United States Department of the Interior

BUREAU OF OCEAN ENERGY MANAGEMENT
Alaska OCS Region
3801 Centerpoint Drive, Suite 500
Anchorage, Alaska 99503-5823

MAR 28 2013

Mr. Mike Brock
Environmental Team Lead
BP Exploration (Alaska), Inc.
PO Box 196612
Anchorage, AK 99519-6612

Dear Mr. Brock:

The Bureau of Ocean Energy Management (BOEM) has reviewed the BP Exploration (Alaska), Inc. (BPXA) notification of ancillary activities for the proposed 2013 Winter Geotechnical and Seabottom Investigation, Liberty Development, Beaufort Sea, Alaska. The notice describes on-lease ancillary activities as defined in 30 CFR 550.105 and 30 CFR 550.207. The BPXA ancillary activities in this notice consist of drilling geotechnical boreholes from the sea ice to depths of approximately 100 feet below the sea bottom in the vicinity of the Liberty Development (OCS Lease Y 1650) to explore the subsurface conditions as part of the geotechnical and sea bottom mapping. The purpose of the investigation is to provide soil information for possible future pad locations, for evaluating proposed pipeline routing, and to provide a visual inspection of the seabottom environment.

BOEM has evaluated the notification under the process outlined in 30 CFR 550.209 and concludes that, subject to the conditions listed below, the ancillary activities described in the notice comply with the performance standards under 30 CFR 550.202(a), (b), (d), and (e). The conditions are:

- Provide BOEM confirmation from the Environmental Protection Agency (EPA) that the ancillary activities proposed by BPXA comply with Section 402 of the Clean Water Act;

- Submit to BOEM a copy of the Letter of Authorization (LOA) from U.S. Fish and Wildlife Service (USFWS);

- Submit to BOEM and the Alaska State Historic Preservation Office (AK SHPO) a brief report of the geotechnical boreholes performed by a qualified marine archaeologist; and

- Adhere to the May 8, 2012 Biological Opinion and Conference Opinion for Oil and Gas Activities in the Beaufort and Chukchi Sea Planning Areas prepared by USFWS (enclosed).

BPXA is also required to submit a final report on the results of the ancillary activities to the BOEM Leasing and Plans Regional Supervisor, consistent with 30 CFR 550.210(a).

BPXA is responsible for notifying other Agencies that may be affected by its ancillary activities.

If you have questions, please contact Bill Ingersoll at (907) 334-5224 or (907) 306-4381.

Sincerely,

David Johnston, Regional Supervisor
Office of Leasing and Plans

Enclosure

cc: Mayor of North Slope Borough
North Slope Borough Planning Department
North Slope Borough Department of Wildlife Management
City of Kaktovik
City of Nuiqsut
City of Barrow
Village of Barrow
Native Village of Kaktovik
Native Village of Nuiqsut
North West Arctic Borough
Alaska Eskimo Whaling Commission
Inupiat Community of the Arctic Slope
Department of Natural Resources OPM
Bureau of Safety Environmental and Enforcement, Alaska Region
Bureau of Safety Environmental and Enforcement, Chief, Environmental Enforcement Division
U.S. Fish and Wildlife Service Region 7, Regional Director
U.S. National Marine Fisheries Service, Alaska Region
U.S. Army Corps of Engineers Regulatory Branch Alaska District
U.S. Environmental Protection Agency Region 10
U.S. Coast Guard Alaska

Biological Opinion and Conference Opinion for Oil and Gas Activities in the Beaufort and Chukchi Sea Planning Areas on Polar Bears (*Ursus maritimus*), Polar Bear Critical Habitat, Spectacled Eiders (*Somateria fischeri*), Spectacled Eider Critical Habitat, Steller's Eiders (*Polysticta stelleri*), Kittlitz's Murrelets (*Brachyramphus brevirostris*), and Yellow-billed Loons (*Gavia adamsii*)

Prepared by:
U.S. Fish and Wildlife Service
Fairbanks Fish and Wildlife Field Office
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Fairbanks, Alaska 99701

May 8, 2012

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Introduction

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion (BO) in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq*., ESA), on the effects of the proposed Action, as defined later in this document, on polar bears (*Ursus maritimus*), polar bear critical habitat, spectacled eiders (*Somateria fischeri*), spectacled eider critical habitat, and Alaska-breeding Steller's eiders (*Polysticta stelleri*). In addition, this document also serves as a conference opinion on the effects of the proposed Action on Kittlitz's murrelet (*Brachyramphus brevirostris*) and yellow-billed loon (*Gavia adamsii*), which are candidate species under the ESA. Because Bureau of Ocean Energy, Management, Regulation and Enforcement (BOEMRE) [1] initiated this consultation, its resulting agencies Bureau of Ocean and Energy Management (BOEM) and Bureau of Safety and Environmental Enforcement (BSEE) are covered by this consultation.

As detailed later in this document, the proposed Action involves oil and gas leasing, exploration, development and other activities in the Chukchi and Beaufort Sea Planning Areas of the Arctic Outer Continental Shelf (Arctic OCS) and is divided into incremental steps. The Chukchi and Beaufort Planning Areas are large areas established by regulation. The Chukchi and Beaufort Program Areas are the proposed lease sale areas delineated in a 5-Year OCS Leasing Program.

[1]BOEMRE was formerly the Minerals Management Service (MMS) and is now the Bureau of Ocean Energy Management (BOEM) and the Bureau of Safety and Environmental Enforcement (BSEE).

A Program Area may be the entire Planning Area or a subset of the Planning Area. The Program Area of both seas may change because the Secretary of the Interior has not made a decision on the Final 2012-2017 5-Year OCS Leasing Program.

BOEM and BSEE have statutory authority (under 43 USC 1331 et. seq.) to complete their respective OCS energy development actions in a tiered approach for review under the National Environmental Policy Act (NEPA) and to use an incremental step consultation process under the ESA as described in regulations at 50 CFR 402.14(k). The regulations at 50 CFR 402.14(k):

> When the Action is authorized by a statute that allows the agency to take incremental steps toward the completion of the action, the Service shall, if requested by the Federal agency, issue a biological opinion on the incremental step being considered, including its views on the entire action. Upon the issuance of such a biological opinion, the Federal agency may proceed with or authorize the incremental steps of the action if:

1. The biological opinion does not conclude that the incremental step would violate section 7(a)(2);
2. The Federal agency continues consultation with respect to the entire action and obtains biological opinions, as required, for each incremental step;
3. The Federal agency fulfills its continuing obligation to obtain sufficient data upon which to base the final biological opinion on the entire action;
4. The incremental step does not violate section 7(d) of the ESA concerning irreversible or irretrievable commitment of resources; and
5. There is a reasonable likelihood that the entire action will not violate section 7(a)(2) of the ESA.

At BOEM's request, we are conducting an incremental step consultation. As an incremental step consultation, this BO examines activities in the first and future incremental steps that may result from the proposed Action. Activities in the first incremental step include lease sales, deep-penetration surveys, high-resolution surveys, exploration drilling, and all vessel and air traffic associated with these surveys and exploratory drilling. Future incremental steps include development through field abandonment and all associated activities. This BO includes analysis and conclusions as to whether the first incremental step would violate section 7(a)(2) of the ESA (i.e., whether this step would likely jeopardize listed species or destroy or adversely modify critical habitat) and provided incidental take authorization for listed eider species. Because the first incremental step could lead to development, production, and field abandonment, we also analyze whether there is a reasonable likelihood that the entire proposed Action, based on the Development Scenarios (DS) prepared by BOEM for both the Chukchi and Beaufort Sea Planning Areas, will jeopardize listed species or destroy or adversely modify critical habitat.

The Service consulted on previous versions of the incremental steps presented here and on lease sales[2] within the Beaufort and Chukchi seas (henceforth referred to as the Beaufort and Chukchi Sea Planning Areas; Figure 1). Since these previous consultations, the Service designated

[2] Lease Sales BF, 71, 87, 97, 109, 124, 144, 170, 186, 195, 202, and 193.

critical habitat for the polar bear, and BOEM updated the development scenarios (DS) for both Planning Areas, including an analysis of a very large oil spill (VLOS) for the Chukchi Sea Planning Area (BOEM reviewed and has concluded their previously analyzed VLOS scenario for the Beaufort Sea [MMS 2003] remains adequate). Thus, an updated consultation and BO is warranted, and this BO, including the *Incidental Take Statement* (ITS) with new *Terms and Conditions*, replaces the prior versions of this BO dated September 3, 2009 and December 23, 2011. Because the *Terms and Conditions* have changed from those set forth in the previous BOs, BOEM and BSEE will need to require that mitigation measures be implemented so that BOEM and BSEE are able to comply with the non-discretionary *Terms and Conditions* in this BO.

