestion or indirectly through reductions in prey, or ingestion of prey exposed to chemically dispersed oil. We expect less than 5,000 bearded seals would be exposed to smoke plumes from *in situ* burns to a degree that would affect individual fitness. These effects to fitness are not expected to be permanent or have a population-level effect. It is possible that 1 bearded seal may be injured via entanglement or collision with oil spill response equipment if individuals remain out of sight of observers.

5.7.4 Steller Sea Lion Risk Analysis

Oil spill response activities are likely to overlap in time and space year-round with western DPS Steller sea lions in the region stretching through the Aleutian Islands, Kodiak Island, Prince William Sound, and northern Southeast Alaska. In addition, oil spill response activities may overlap seasonally with western DPS Steller sea lions on or near Bering Sea Islands (e.g., St. Lawrence, St. Matthew, St. Paul, and St. George) and Bristol Bay. Of particular concern would be a large magnitude spill within Steller sea lion designated critical habitat near one or more rookeries during the pupping season (generally from late May to early July).

Dedicated marine mammal observers on shore, marine vessels, and aircraft to look for Steller sea lions and monitor/implement minimum approach distances, will greatly reduce the risk of ship strike, acoustic harm and harassment, harmful *in situ* burns, and application of chemical dispersant on or near Steller sea lions. However, some harassment will still occur in response to noise produced by marine vessels, aircraft, and other oil spill response equipment and personnel operating in or transiting waters or ice where Steller sea lions are present, and sea lions may be more exposed to oil as a result of chemical dispersant use (albeit for a reduced period of time compared to not using dispersants).

Western DPS Steller sea lions occur in relatively low densities at sea, but are more concentrated in nearshore areas, especially near haulouts and rookeries. The locations of haulouts and rookeries are generally well known and consistent sites that can be avoided. However, it may be necessary for responders to harass Steller sea lions incidentally in order to properly deploy equipment or clean beaches, resulting in a long term net benefit for the species. These trade-offs will be considered by the NMFS section 7 biologist prior to approval of operations. In addition, western DPS Steller sea lions may be harassed by responders that inadvertently approach an unknown haulout or individuals at sea. We do not expect more than 300 western DPS Steller sea lions will be harassed to the point that their behavior is significantly negatively altered resulting in impacts to individual fitness (e.g., reduced feeding, social interactions, increased energy expenditure, temporary displacement from preferred habitat). In addition, we do not expect more than 250 western DPS Steller sea lions to be exposed to chemically dispersed oil directly through ingestion or indirectly through decreased prey, or ingestion of prey exposed to chemically dispersed oil. We expect that less than 250 western DPS Steller sea lions would be exposed to smoke plumes from in situ burns to a degree than would affect individual fitness. These effects to fitness are not expected to be permanent or have a population-level effect. It is possible that 1 western DPS Steller sea lion may be injured via entanglement or collision with oil spill response equipment if individuals remain out of sight of observers.

Steller sea lion critical habitat was designated through a large swath of the Aleutian Islands, Kodiak Island, and Prince William Sound (Figure 12). These areas are likely to experience oil spills in the future, and responses associated with these spills are likely to affect Steller sea lion critical habitat. However, we do not expect any impacts to Steller sea lion critical habitat from oil spill response activities to be long-lasting or permanent, and response activities will be localized to one small region of designated critical habitat. Within a calendar year, we do not expect more than 5% of designated Steller sea lion critical habitat to be negatively impacted by oil spill response activities to a measureable level.

5.7.5 Cook Inlet Beluga Whale Risk Analysis

Oil spill response activities in Cook Inlet are likely to overlap in time and space with Cook Inlet beluga whales, which are present year-round. The DPS is more concentrated to the northern half of the inlet during the summer months, so risk of overlap in the southern half of the inlet is reduced during those months. Distribution within the inlet is variable, and marine mammal observers will be integral to detection and avoidance of Cook Inlet beluga whales during oil spill response. Of particular concern would be a large magnitude spill occurring during the late-summer, early-fall near the mouths of streams where Cook Inlet beluga whales congregate to forage on spawning salmon.

Dedicated marine mammal observers on marine vessels and aircraft to monitor/implement minimum approach distances will greatly reduce the risk of ship strike, acoustic harm and harassment, and application of chemical dispersant on or near Cook Inlet beluga whales.

However, some harassment will still occur in response to noise produced by marine vessels, aircraft, and other oil spill response equipment operating in or transiting waters where Cook Inlet beluga whales are present, and whales may be more exposed to oil as a result of chemical dispersant use (albeit for a reduced period of time compared to not using dispersants).