Preparing a single BO for the first incremental step of the proposed Action covering activities in both the Beaufort and Chukchi Sea Planning Areas allows a thorough and comprehensive analysis of all potential impacts to listed species and critical habitat from oil and gas activities in the Arctic OCS. This comprehensive analysis considers the potential direct and indirect effects of the first incremental step of the proposed Action, as well as cumulative effects and effects of interrelated and interdependent activities added to and evaluated within the context of the environmental baseline to provide an aggregative analysis of impacts to listed and candidate species and critical habitat. We prepared this BO using BOEM's Final Biological Evaluation (BOEMRE 2011*a*), other information received from BOEM in 2011, published literature, agency consultation and biological survey reports, other information in our files, and personal communication with species experts in the Service.

Based on the limited number of individuals of listed species likely to be affected, and mitigation measures required and/or to be enforced by BOEM and BSEE during the first incremental step of the proposed Action, the Service concludes the first incremental step is not likely to jeopardize the continued existence of listed species or to destroy or adversely modify designated critical habitat. We also conclude, based on the best available information at this time, the entire proposed Action, including future incremental steps, is not reasonably likely to jeopardize the continued existence of listed species or to destroy or adversely modify designated critical habitat. However, as specific oil and gas activities are proposed, and additional information about the nature, location, and timing of proposed oil and gas activities becomes available, the Service may determine in the future that the proposed activities are likely to jeopardize the continued existence of listed species or result in destruction or adverse modification of critical habitat, particularly if the status of a listed species declines or large changes in the environmental baseline have occurred when development is actually proposed. As BOEM and BSEE propose to authorize subsequent specific activities, (e.g., development projects) these proposals will require section 7 consultation to determine whether the proposed activities are likely to jeopardize a listed species or adversely modify critical habitat.

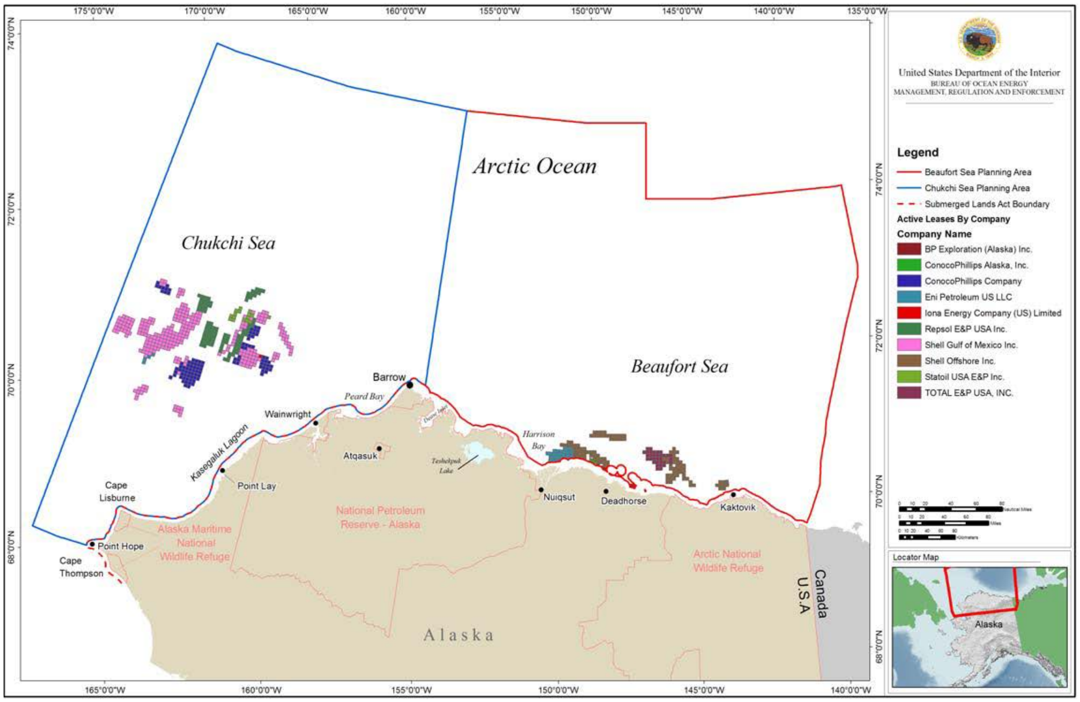


Figure 1. Chukchi Sea and Beaufort Sea Planning Areas in the Arctic Outer Continental Shelf.

The Proposed Action

BOEM's proposed Action is divided into incremental steps. In the first step, we consider the effects of leasing, marine deep-penetration surveys, high-resolution surveys, and exploration activities in the Beaufort and Chukchi Sea Planning Areas as described by BOEM (MMS 2003, and BOEMRE 2011*a*, *b*) and summarized below. In the future steps, we consider the effects of the entire Action, which includes potential development based on BOEM's reasonable hypothetical development scenario (DS) for each Planning Area. These scenarios consider the petroleum potential of the area, available technology, and industry trends in developing hydrocarbon resources and include activities that occur during development, production, and abandonment.

First Incremental Step

Introduction

The first incremental step includes lease sales, marine deep-penetration surveys, high-resolution surveys, and exploratory drilling, but not development. During the first incremental step oil and gas companies follow a sequence of events to explore for and locate hydrocarbon deposits. They first search for hydrocarbon deposits by conducting deep-penetration seismic surveys (Table 1). If the surveys indicate sufficient hydrocarbons are present, a lease may be obtained. Additional deep-penetration seismic surveys or controlled source electromagnetic (CSEM) studies may also be conducted to further define prospects and select exploratory drilling locations after leases are acquired. After prospective drilling locations have been selected, the lessees conduct high-resolution survey activities, typically at least one year (and possibly several years) prior to drilling, to further evaluate the site (e.g., surveys for shallow hazards including faults and shallow gas pockets, surface geomorphology, and archeological resources). These data are needed to support an Exploration Plan (EP). Upon BOEM's approval of an EP, the lessees submit an Application for Permit to Drill (APD) to BSEE. Upon approval of the APD, lessees may then commence exploratory drilling. We describe these different techniques below. Because the exploration scenarios differ for each Planning Area, we separately identify anticipated techniques for each area.

Marine Deep-penetration Surveys

The first type of exploratory activities is marine deep-penetration surveys. Several survey methods may be used in the Chukchi and Beaufort seas (Table 1).

Table 1. Typical marine deep-penetration surveying, high-resolution surveying, and exploratory drilling equipment that may be used during the first incremental step.

Activity	Typical Support Operations
Marine streamer 2D and 3D surveys (marine deep-penetration surveying)	• 1 source/receiver vessel • 1 support vessel • Likely 1 vessel for monitoring
In-ice seismic survey (marine deep-penetration surveying)	• 1 source/receiver vessel • 1 icebreaker • Potentially 1 support vessel
Ocean-bottom cable surveys (marine deep-penetration surveying)	• 2 vessels for cable layout/pickup • 1 recording vessel • 1 to 2 source vessels • 1 to 2 small support vessels
Ocean-bottom node survey (marine deep-penetration surveying)	• 2 source vessels • 1-3 node deployment vessels • 1 vessel for support monitoring
High-resolution surveys using airguns	• 1 source/receiver vessel • Potentially 1 vessel for monitoring
High-resolution surveys using sonar	• 1 source vessel
On-ice vibroseis (marine deep-penetration surveying)	• Truck-mounted vibrators over ice • 1 large tracked recording vehicle • 1-2 large tracked crew transport vehicles • 1-2 vibrosies vehicles • 1 bulldozer • 35-40 sled trailers housing 120 people
Electromagnetic surveys (marine deep-penetration surveying)	• 1 source and layout vessel
Artificial island drilling (exploratory drilling)	• Sea lift or ice road operations to transport drilling rig and support modules • Drilling on island • Small support vessels • Aircraft for crew changes
Steel-drilling caisson drilling (exploratory drilling)	• Modified very large crude carrier vessel • 2-3 tugs and supply to and from drill site • Aircraft for crew changes

Activity	Typical Support Operations
Exploratory Drilling Program from a Drillship (exploratory drilling)	• Drillship • 1 or 2 icebreakers • 1 anchor handler • 1 or 2 oil spill response barge and tug • Tank vessel for spill storage • 2-3 support vessels • Aircraft for crew changes
Exploratory Drilling Program from a Jackup rig (exploratory drilling)	• Jackup rig • 1 or 2 icebreakers • 1 or 2 oil spill response barge and tug • Tank vessel for spill storage • 2-3 support vessels • Aircraft for crew changes

Open-water Deep-penetration Surveys

To locate hydrocarbon deposits, companies usually conduct 2-D and 3-D seismic surveys using a large seismic vessel to tow an airgun array as an acoustical source and several hydrophones (also called receivers or streamers). The receivers are passive listening devices, consisting of multiple hydrophone elements, which are also towed behind the vessel. In 3-D surveys, primary seismic vessels tow one to three parallel airgun arrays containing airguns 50-200 m behind the vessel along "track lines." The airgun array is activated every 10-15 seconds and emits a pulse of sound the hydrophones can detect. Four to 12 streamer-receiver cables supporting multiple hydrophones follow the source arrays by about 100-200 m. Each streamer-receiver cable can be 3-8 km long. Biodegradable liquid paraffin, kerosene, and solid/gel are materials used to fill the streamer and provide buoyancy. 2-D surveys often use smaller vessels which may tow only one hydrophone streamer, and they have wider-spaced track lines than 3-D surveys.

Seismic vessels have limited maneuverability while towing acoustic equipment, requiring a 10 km run-in for the start of a seismic line, and a 4-5 km (2.5-3.1 mi) run-out at the end of the line. Additionally, seismic vessels do not stop while streamers are deployed in order to avoid tangling the streamers. Seismic vessels typically operate day and night, and a survey may continue for weeks or months depending upon the size of the survey area. However, this does not mean the acoustic source is active at all times. The airguns are powered down to the smallest gun in the array during turns, and there are also periods of inactivity due to equipment problems and weather. One or more support vessels often accompany seismic vessels to assist with maintenance and resupplying (Table 1). Surveys could take place from July through December.

Seismic surveys vary, but a typical 2D/3D seismic survey with multiple guns would emit impulsive sounds at about 10-120 Hz (Greene and Moore 1995, BOEMRE 2011*a*: 66). While seismic energy does have the capability of propagating for long distances, it generally decreases to a level at or below the ambient noise level at a distance of 10 km from the source (Richardson 1998 and 1999, Thode, Greene, and Roth 2010, BOEMRE 2011*a*: 66). Typical arrays tend to produce peak to peak sound levels of 243-249 dB re 1 μPa-m (Landrø and Amundsen 2010).

Ocean-bottom Cable (OBC) and Ocean-bottom Node (OBN) Surveys

During OBC and OBN surveys, acoustical receivers are placed on the sea floor using small utility vessels (Table 1). An acoustical source vessel tows airguns, and a stationary recording vessel records the information relayed by the hydrophones on the sea floor. The seismic arrays and vessels used for shallow water OBC and OBN surveys are frequently smaller than those of towed marine streamer surveys in deeper water. Airguns during these surveys emit sound waves and typical arrays tend to produce peak to peak sound levels of 243-249 dB re 1 μPa-m (Landrø and Amundsen 2010). Like 2D and 3D surveys, the sound level dissipates with increasing distance from the source. Surveys take place during the open water season.

In-ice Towed-Streamer 2-D Surveys

Usually with the assistance of an icebreaker, a seismic vessel tows standard acoustical 2D equipment in areas with new ice. In some instances, an icebreaker may tow the seismic array without using a separate vessel. As with open-water seismic surveys, seismic vessels do not stop while streamers are deployed; therefore, in-ice seismic surveys are only technologically feasible in ice thin enough to allow for continuous forward progress by the icebreaker and the seismic vessel. In general, in-ice surveys are most feasible in newly forming first year ice in the fall and early winter. The icebreaker would operate ~0.5–1 km (~0.3-0.62 miles [mi]) ahead of the seismic vessel, which follows at speeds ranging from 4 to 5 kn (7.4 to 9.3 km/hour). Like open-water 2D surveys, in-ice surveys operate 24 hours a day or as conditions permit. A third vessel may be used for support trips (Table 1). Surveys could take place in the fall through December depending upon ice conditions.

Hardwater (On-ice, Over-ice, Vibroseis) 2-D/3-D Surveys

Winter vibroseis seismic operations use truck-mounted vibrators that systematically send variable frequency vibrations through the ice to the seafloor. Suitable ice conditions of at least 1.2 m thickness usually occur from January until May in the Action Area. On-ice techniques are most commonly used on landfast ice, but they can be used in areas of stable offshore pack ice near shore. One- or two-tracked vehicles (weighing 20,000 to 68,000 lbs) with survey crews lead the operation by marking source and receiver (geophone) points (Table 1). Crews may use bulldozers occasionally to build snow ramps or smooth rough offshore ice. Receivers are connected to the recording vehicle by multi-pair cable sections. The vibrators move along a source line, which is at some distance or angle to a receiver line. The standard distance between vibration points is 67 m. The vibrators vibrate in synchrony. In a typical 16- to 18-hour day, a survey will complete 6 to 16 linear km in 2D seismic surveys, and 24 to 64 linear km in a 3D seismic survey. Surveys may be conducted over hundreds or thousands of linear miles. A field camp, transported and housed on 35-40 sled trailers with about 120 people supports these activities (Table 1). Because of differences in ice formation, these surveys could occur in the Beaufort but not the Chukchi Sea Planning Area.

Controlled Source Electromagnetic (CSEM) Sounding

From a single vessel, CSEM uses a mobile horizontal electric dipole source that emits an electromagnetic signal (typically 0.5 to 10 Hertz [Hz]) detected by an array of receivers deployed on the sea floor. The length of the dipole varies between 10-50 m and the system is towed at approximately 24-40 m above the seafloor at a speed of 1-2 kn. The only sound emitted during this type of survey is noise from the vessel's engines. CSEM is only used in open water, and can be used in both Planning Areas.

High-resolution Surveys
High-resolution surveys involve geophysical data collection to identify and characterize any potentially hazardous conditions at or below the seafloor. Such surveys also identify potential benthic biological communities (or habitats) and archaeological sites. Geotechnical studies involve collecting bottom samples to obtain physical and chemical data on surface sediments and information on the physical characteristics of the seafloor. These data are vital to planning for the design, engineering, and placement of drilling units or production facilities and for developing appropriate operational procedures.

Exploratory Drilling
Exploratory drilling begins when the drill rig arrives (or when the drilling platform is fully-constructed) on site and drills the first well. If oil is not found (e.g., the rig drills a "dry well"), the lessee may drill another well. If an oil pool or accumulation is discovered, delineation wells are drilled to identify the volume and geographic extent of the pool. A rig can only drill one well at a time, and a well must be capped and closed down before another is drilled. Therefore, even if the lessee discovers oil, several wells may be drilled before the lessee knows if the pool or reservoir contains enough oil to warrant development and production. Exploratory wells take 30 to 90 days to drill depending upon reservoir depth and geology of the area. Drilling would likely take place from July through November, although some drilling structures could operate year-round. While lessees may propose to drill several (e.g., six or more) wells from one drill rig annually, the actual number of wells drilled will likely be fewer.

The type of drilling rig/platform used depends on water depth, sea-ice conditions, ice-resistance of the rigs, and unit availability. Currently, the three principal forms of exploratory drilling platforms that may be used in offshore exploration in the Arctic OCS are artificial or natural islands; bottom-founded structures; and floating vessels. Generally, exploratory wells are drilled vertically. Directional wells (any well over three degrees from vertical) may be drilled if a suitable surface location cannot be used or if there is a subsurface anomaly that should be avoided. Extended reach drilling (ERD, with a reach of several km) is an evolving technology that involves drilling from a platform that may be some distance horizontally from the target site. Therefore, a variety of well platforms and possibly directional drilling could be used during exploration drilling. We briefly describe the types of exploratory platforms (Table 1) that could be used during the proposed Action, anticipated discharges from drilled wells, and summarize the likely support activities during exploratory drilling. We then describe the exploration drilling scenarios for each Planning Area.

Islands

Artificial islands – Artificial islands are constructed in shallow offshore waters. In the Arctic, artificial islands have been constructed from a combination of gravel, boulders, artificial structures (e.g., caissons, which are watertight retaining structures), and/or ice. Artificial islands can be constructed any time of year. During summer, gravel is removed from the seafloor or onshore sites and barged to the proposed site and deposited to form the island. In the winter, gravel is transported over ice roads from an onshore site to the island site. After the artificial island is constructed to its full size, slope protection systems are installed, as appropriate for local oceanographic conditions, to reduce ice ride-up and erosion of the island. Once the island is complete, a drilling rig is transported to the island. On average, approximately 100 people operate a typical rig site. Due to economic and engineering considerations, gravel island construction has historically been restricted to waters less than 15 m (49 ft) deep. BOEM anticipates that artificial islands could be constructed in the Beaufort Sea but not in the Chukchi Sea.