For a large and/or long-lasting (greater than one month) response at or near a primary feeding area during the salmon run, we would expect that up to half the Cook Inlet beluga whale population (~160 whales) would be exposed to potential stressors from response activities. However, considering the use of mitigation measures, we would not expect more than 75 Cook Inlet beluga whales to respond behaviorally to acoustic stressors in a way that negatively affects individual fitness (e.g., temporary displacement from a foraging ground, disruption of important social interactions, increased energy expenditure). In addition, we would not expect more than 100 Cook Inlet beluga whales to be exposed to chemically dispersed oil through ingestion or indirectly through reductions prey availability, or ingestion of prey exposed to chemical dispersed oil. We expect less than 75 Cook Inlet beluga whales would be exposed to smoke plumes from *in situ* burns to a degree that would significantly affect individual fitness. These effects to fitness are not expected to be permanent or have a population-level effect. It is possible that 1 Cook Inlet beluga whale may be injured via entanglement or collision with oil spill response equipment if individuals surface unexpectedly, but not to the extent that the injury would affect reproductive success or survival.

Cook Inlet beluga whale critical habitat was designated along much of the shore of Cook Inlet, all of Kachemak Bay, and the entire northern portion of Cook Inlet, excluding a relatively small area in front of the Port of Anchorage (Figure 15). These areas are likely to experience oil spill in the future, and responses associated with these spills are likely to affect Cook Inlet beluga whale critical habitat. However, we do not expect any impacts to Cook Inlet beluga whale critical habitat from oil spill response activities to be long-lasting or permanent, and response activities will likely be localized to one portion of designated critical habitat. Within a calendar year, a conservative estimate is that not more than 15% of designated Cook Inlet beluga whale critical habitat would be negatively impacted by oil spill response activities to a measureable level, and these impacts would be environmentally preferable to refraining from response.

5.7.6 Humpback Whale Risk Analysis

Oil spill response activities in the Aleutian Islands, around Kodiak Island, in Prince William Sound, or in Southeast Alaska are likely to overlap in time and space with humpback whales, especially during the summer months when their numbers are significantly greater in those areas. Distribution within and between those areas varies significantly between years so impacts are difficult to predict and will be incident specific. Of particular concern would be a large magnitude spill in a feeding area where whales and their prey are concentrated (e.g., Aleutian Islands, Prince William Sound, or Southeast Alaska during the summer).

Dedicated marine mammal observers on marine vessels and aircraft to monitor/implement minimum approach distances will greatly reduce the risk of ship strike, acoustic harm and harassment, and application of chemical dispersant on or near humpback whales. However, some harassment will still occur in response to noise produced by marine vessels, aircraft, and other oil spill response equipment operating in or transiting waters where humpback whales are present, and whales may be more exposed to oil as a result of chemical dispersant use (albeit for a reduced period of time compared to not using dispersants.

Even a large and/or long-lasting (greater than one month) oil spill response will be localized relative to the range of the humpback whale in Alaska waters. Humpback whales arrive in Alaska via numerous routes and do not follow a migration route as distinct as what is observed for other species such as the bowhead whale. Within one calendar year, we do not expect more than 750 humpback whales to be exposed to potential stressors from response activities in Alaska as directed by the Unified Plan. However, considering the use of mitigation measures, we would not expect more than 250 humpback whales to respond behaviorally to acoustic stressors in a way that negatively affects individual fitness (e.g., temporarily displaced from a foraging ground, disruption of important social interactions, increased energy expenditure). In addition, we would not expect more than 500 humpback whales to be exposed to chemically dispersed oil through ingestion or indirectly through reductions prey availability, or ingestion of prey exposed to chemical dispersed oil. We expect less than 250 humpback whales would be exposed to smoke plumes from *in situ* burns to a degree that would significantly affect individual fitness. These effects to fitness are not expected to be permanent or have a population-level effect. It is possible that up to 2 humpback whales may be injured via entanglement or collision with oil spill response equipment if individuals surface unexpectedly.

5.7.7 Chinook and Coho Salmon Risk Analysis

Oil spill response activities will overlap in time and space with ESA-listed stocks of Chinook and coho salmon, which are thought to be present year-round in Alaska waters. Relative distribution of ESA-listed salmonids throughout Alaska's marine waters is unknown and likely varies substantially between years. Of particular concern would be a large magnitude spill in Southeast Alaska during the spring and summer months (May through September) months when juvenile coho from the Lower Columbia River ESU migrate up the coast from the Columbia River estuary, hugging the coastline, and transiting and feeding in Inside Passage waters.