Caisson-retained island – Caisson-retained islands are similar in construction and design to other artificial islands except that instead of relying entirely on gravel or large boulders for support, the island contains one or more floatable concrete or steel caissons that rest on an underwater gravel berm or on the ocean floor in water less than 6 m (19.7 ft) deep. The berm is constructed with dredged or deposited material to within 6 m (19.7 ft) of the sea surface. When each caisson is in place, the resulting concrete or steel ring is filled with sand to give the structure stability. This design, like the gravel island, allows drilling to occur all year. When drilling is completed, the center core of sand can be dredged out, the caissons refloated, and the structure moved to a new location. The berm is left to erode by the natural action of the ocean. Again, due to water depth this technique is unlikely to be used in the Chukchi Sea.

Bottom-founded Vessels

Steel drilling caisson (SDC) – The SDC, a bottom-founded structure, is a "fit for purpose" drilling unit constructed typically by modifying the forward section of an ocean-going Very Large Crude Carrier. The main body of the structure is approximately 162 m (531 ft) long, 53 m (174 ft) wide, and 25 m (82 ft) high. The SDC is designed to conduct exploratory year-round drilling under arctic environmental conditions. The SDC requires minimal support during the drilling season because usually the vessel is stocked with supplies before being moved to a drill site. Two or three tugs and/or supply vessels tow the SDC to or from the drill site during open water periods. Deployment and recovery of the SDC require less than one week. Personnel (typically a maximum of 100) and some smaller equipment are transported to and from the SDC by helicopter or boat. Fuel and larger items, if required, are transported by supply vessel.

Floating Drilling Vessels

Floating drilling vessels that may be employed in the Arctic include drillships (e.g., *Northern Explorer II*, *Noble Discoverer*), semi-submersibles, or other floating vessels (e.g., *Kulluk*) in which the hull does not rest on the seafloor. These drilling vessels can typically be used in water depths greater than 18 m (59 ft) in both Planning Areas. This range makes them more suitable for the deeper water exploratory prospects. Floating drilling vessel crews typically range from 100 to 200 people to operate the marine and drilling systems and ensure the safety of the operation (not including support or ice management vessels). Floating drilling vessels are held over a well drilling location either by a mooring system (consisting of an anchor, chain, and wire rope) or by the use of dynamic positioning (omni-directional thrusters coupled with a computer control system).

Sounds generated from vessel-based drilling operations occur at low frequencies (below 600 Hz), although tones up to 1,850 Hz were recorded by Greene (1987) during drilling operations in the Beaufort Sea. For the drillship *Explorer I*, sound levels of 122 to 125 dB re 1 Pa between 20 to 1,000 Hz band level were measured at a range of 0.17 km (0.10 mi) (Greene 1987). Sound levels from the drillship *Explorer II* were slightly higher (134 dB re 1 Pa) at a range of 0.20 km (0.12 mi) although tones were only recorded below 600 Hz (Greene 1987). Sounds from the *Kulluk* at 0.98 km (0.61 mi) were higher (143 dB re 1 Pa) than from the other two vessels (Greene 1987).

Drillships - Drillships are completely independent maritime vessels that can drill in water depths of more than 2,500 m (8,202 ft). Shell has proposed, in prior applications, to use the *M/V Noble Discoverer* for drilling in both the Chukchi and Beaufort seas (BOEMRE 2011*a*). The *Discoverer* is a 156 m (512 ft) conventionally-moored drillship with drilling equipment on a turret. It mobilizes under its own power, so it can be moved off the drill site with its anchor handler. Depending on the circumstances, the procedure and time needed to move off a drill site can change. In extreme emergencies, this process can be completed in less than one hour. In the event that operations must be temporarily curtailed due to the advance detection of a hazard, the process could take from 4 to 12 hours. Typical transit speed of the *Discoverer* is 8 kn (14.8 km/hour). The vessel has full accommodations for a crew of up to 124 persons (quarters, galley and sanitation facilities). Broadband source levels of the *Discoverer* ranged from 177 to 185 dB re 1 μPa rms (Shell 2011).

Jackup Rig – The three main components of a jackup rig are the hull, the legs and footings, and the equipment. The hull is a watertight structure that houses the equipment, systems, and personnel. When the jackup is afloat, the hull provides buoyancy and supports the weight of the legs and footings, equipment, and variable load. The legs and footings are steel structures that support the hull when elevated and provide stability to resist lateral loads. Most jackup rigs have no more than four legs. The actual dimensions of a jackup rig would depend on the environment in which the unit would be operating and the maximum operating water depth. A typical jack up rig with a maximum operating depth of 50 m (164 ft) is approximately 50 m (164 ft) in length, 44 m (144 ft) beam, and 7 m (23 ft) deep. Leases in deeper waters would require a larger jack-up rig. ConocoPhillips is considering using a jackup rig for drilling in the Chukchi Sea Planning Area.

Noise levels from jackup rigs would be similar to or less than noise levels produced by the drillship discussed above, as jackup rigs use the same general drilling machinery. Sound levels transmitted into the water from jack-up rigs are typically less than sound levels from a drillship because the vibrating machinery is not in direct contact with the water because the platform is above water.

Other Exploratory Drilling Effects/Activities

Exploratory drilling will disturb an area of the sea floor. The area of disturbance would vary based on the type of drill rig used, but in general includes disturbance from the mud cellar, the anchoring system for the drillship (e.g., legs of the jack up rig or footprint of the SDC, etc.), displacement of sediments, and discharges from the drill hole. For example, the estimated surface area for a drill ship's mud cellar is 628-904 ft^2 or more, with a conservative estimate of 1,000 ft^2 (or 92.9 m^2). Displaced sediments could cover an additional 1,600 ft^2 (or 148.6 m^2).

The anchoring system of a drill ship with 12 anchors (usually drill ships use 8-12 anchors) would disturb an estimated 78,000 ft^2 (7,500 m^2) of the sea floor.

Rock cuttings and other materials such as drilling muds from each well site would be discharged into the water and onto the ocean floor. Drilling muds would be reconditioned, and an estimated 80% will be re-used, including all the synthetic drilling fluids. The remaining 20%, typically composed of EPA Type 2 Lignosulfonate Mud, will likely be discharged at the drill site subject to federal (e.g., EPA) and State water quality regulations. The area of sea floor disturbance would depend upon the water depth of the drilling and the current strength. As an example, the Arctic MultiSale EIS (MMS 2008) reported detection of cuttings 50-500 m from the well site. Using the radius of 500 m and assuming the area of a circle, the maximum area disturbed by one well could be 785,000 m^2or 193.98 acres; lessees could drill up to six wells from two drill ships in each sea annually over several years. Therefore, hundreds of acres could be affected by discharged material. The area affected by discharged material, however, would not likely take the shape of a circle due to the influence of currents and other physical factors, and there would not be an even distribution of material. Additionally, the area around wells would begin to recover after the disturbance ceased. Thus, the area affected by discharges would likely be much less than the maximum described above because: currents would likely carry discharged material mainly in one direction; some areas would be minimally affected by discharged material; and, recovery of an area around a well would minimize the level of disturbance with time (discussed further in the *Effects* section).

Vertical seismic profiling (VSP) – VSPs could take place during drilling within the drilled hole. Hydrophones suspended at intervals within the well receive signals from external sound sources, usually an airgun(s) suspended from the drill rig or a nearby supply vessel.

Air and Vessel Support Activities

Helicopters and various-sized vessels would likely support exploration drilling operations (Table 1). Helicopters would fly from coastal-area base camps about one to three times daily. Several support vessels may remain on site, and other vessels may travel from the site to the mainland for supplies and personnel one to three trips/week.

Ice-breaking and Ice-management

Ice-breaking and ice-management will likely occur during some of the activities described above. BOEM separately defines ice breaking and ice management. Ice-breaking is defined as opening a pathway or lead through pack ice, ice floes or landfast ice for the purpose of moving vessels through sea ice. Ice-breaking occurs in waters with ice. BOEM defines ice management as using an ice-hardened vessel or icebreaker to move floes away from a stationary vessel, such as a drill rig, by pushing, towing or passing back and forth upstream of the stationary vessel or drill rig. Ice management activities take place in an environment that is primarily open water.

Alternative Methods

BOEM presented several alternative methods for deep-penetration and high-resolution surveys (BOEMRE 2011*a*). However, use of these methods is unlikely and even if they were used they would not be used for several years. Thus, effects of these potential but highly unlikely methods are beyond the scope of this BO. However, if any of these methods are actually proposed to be used in specific future proposals, BOEM will be required to re-initiate section 7 consultation before the activity may be permitted.

Mitigation during Deep-penetration and High-resolution Survey Activities
BOEM and BSEE cannot authorize activities that do not comply with the MMPA and ESA; however, BOEM and BSEE cannot require that a lessee or permittee (or the agent of a lessee or permittee) request an LOA under the MMPA. Should the lessee or permittee (or the agent of a lessee or permittee) decline to apply for an LOA, BOEM would need to consult separately under the ESA if the proposed activity may affect the polar bear. Please see Appendix A for a complete list of lease stipulations and typical mitigation measures for geological and geophysical (G&G) permits. These are summarized below.

MMPA authorizations typically require all vessels to have marine mammal observers on board to monitor the area around vessels for marine mammals and trigger power downs or shutdowns of seismic airguns as necessary to minimize impacts to these animals. In addition, marine mammal surveys could be conducted by aircraft flying at or above 1,500-feet (unless unsafe to do so). When concentrations of marine mammals, such as polar bears, are identified, seismic work would be required to be modified to avoid impacts to them.

BOEM will require mitigation measures to be followed as well as stipulations that avoid or minimize impacts on avian species in the spring and fall using the Chukchi Sea Planning Area. Seismic survey vessels, support vessels, and drill rigs are also required to minimize the use of high intensity lights to avoid attracting waterfowl that may result in collisions of listed eiders. To minimize impacts on molting spectacled eiders, seismic surveys and survey support vessels are not permitted in the Ledyard Bay Critical Habitat Unit (LBCHU) from July 1 to November 15.

Summary of Activities - First Incremental Step - Beaufort Sea

Deep-penetration Surveys

BOEM anticipates authorizing up to five deep-penetration seismic or controlled-source electromagnetic activities annually. The actual number of annual surveys would likely be lower, as five surveys would likely only take place if a commercial discovery is confirmed and an increase occurs in seismic activity over nearby prospects. Deep penetration seismic surveys could take place in open water and in ice with the assistance of icebreakers. Hardwater surveys may also take place, although infrequently.

High-resolution Survey Activities

Because oil and gas companies have already conducted substantial high-resolution survey activities in the Beaufort Sea Planning Area (i.e., shallow-hazards and site-clearance surveys, as well as surveys to obtain biological, physical oceanographic and meteorological information), BOEM projects a maximum of four high-resolution activities (most likely shallow hazard and biological surveys) will occur annually in the Beaufort Planning Area. The linear distance traveled during these activities can vary annually from very few to thousands of kilometers, although this upper range is unlikely.

Exploration Drilling

The drill rigs will likely operate 30-90 days, typically from July through November. BOEM expects up to two drill rigs to operate simultaneously in the Beaufort Sea open-water season, with each rig drilling up to six wells each season annually. For the purposes of this BO, we assume the maximum number of exploratory wells drilled in the Beaufort Sea will not exceed 16 exploration wells (BOEM 2011*a*: 4-106); the actual number drilled, however, will likely be less than this due to logistic constraints. All drilling activities would use helicopters and/or vessels to transport crew members and supplies to the offshore facilities from a shore base (e.g., Deadhorse, Barrow).

Summary of Activities - First Incremental Step - Chukchi Sea

Deep-penetration Survey Activities

BOEM anticipates authorizing up to five deep penetration seismic or CSEM activities annually. The actual number of surveys would likely be lower, as five surveys would likely only take place if a commercial discovery is confirmed and an increase in seismic activity over nearby prospects occurs, or in the event of additional lease sales. The linear distance traveled by seismic vessels can vary annually from very few to thousands of kilometers. Hardwater techniques are not proposed for the Chukchi Sea due to lack of necessary ice conditions.

High-resolution Survey Activities

Because the oil and gas industry has already conducted substantial site-clearance activities in the Chukchi Sea Planning Area (i.e., shallow-hazards and site-clearance surveys, as well as surveys to obtain biological, physical oceanographic and meteorological information), BOEM projects no more than four high-resolution survey activities (most likely shallow hazard surveys) annually for the Chukchi Sea Planning Area. The linear distance traveled during these surveys can vary annually from very few to thousands of kilometers, although this upper limit is unlikely.

Exploration Drilling

The Chukchi Sea drilling operations are most likely to employ drill ships or jack-up rigs with ice management and other support vessels. While lessees may propose to drill several wells annually, BOEM expects a maximum of two drill rigs will operate simultaneously during the Chukchi Sea open-water season, and expects each rig to drill two but possibly up to six wells from each drill rig annually, beginning in 2012. The drill rigs will likely operate 30-90 days, typically from July through November. For the purposes of this BO, we assume the maximum number of exploratory wells drilled in the Chukchi Sea will not exceed 20 exploration wells (BOEM 2011*a*: 4-106); the actual number drilled, however, will likely be less than this due to logistic constraints. All drilling activities would use helicopters and light vessels to transport crews and supplies to the offshore facilities from Barrow, Wainwright, or Point Lay.

Future Incremental Steps

As described above, to evaluate whether the entire Action would violate 7(a)(2) and for the purposes of other environmental analyses, DSs were prepared for each Planning Area. In summary, these DS assume the TAPS will remain in operation and transport oil from fields in northern Alaska, including any produced in the Chukchi and Beaufort Program Areas. Although there is currently no infrastructure to export gas from Alaska's North Slope area to market, there is considerable interest in developing a gas pipeline project. BOEM has, therefore, included a generic gas development scenario in their DSs. Much of the infrastructure and activities are similar regardless of whether the field produces oil, gas, or a mixture of both. It is likely that oil would be produced first, as it can be shipped to market via TAPS, while the gas is re-injected to aid oil recovery. Gas production is likely to occur much later in time after a gas transportation system (anticipated to be via pipelines) has been constructed.

A 2011 assessment by BOEM (2011*b*) estimated the Chukchi and Beaufort Sea Planning Areas could contain technically recoverable resources of 23.6 billion barrels of oil and 104.4 trillion cubic feet of gas. However, despite these potential resources no offshore development has occurred to date in the Chukchi or Beaufort Sea OCS. MMS noted that while the high petroleum resource potential will continue to attract industry interest, development is unlikely to occur unless some of the economic and engineering challenges can be ameliorated (MMS 2008). Of the 929 blocks leased since 1979 in the Beaufort Sea, only 2 have been commercially successful. In the Chukchi Sea, 5 exploration wells were drilled and although hydrocarbons were identified, these leases expired. While no development has occurred in the Chukchi Sea Planning Area, industry interest in the area is high, as evidenced by the record value of bids received in Lease Sale 193 in 2008.

Beaufort Sea

BOEM estimates a 67% probability of future development occurring in the Beaufort Sea Program Area (BOEMRE 2011*a*). The development scenarios prepared by BOEM, and hence the one analyzed in this BO, assumes three fields ranging in size from 125-250 MMbbl with a combined production of 500 MMbbl of oil (or 3,000 Bcf of gas) could be discovered and developed though one new offshore production facility. BOEMRE (2011a) estimated these fields could produce hydrocarbons for approximately 25-30 years once production begins.

The fields could be located on leases anywhere in the Planning Area, but are more likely to be located in shallower water and near existing infrastructure. Smaller fields are more likely to be developed if they are close to existing infrastructure, and may even be developed from it (e.g., like the Liberty project) while fields further from infrastructure, or in deeper water, have to be larger to be economical viable.

The new production facility could vary in form depending upon its location. In shallow water (< 15 m) an artificial gravel island could be constructed (e.g., e Northstar); in waters 15 – 50 m deep a bottom founded, pack-ice resilient platform would be constructed; while in waters deeper than 50 m, subsea wells tied back to a platform in shallower waters could be used. Oil / gas from the production platform could be transported to shore via a trenched subsea pipeline.

At landfall the pipeline may be elevated on a short causeway to protect against coastal erosion before continuing to a processing facility aboveground on vertical support members for oil, or buried for gas. A gravel road may be constructed along the pipeline. Where possible, a new development would likely use existing pipelines and processing facilities. While landfall could occur anywhere along the Beaufort Sea coast, BOEM anticipates projects in the central Beaufort will likely tie into existing Deadhorse area facilities at either Endicott, Milne Point, or Northstar; projects in the eastern Beaufort Sea would likely result in a new landfall in the Point Thompson area, while Cape Simpson may serve as a landfall for developments in the western Beaufort Sea with an overland pipeline through NPR-A to Kuparuk.

BOEM anticipates development could require construction of a 50 acre shore base and staging facilities, two pump stations of 40 acres in size, and up to 50 miles of new road. The shorebase would require access to an airstrip. At Cape Simpson and Deadhorse airstrips already exist, so only the Point Thompson shore base alternative would require construction of a new airstrip. Gravel material for these facilities would be mined from upland material sites where possible, although coastal areas such as barrier islands and intertidal areas may also be mined. The total terrestrial development footprint is estimated at 845 acres (3.41 km^2), and an additional 10 acres (0.04 km^2) at Point Thompson for an airstrip.