Mitigation measures such as temporal, depth, and volume limits on dispersant use, and wildlife observers ensuring that dispersants are not applied directly on schools of fish, will minimize potential impacts to ESA-listed salmonids. However, dispersant use and *in situ* burns may impact salmon even when mitigation measures are followed.

Although take of ESA-listed salmonids will be unobserved due to the inability to monitor individuals, we do not expect more than 10% of nearshore (within 2 miles) waters in Alaska to be impacted by stressors associated with oil spill response activities within one calendar year. Outside of 2 miles, we expect that the effects of oil spill response will be diluted to the point that effects to ESA-listed salmonids will not be measureable.

6.0 CONCLUSION

After reviewing the current status of the listed species, the environmental baseline within the action area, the effects of the proposed action, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to adversely affect the endangered North Pacific right whale (*Eubalaena japonica*) and its designated critical habitat, endangered fin whale (*Balaenoptera physalus*), endangered blue whale (*Balaenoptera musculus*), endangered sei whale (*Balaenoptera borealis*), endangered sperm whale (*Physeter microcephalus*), endangered western North Pacific gray whale (*Eschrichtius robustus*), and threatened steelhead trout (*Oncorhynchus mykiss*) ESUs. Additionally, the proposed action is not likely to jeopardize the continued existence of the endangered bowhead whale (*Balaena mysticetus*), endangered humpback whale (*Megaptera novaeangliae*), endangered western DPS Steller sea lion (*Eumatopias jubatus*), threatened Arctic subspecies of ringed seal (*Phoca hispida hispida*), threatened Beringia DPS of bearded seal (*Erignathus barbatus barbatus*), endangered Cook Inlet beluga whale (*Delphinapterus leucas*), endangered and threatened Chinook salmon (*Oncorhynchus tshawytscha*) ESUs, threatened coho salmon (*Oncorhynchus kisutch*) ESUs, or destroy or adversely modify the designated critical habitat of the Steller sea lion and Cook Inlet beluga whale.

7.0 INCIDENTAL TAKE STATEMENT

Section 9 of the ESA prohibits the take of endangered species without special exemption. For certain threatened species, NOAA has promulgated regulations pursuant to section 4(d) of the ESA extending section 9's take prohibition to them. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2) of the ESA, taking that is incidental to the agency action is not considered to be prohibited taking under the ESA, provided that such taking is in compliance with the terms and conditions of an incidental take statement. ESA section 7(b)(4) regulations at 50 CFR 402.14 (i)(1) provide that where NMFS concludes that an action (or any offered reasonable and prudent alternative) and the resultant incidental take of listed species will not violate section 7(a)(2), NMFS will provide with the Biological Opinion a statement concerning incidental take.

The ESA does not prohibit the taking of threatened ringed or bearded seals. This incidental take statement, however, includes numeric limits on taking those species because those numbers were analyzed in the jeopardy analysis and to provide guidance to the action agencies on their requirement to re-initiate consultation if the take limit for any species covered in this consultation is exceeded.

Section 7(b)(4)(C) of the ESA provides that any takings of ESA-listed marine mammals must be authorized pursuant to section 101(a)(5) of the MMPA before this incidental take statement can become effective. Section 109(h) of the MMPA, however, exempts takings of marine mammals by governmental officials acting in the course of his or her duties provided the taking occurs in a humane manner and for certain, specified reasons, including the protection or welfare of the animal and the protection of the public health and welfare. As a result, NMFS will consider any taking in connection with an oil spill response activity that meets the express conditions of section 109(h) of the MMPA to be effectively authorized for purposes of ESA section 7(b)(4)(C).

7.1 AMOUNT OR EXTENT OF TAKE

In light of variables concerning timing, size, and location of potential spills, it is impossible to precisely predict the amount of take that will result from the implementation of the Unified Plan. The number, size, time of year, and location of oil spills is largely unpredictable and will vary tremendously between years. There is a paucity of historical spill information for oil and gas exploration and development activities in Alaska's marine waters, particularly in the Arctic, and past activities are not expected to provide an accurate reflection of future activities. Locations of ongoing and proposed oil wells are known, but the occurrence, timing, duration, and magnitude of an accidental blowout or discharge is impossible to predict. Similarly, approximate shipping transit routes and schedules are known, but vary widely with weather, ice conditions, mechanical problems, and human error. Shipping accidents, including collisions, capsizing, and groundings, can be a result of any of these factors and the timing, location, and magnitude of associated spills and discharges is unpredictable. Further, the locations of existing and proposed pipelines used to transport oil are known, but accidental discharges from pipelines are unpredictable in their timing, duration, and magnitude.