Construction of the offshore platform and subsea pipelines may take place in the summer open water season, or in winter once land fast ice has stabilized. Heavy equipment, materials, and modules for both the onshore and offshore facilities would likely be transported by barge (estimated at 2 trips / year) and possibly via winter ice road. BOEM also estimates that three helicopter flights / day to and from the offshore facility and 1–3 support vessel trips from West Dock or a similar location each week would occur during construction of offshore facilities. Construction of the onshore pipeline and excavation of gravel material would likely be winter operations. In addition to the barge trips, materials for the shore base and other terrestrial structures may be transported via an estimated five C-130 aircraft flights / week. BOEM estimates project construction may last three years.

Once in production, BOEM anticipates up to 3 helicopter flights/day between the shore base and offshore platform, 2 additional aircraft flights each day to the shore base, and 1 support vessel trip to and from the offshore platform every 1 – 2 weeks during the open water season. Ice roads may be constructed on an as needed basis, and 2 barge trips/year for 6 years to remove spent drilling muds from the offshore platform. Well workovers would likely be made at 5-10 year intervals to restore production flow rates. Pipelines would be inspected and cleaned regularly using Pipeline Inspection Gauges (PIGS).

BOEM anticipates the lifespan of this project (exploration through production), if it occurs would be 30-40 years. Field life could be extended if the platform and wells are used for gas production after oil reserves are depleted. After production, abandonment operations would commence and would be expected to last two years for each field. Typically wells are permanently plugged and wellhead equipment removed. Pipelines are cleaned, plugged at both ends, and are left in place. The platform would likely be completely or partially removed and the seafloor returned to some practicable, predevelopment condition. Onshore structures would undergo a similar process, although they may be used by other, future projects.

Chukchi Sea

There is no oil and gas infrastructure close to the Chukchi Sea; therefore, for development to occur in this remote area, a very large field of oil would have to be found and developed. BOEM estimates there is only a 27% probability that development would occur (BOEMRE 2011*b*). If development were to occur, BOEM assumes a 1 billion-barrel field would have to be found and developed through one new production facility. This field could be located anywhere on a leased block in the Planning Area.

The offshore production facility (central platform) is likely to be an ice-resistant bottom-founded platform. The platform would support drillrigs, processing equipment, fuel-and-production storage capacity, and personnel quarters. BOEM estimates 50% of production could come from subsea wells arranged in templates of 4. Production from these templates would be moved to the central platform for processing via subsea pipelines. At the central platform, gas would be separated from oil and water and either re-injected or used for fuel. Shallow wells from the central platform could be used to dispose of waste water and drilling mud and cuttings. From the central platform, subsea pipes could transport oil, and possibly gas at a later date, to shore.

At the coast, a new shorebase and staging facilities would be constructed to support offshore operations and serve as the first pump station. The location of the shorebase is unknown, but BOEM considers the likely location between Icy Cape and Point Belcher, near Wainwright. From the shorebase, vertical supports would suspend communication cables and oil pipelines approximately 300 miles east to connect to existing North Slope oilfield infrastructure. A chilled high-pressure gas pipeline could be buried in the same corridor, and BOEM anticipates a 65-foot wide road would be constructed along the pipeline corridor. Four pump/compressor stations (each 40 acres in size) would probably be built along the route. Gravel for building these facilities would likely come from currently unknown gravel deposits along the route, or possibly from coastal areas. The estimated footprint of terrestrial development in this DS is 4,291 acres (17.37 km^2).

BOEM estimates it may take 4-5 years to design, fabricate, and install project facilities. The offshore central platform would likely be constructed in large sections which would be transported to the site by boat, before they are mated together. Subsea templates and pipelines could also be installed in the summer open-water season. During construction, BOEM estimates up to 3 helicopter flights per day and 3 support vessel trips per week would be made to the central platform site, either from the shore base or from Barrow. Heavy equipment and other materials for construction would likely be transported to the shore base site via barges (estimated at 2/year) and aircraft (5 C-130 flights/week).

In the production phase, the number of helicopter trips to the production platform would likely remain the same, while vessel traffic would drop to 1 trip every 1-2 weeks. Two barge trips/year for 6 years may also be required to remove cuttings and spent mud from the subsea templates and central platform. Two to three daily aircraft flights are expected at the shore base, and ice roads may be constructed as needed. Well workovers would likely be made at 5-10 year intervals to restore production flow rates. Pipelines will be inspected and cleaned regularly using PIGS.

BOEM anticipates oil production could last 15-25 years, after which gas production may occur if a gas-export system from the North Slope is in place. Gas production may extend the life of the facilities by 20 years. After this, wells would be plugged and wellhead equipment removed. Pipelines would be cleaned, plugged at both ends, and are left in place on the seafloor. The platform would likely be completely or partially removed and the seafloor returned to some practicable, predevelopment condition. Onshore structures would undergo a similar process, although they may be used for other activities.

The Action Area

The Action Area (Figure 2) is the geographic region in which direct and indirect effects of the Action may occur. Exploration and development is projected to occur within the Beaufort Sea and Chukchi Sea Planning Areas. The Beaufort Sea Planning Area includes approximately 33.2 million acres of the Beaufort Sea from Barrow east to the Alaska–Canada border. The Chukchi Sea Planning Area covers approximately 40.2 million acres of the Chukchi Sea from the US–Russia Maritime border west of Point Hope to the edge of the Beaufort Sea Planning Area at Barrow.

The Action Area is broader than the Planning Areas, as structures resulting from the Action could be constructed in marine waters outside the Planning Areas (e.g., platform-to-shore pipelines) and on land for shore facilities, pump stations, and a pipeline connecting to the Trans-Alaska Pipeline System (TAPS), and the effects of the Action could affect areas outside the Planning Areas. Because the specific location of future development is unknown, we have broadly defined the Action Area (Figure 2) to include:

- The Chukchi and Beaufort Planning Areas;
- Marine waters between the southern boundary of the Chukchi Sea Planning Area and the Alaskan coastline;
- Marine waters between the southern boundary of the Beaufort Sea Planning Area and the Alaskan coastline; and
- Areas where impacts of the proposed action occur.

Figure 2. The Action Area

Status of the Species and Critical Habitat

This section presents biological and ecological information relevant to formation of the BO. Appropriate information on species' life history, habitat and distribution, and other factors necessary for their survival is included for analysis in later sections.

Spectacled Eiders

Status and Distribution

The entire species was listed throughout its range as threatened on May 10, 1993 (58 FR 27474) because of documented population declines. The Yukon-Kuskokwim Delta (Y-K Delta) population had declined 96% between the 1970s and early 1990s (Stehn et al. 1993, Ely et al. 1994), and anecdotal information indicated that populations in the other two primary breeding areas had also declined (USFWS 1996). The aerial population index obtained from Arctic Coastal Plain (ACP), Alaska surveys suggest a downward annual trend of birds using the ACP (Figure 19 in Larned et al. 2011). Spectacled eiders inhabit the North Pacific and consist of three primary breeding populations; those on Alaska's North Slope, the Y-K Delta, and northern Russia (Figure 3). Historically, spectacled eiders nested in Alaska discontinuously from the Nushagak Peninsula north to Barrow, and east nearly to Canada's Yukon Territory (Phillips 1922-1926, Bent 1925, Bailey 1948, Dau and Kistchinski 1977, Derksen et al. 1981, Garner and Reynolds 1986, Johnson and Herter 1989). The global population of spectacled eiders is estimated at 363,000 birds (Petersen et al.1999), or 418,420 birds (USFWS and USGS Spectacled Eider Experts Meeting 2006).

Spectacled eiders molt in several discrete areas (Figure 3) with birds from the different populations and genders apparently favoring different molting areas (Petersen et al. 1999). After molting, spectacled eiders migrate to openings in pack ice of the central Bering Sea south/southwest of St. Lawrence Island (Petersen et al. 1999; Figure 3), where they remain until March or April (Lovvorn et al. 2003).

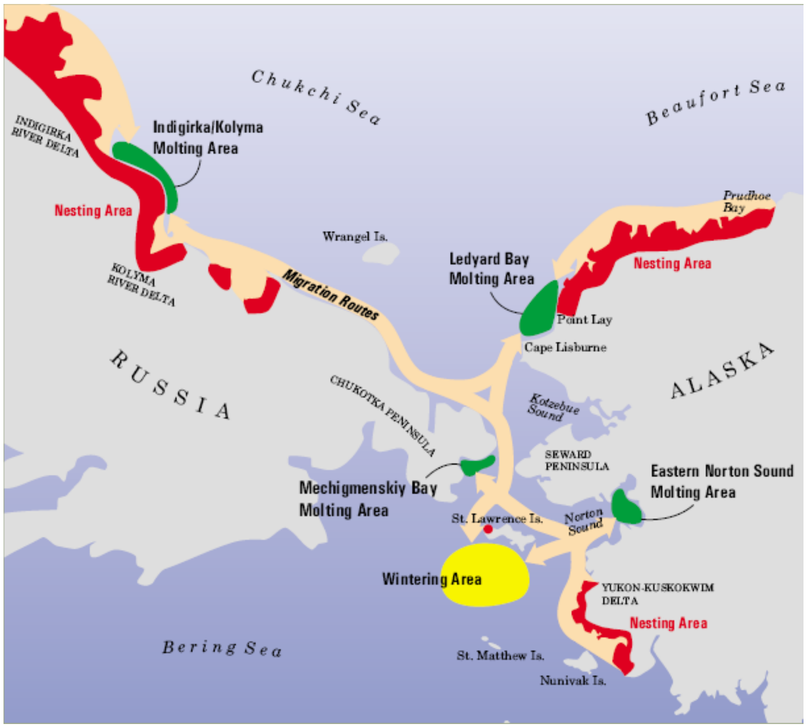


Figure 3. Distribution of spectacled eiders. Molting areas (green) are used July through October. Wintering area (yellow) are used October through April. The full extent of molting and wintering areas is not yet known and may extend beyond the boundaries shown.