The response to hazardous materials spills is incident-specific and varies widely depending on the material spilled, location, size, duration, timing, environmental conditions (e.g., weather, ice conditions, day length, distance from shore), responsible party, and available personnel and equipment. For these reasons, it is not possible to reasonably predict an accurate estimate of the number of individual animals of ESA-listed species that will be affected by oil/hazardous materials spills in Alaska marine waters.

In spite of these uncertainties and unknowns, NMFS used the historic spill record provided in the Biological Assessment for this consultation (USCG and EPA 2014) and incorporated information on projected increases in oil and gas development and shipping in Alaska to determine potential exposures from the overlap of hazardous material spill response activities and presence of ESA-listed species under NMFS's authority. Assuming that oil and gas activities and shipping do not occur at levels exceeding our current understanding of predictions for the foreseeable future, NMFS anticipates take of listed species from spill response actions will not exceed the following values within any one calendar year, or 150% of any of these values in any three consecutive years:

Steller Sea Lions

- 300 western DPS Steller sea lions harassed to the point of behavioral change. No lethal take and no long term impacts to individual fitness.
- 1 western DPS Steller sea lion injured via entanglement or collision with spill response equipment.
- 250 western DPS Steller sea lions exposed directly to chemically dispersed oil or indirectly through decreased prey or ingestion of prey exposed to chemically dispersed oil.
- 250 western DPS Steller sea lions exposed to a smoke plume from *in situ* burns to a level that impacts short term individual fitness. No harm, no lethal take, and no long term impacts to individual fitness from this stressor.
- 5% of the area of designated critical habitat for western DPS Steller sea lions will be exposed to factors that temporarily decrease the value of the principal constituent elements (i.e., prey availability, foraging duration, and significant land use areas). No long term destruction or adverse modification of designated critical habitat.

Ringed Seals

- 5000 ringed seals harassed to the point of significant negative behavioral change.

- 2 ringed seal injured via entanglement or collision with spill response equipment. No lethal take.
- 10,000 ringed seals exposed directly chemically dispersed oil or indirectly through ingestion of prey exposed to chemically dispersed oil.
- 10,000 ringed seals exposed to a smoke plume from *in situ* burns to a level that impacts short term individual fitness. No harm, no lethal take, and no long term impacts to individual fitness from this stressor.

Bearded Seals

- 1000 bearded seals harassed to the point of significant negative behavioral change.
- 1 bearded seal injured via entanglement or collision with spill response equipment. No lethal take.
- 5000 bearded seals exposed directly chemically dispersed oil or indirectly through ingestion of prey exposed to chemically dispersed oil.
- 5000 bearded seals exposed to a smoke plume from *in situ* burns to a level that impacts short term individual fitness. No harm, no lethal take, and no long term impacts to individual fitness from this stressor.

Bowhead Whales

- 500 bowhead whales harassed to the point of significant negative behavioral change.
- 1000 bowhead whales exposed directly chemically dispersed oil or indirectly through ingestion of prey exposed to chemically dispersed oil.
- 250 bowhead whales exposed to a smoke plume from *in situ* burns to a level that impacts short term individual fitness. No harm, no lethal take, and no long term impacts to individual fitness from this stressor.
- 2 bowhead whales injured via entanglement or collision with spill response equipment. No lethal take.

Humpback Whales

- 250 humpback whales harassed to the point of significant negative behavioral change.
- 500 humpback whales exposed directly chemically dispersed oil or indirectly through ingestion of prey exposed to chemically dispersed oil.
- 250 humpback whales exposed to a smoke plume from *in situ* burns to a level that impacts short term individual fitness. No harm, no lethal take, and no long term impacts to individual fitness from this stressor.
- 2 humpback whales injured via entanglement or collision with spill response equipment. No lethal take.

Cook Inlet Beluga Whales

- 75 Cook Inlet beluga whales harassed to the point of significant negative behavioral change.

- 100 Cook Inlet beluga whales exposed directly to chemically dispersed oil or indirectly through ingestion of prey exposed to chemically dispersed oil.
- 75 Cook Inlet beluga whales exposed to a smoke plume from *in situ* burns to a level that impacts short term individual fitness. No harm, no lethal take, and no long term impacts to individual fitness.
- 1 Cook Inlet beluga whale injured via entanglement or collision with spill response equipment. No lethal take.
- 15% of the area of designated critical habitat for Cook Inlet beluga whales will be exposed to factors that temporarily decrease the value of the principal constituent elements (i.e., abundant prey, toxin-free waters, unrestricted passage, and waters with noise below levels resulting in temporary displacement). No long term destruction or adverse modification of designated critical habitat.

Chinook and Coho Salmon

- 10% of nearshore (within 2 miles) marine waters within the range of Chinook and coho salmon in Alaska will be exposed to factors that temporarily decrease the value of this habitat for salmonids (e.g., *in situ* burn residuals and chemical dispersant use).

These expected maximum take values were determined based on population estimates, densities, and habitat preferences of the ESA-listed species in areas with risk of spill responses; historic reported spills from 1997-2012; and expected increases in oil and gas exploration and development and shipping in Alaska.

No take of North Pacific right whales or their critical habitat has been requested or authorized. In addition, lethal take of individuals of any species is not anticipated, and therefore is prohibited and may result in the modification, suspension, or revocation of the ITS.

7.2 REASONABLE AND PRUDENT MEASURES

“Reasonable and prudent measures” are nondiscretionary measures to minimize the amount or extent of incidental take (50 CFR 402.02).

The RPMs included below, along with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. NMFS concludes that the following RPMs are necessary and appropriate to minimize or to monitor the incidental take of bowhead whales, humpback whales, Cook Inlet beluga whales, western DPS Steller sea lions, ringed seals, bearded seals, and salmon resulting from the proposed action.

1. The USCG/EPA shall implement measures to reduce the probability of exposing bowhead whales, humpback whales, Cook Inlet beluga whales, western DPS Steller sea

lions, ringed seals, bearded seals, and salmon to oil spill response related stressors.

2. The USCG/EPA shall implement a monitoring and documentation program that allows NMFS to evaluate the spill response action exposure estimates contained in this Biological Opinion and that underlie this ITS.

7.2.1 Terms and Conditions

“Terms and conditions” implement the reasonable and prudent measures (50 CFR 402.14). The USCG and EPA must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. For NMFS’s purposes, compliance with the terms and conditions meets the intent of Appendix B of the 2001 Inter-agency MOA (USCG et al. 2001).

Partial compliance with these terms and conditions may result in more take than anticipated, and invalidate any exemption from section 9 of the ESA. These terms and conditions constitute no more than a minor change to the proposed action because they are consistent with the basic design of the proposed action.

To carry out RPM #1, the USCG/EPA and/or authorized responders must undertake the following:

1. Training and Education. The USCG and EPA shall ensure all field deployed response personnel involved with spill response in a manner which may result in incidental take are given the information needed to enable them to properly follow the: (1) “Mitigation Measures,” as outlined in Sections 2.5 and 5.2.1-5.2.5 above; and (2) Reasonable and Prudent Measures and their corresponding Terms and Conditions, as outlined in this Biological Opinion.
2. Contracts. The USCG and EPA shall, within their level of discretion and contracting limitations, include as part of any contractual agreement with third parties involved in spill response in a manner which may result in incidental take, terms requiring compliance with: (1) “Mitigation Measures,” as outlined in Section 2.5 and 5.2.1-5.2.5 above; and (2) Reasonable and Prudent Measures and their corresponding Terms and Conditions, as outlined in this Biological Opinion.
3. Tiered Emergency Consultation for Individual Spill Response Actions. The USCG/EPA shall conduct Emergency Consultation with NMFS during incidents when the USCG/EPA determines that ESA-listed species under NMFS’s jurisdiction may be affected by response activities. Emergency Consultation will be conducted in the following manner and to accomplish the below measures.
    A. Confirmation of Species Presence. Contact a section 7 biologist from NMFS to confirm whether a spill response is within the range of a listed species or a designated critical habitat.