Breeding–North Slope Population

Research and spring aerial surveys have provided data on spectacled eider populations on Alaska's ACP (the North Slope breeding population) since 1992. On the North Slope, spectacled eiders breed north of a line connecting the mouth of the Utukok River to a point on the Shaviovik River about 24 km (~15 miles) inland from its mouth. Breeding density varies across the North Slope (Figure 4). Breeding pair numbers peak in mid-June and the number of males declines 4-5 days later (Smith et al. 1994, Anderson and Cooper 1994, Anderson et al. 1995, Bart and Earnst 2005). The estimated average density of spectacled eiders was 0.12103 eiders/km^2 within the ACP Survey in 2010 (Larned et al. 2011). The 2010 spectacled eider index was 4% lower than the 18-year mean (Larned et al. 2011). Average clutch size for spectacled eiders in northern Alaska is 3.9 (Petersen et. al. 2000, Bart and Earnst 2005, Johnson et al. 2008). Incubation lasts 20-25 days (Kondratev and Zadorina 1992, Harwood and Moran 1993, Moran and Harwood 1994, Moran 1995), and hatching occurs from mid- to late July (Warnock and Troy 1992). On the nesting grounds, spectacled eiders feed on mollusks insect larvae, small freshwater crustaceans, and plants and seeds (Kondratev and Zadorina 1992) in shallow freshwater or brackish ponds, or on flooded tundra. Young fledge approximately 50 days after hatch, and then females with broods move from freshwater to marine habitats.

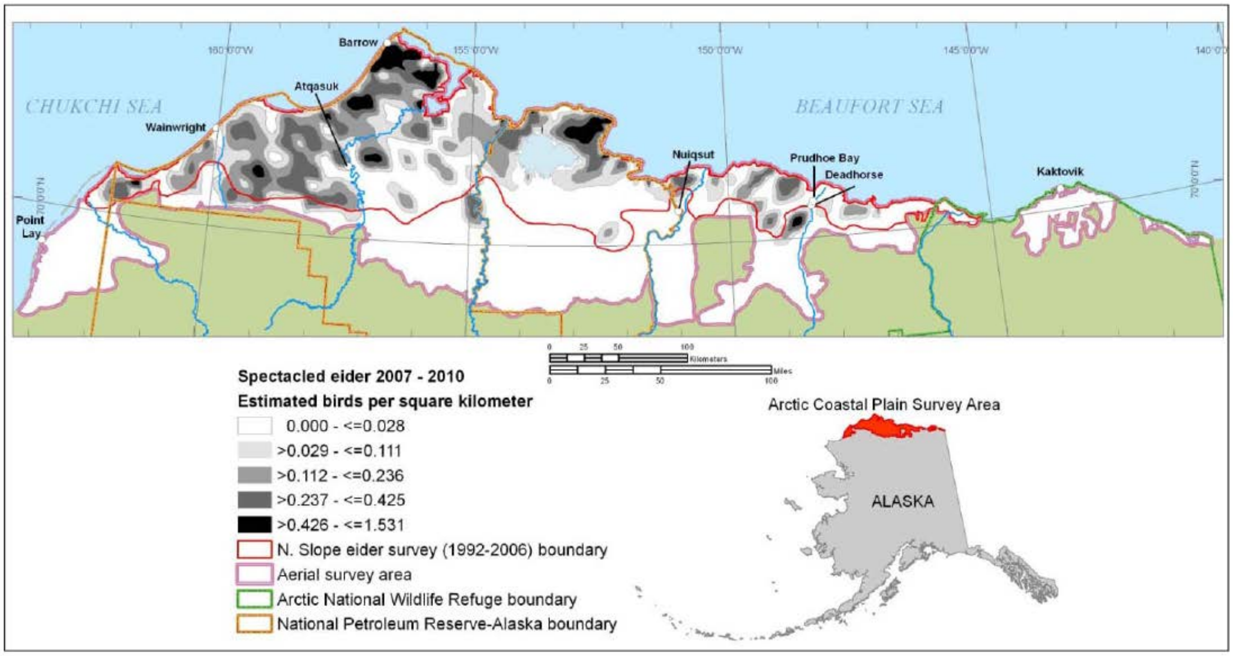


Figure 4. Density distribution of spectacled eiders (*Somateria fischeri*) observed on aerial transects sampling 57,336 km^2 of wetland tundra on the North Slope of Alaska during early to mid-June, 2007-2010. From Larned et al. 2011.

Nest success is highly variable and greatly influenced by predators. In arctic Russia, apparent nest success was estimated as <2% in 1994 and 27% in 1995; predation was believed to be the cause of high failure rates, with foxes, gulls and jaegers the suspected predators (Pearce et al. 1998). Apparent nest success in 1991 and 1993-1995 in the Kuparuk and Prudhoe Bay oil fields on the ACP varied from 25-40% (Warnock and Troy 1992, Anderson et al. 1998).

Post-breeding – North Slope

Males generally depart breeding areas when females begin incubation in late June (Anderson and Cooper 1994, Bart and Earnst 2005). Use of the Beaufort Sea by departing males is variable. Some appear to move directly to the Chukchi Sea over land, while the majority moved rapidly (average travel of 1.75 days), over nearshore waters from breeding grounds to the Chukchi Sea (TERA 2002). Preferred areas for males appeared to be near large river deltas such as the Colville River where open water is more prevalent in early summer when much of the Beaufort Sea is still frozen.

Females generally depart the breeding grounds later, when much more of the Beaufort Sea is ice-free, allowing for more extensive use of the area. Females spent an average of two weeks in the Beaufort Sea (range 6-30 days) with the western Beaufort Sea the most heavily used (TERA 2002). Females also appeared to migrate through the Beaufort Sea an average of 10 km further offshore than males (Peterson et al. 1999). The greater use of the Beaufort Sea and offshore areas by females was attributed to the greater availability of open water when females move through the region (Peterson et al. 1999, TERA 2002).

Molt

Avian molt is energetically demanding, especially for species such as spectacled eiders that complete molt in a few weeks. Spectacled eiders use specific molting areas from July to late October. Larned et al. (1995) and Peterson et al. (1999) discussed spectacled eiders' apparently strong preference for specific molting locations, and concluded that spectacled eiders molt in four discrete areas. Females generally used molting areas nearest their breeding grounds. Males did not show strong molting site fidelity; males from all three breeding areas molted in Ledyard Bay, Mechigmenskiy Bay, and the Indigirka/Kolyma River Delta. Males reached molting areas first, beginning in late June, and remained through mid-October. Non-breeding females, and those that nested but failed, arrived at molting areas in late July, while successfully-breeding females and young of the year reached molting areas in late August or September and remained through October.

Wintering

After molting, spectacled eiders migrate offshore in the Chukchi and Bering Seas to a single wintering area in openings in pack ice of the central Bering Sea south/southwest of St. Lawrence Island (Figure 3). Spectacled eiders numbering in the hundreds of thousands of (Petersen et al. 1999) rest and feed by diving up to 70 m to eat bivalves, mollusks, and crustaceans (Cottam 1939, Petersen et al. 1998, Petersen and Douglas 2004). Sampling over several decades suggests that the benthic community in the overwintering area has shifted from larger to smaller species of clams (Lovvorn et al. 2000, Richman and Lovvorn 2003).