B. Whenever possible, the USCG/EPA shall document in writing the proposed response method and site-specific conditions, and supply these documents to NMFS for Emergency Consultation review as soon as practicable, prior to conducting the proposed response method. In-person meetings or phone calls may be used to expedite Emergency Consultation response, and NMFS may request supplemental information be provided in these circumstances. The USCG/EPA shall document in writing the substance and subsequent agreements of the Emergency Consultation when personal communication is used.
C. Following each spill response action over which the USCG and EPA have exercised jurisdiction, the USCG and EPA shall review each spill response to ensure that all adverse effects to listed species, their prey, and their habitats were within the range of effects considered in this Biological Opinion. Additional formal consultation may be required.
D. Tiered Consultation will explore methods to further minimize effects from spill response based on site-specific conditions and species use.
E. At all times when conducting emergency spill response activities, the USCG/EPA shall notify responders that no take of North Pacific right whales is authorized. The USCG/EPA shall implement measures to avoid any take including the use of marine mammal observers on marine vessels and aircraft in or near North Pacific right whale critical habitat, and limiting the use of *in situ* burns and chemical dispersants to seasons when North Pacific right whales are not present down-wind or down-current (e.g., winter months).
F. The taking of any marine mammal in a manner other than that described in this ITS must be reported immediately to NMFS AKR, Protected Resources Division at 907-586-7235.
G. Species Collection. The USCG and EPA shall ensure that if a sick, injured, or dead marine mammal under NMFS's authority is observed during a spill response in which the USCG or EPA has exercised jurisdiction, the information about the observation will be relayed through the Incident Command to the NMFS Alaska Region as soon as possible.

To carry out RPM #2, the USCG/EPA and/or authorized responders must undertake the following:

1. The USCG and EPA shall ensure that for those spill response actions over which the USCG and EPA have jurisdiction pursuant to the OPA-1990 and/or the CWA, the USCG and EPA shall document effects to listed species, their prey, and habitat used by listed species from the response methods. Documentation shall contain the following:
    A. Species Affected. Number or estimates of species affected by the spill response methods, to the extent possible.

B. Habitat Area and Type. The area and type of habitat affected by the spill response methods.
C. Temporal Effects. The anticipated temporal extent of impacts from the spill response methods.
D. Annual Monitoring Report. Provide NMFS with a copy of the annual Alaska Regional Response Team (ARRT) report by January 31 of each year, with a section describing the USCG/EPA’s efforts carrying out the Terms and Conditions of this Biological Opinion.

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8.0 CONSERVATION RECOMMENDATIONS

In addition to section 7(a)(2), which requires agencies to ensure that proposed projects will not jeopardize the continued existence of listed species, section 7(a)(1) of the ESA places a responsibility on all federal agencies to use their authorities in furtherance of the purposes of the Act by carrying out programs for the conservation of endangered species. Conservation Recommendations are discretionary activities designed to minimize or avoid adverse effects of a proposed action on listed species or critical habitat. The following conservation measures are recommended:

1. Vessels should be operated at speeds not exceeding 13 knots when listed whales are nearby. Most injurious or lethal ship strikes occur when vessels are moving at 13 knots or faster, therefore, vessels operating at slower speeds are expected to present less risk.

2. Protected species observers should be present to monitor take of ESA-listed species from all response activities.

3. Implement 1,500 foot restricted access zones around all known Steller sea lion haulouts and rookeries. Add maps/data layers to Subarea Contingency Plans.

4. Implement 500 foot avoidance distance from all whales observed during the response.

5. Monitor sound levels from response machinery (e.g., particularly aircraft and marine vessels), and restrict sound exposure levels to below 180 decibels near the marine environment to avoid physical harm to marine mammals. The USCG and the EPA should use or procure quieter equipment when possible. New, quieter technologies continue to be developed.

6. The USCG and the EPA should explore non-toxic dispersant technology to be used in oil spill response.

7. Establish incident-specific traffic lanes for aircraft and marine vessels in congested areas (areas with multiple aircraft/vessels or repeated transits).

8. Implement a safety and communication plan that increases awareness about traffic patterns and the presence of marine mammals.

NMFS requests notification of the action agencies’ decisions regarding implementation of these conservation recommendations.

9.0 REINITIATION - CLOSING STATEMENT

This concludes formal consultation on activities directed by the *Alaska Federal/State Preparedness Plan for Response to Oil & Hazardous Substance Discharges/Releases (Unified Plan)* as described in the USCG/EPA Biological Assessment (USCG and EPA 2014). As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of anticipated incidental take is exceeded for any species in any given calendar year; (2) new information reveals effects of the agency action that may affect listed species or designated critical habitat in a manner or to an extent not considered in this Biological Opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or designated critical habitat not considered in this opinion (such as additional dispersant compounds requested for use in Alaska that may affect ESA-listed species); or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, the action agency must immediately reinitiate formal consultation on the action.

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