Late Winter/Spring

Recent information about spectacled and other eiders indicates that they probably make extensive use of the eastern Chukchi spring lead system between departure from the wintering area in March and April and arrival on the North Slope in mid-May or early June. Limited spring aerial observations in the eastern Chukchi have documented dozens to several hundred common eiders (*Somateria mollissima*) and spectacled eiders in spring leads and several miles offshore in relatively small openings in rotting sea ice (W. Larned, USFWS; J. Lovvorn, University of Wyoming, *pers. comm.*). Woodby and Divoky (1982) documented large numbers of king eiders (*S. spectabilis*) and common eiders using the eastern Chukchi lead system, advancing in pulses during days of favorable following winds, and concluded that an open lead is probably requisite for spring eider passage in this region. Preliminary results from an ongoing satellite telemetry study conducted by the USGS Alaska Science Center (Figure 5, Figure 13; USGS, unpublished data) suggest that spectacled eiders also use the lead system during spring migration.

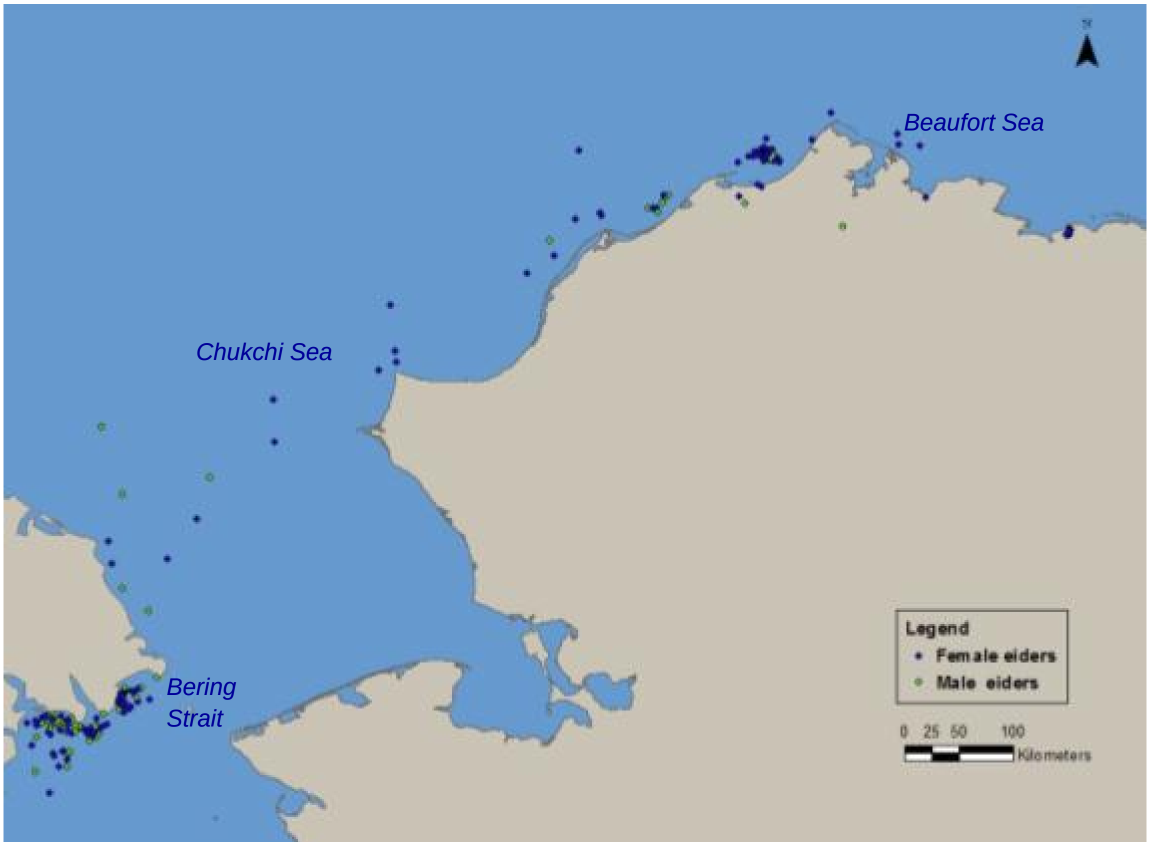


Figure 5. Spectacled eider satellite telemetry locations for 12 female and 7 male spectacled eiders in the eastern Chukchi Sea from 1 April – 15 June 2010 and 1 April – 15 June 2011. Additional locations from the northern coast of Russia are not shown. Eiders were tagged on the North Slope during the 2009 and 2010 breeding seasons. Data provided by Matt Sexson, USGS Alaska Science Center (USGS, unpublished).

Adequate foraging opportunities and nutrition during spring migration are critical to spectacled eider productivity. Like most sea ducks, female spectacled eiders do not feed substantially on the breeding grounds, but produce and incubate their eggs while living primarily off body reserves (Korschgen 1977, Drent and Daan 1980, Parker and Holm 1990). Clutch size, a measure of reproductive potential, was positively correlated with body condition and reserves obtained prior to arrival at breeding areas (Coulson 1984, Raveling 1979, Parker and Holm 1990). Body reserves must be maintained from winter or acquired during the 4-8 weeks (Lovvorn et al. 2003) of spring staging, and Petersen and Flint (2002) suggest common eider productivity on the western Beaufort Sea coast is influenced by conditions encountered in May to early June during their spring migration through the Chukchi Sea (including Ledyard Bay). Common eider female body mass increased 20% during the 4-6 weeks prior to egg laying (Gorman and Milne 1971, Milne 1976, Korschgen 1977, Parker and Holm 1990). For spectacled eiders, average female body weight in late March in the Bering Sea was 1,550 ± 35 g (n = 12), and slightly (but not significantly) more upon arrival at breeding sites (1,623 ± 46 g, n = 11; Lovvorn et al. 2003), indicating that spectacled eiders must maintain or enhance their physiological condition during spring staging.

Abundance and Trends

The most recent range-wide estimate of the total number of spectacled eiders was 363,000 (95% CI: 333,526-392,532), obtained by aerial surveys of the known wintering area in the Bering Sea in late winter 1996-1997 (Petersen et al. 1999). Winter/spring aerial surveys were repeated in 2009 and 2010. Preliminary results from 2009 indicate an estimate of 301,812 spectacled eiders, but this value will be updated when surveys from both years are analyzed (Larned et al. 2009: 2).

In 1992, the Y-K Delta spectacled eider population was reportedly at about 4% of historic levels (Stehn et al. 1993). Evidence of the dramatic decline in spectacled eider nesting on the Y-K Delta was corroborated by Ely et al. (1994). They documented a 79% decline in eider nesting between 1969 and 1992 for areas near the Kashunuk River. Aerial and ground survey data indicated that spectacled eiders were undergoing a decline of 9-14% per year from 1985-1992 (Stehn et al. 1993). Further, from the early 1970s to the early 1990s, the number of pairs on the Y-K Delta declined from 48,000 to 2,000, apparently stabilizing at that low level (Stehn et al. 1993). Before 1972, an estimated 47,700 to 70,000 pairs of spectacled eiders nested on the Y-K Delta in average to good years (Dau and Kistchinski 1977).

Fischer et al. (2010) used ground-based and aerial surveys to estimate the number of nests and eggs of spectacled eiders on the coastal zone of the Y-K Delta from 1985–2010. The estimated total number of nests is a direct measure of effective breeding population size and an index to the number of potential nesters (Fischer et al. 2010). In 2010 they estimated 6,750 ± 866 (SE) spectacled eiders nests on the Y-K Delta. The 2009 indicated total bird index, based solely on aerial surveys for the entire coastal zone, was 6,537 ± 527 birds (SE; Platte and Stehn 2009). The aerial index is lower than the nest estimate because the indicated total number of birds has not been corrected for detection probability. The average aerial index for 2005–2009 was 5,244 birds (90% CI: 4,872–5,616), and the estimated population averaged for the last 5 years was 11,411 spectacled eiders (90% CI: 9,657–13,165; corrected for detection probability of 46%).

The average population growth rate of the estimated number of nests on the Y-K Delta from 2000–2010 increased at 1.098 (90% CI: 1.057-1.138; Fischer et al. 2010). The population growth rate from 2000 to 2009 for the Y-K Delta indicated total bird index from aerial surveys of spectacled eiders was 1.081 (90% CI: 1.050–1.113; Platte and Stehn 2009). A more thorough analysis accounting for observer experience and survey timing yielded a 1993-2006 adjusted growth rate of 1.042 (90% CI: 1.030–1.053; Stehn et al. 2006). Thus, the Y-K Delta population of spectacled eiders appears to be increasing at an estimated rate of roughly 4–10% per year.

No population estimates for the North Slope breeding population are available before 1993. At Prudhoe Bay, within the North Slope breeding area, Warnock and Troy (1992) documented an 80% decline in spectacled eider abundance from 1981 until 1991. For the North Slope breeding population, ground-plot surveys have not been conducted. The 2009 population index based on aerial surveys was 5,018 ± 854 birds (SE; unadjusted for detection probability). The North Slope spectacled eider population from 1993-2009 was slightly decreasing, with an average (n = 17 years) population growth rate of 0.985 (90% CI: 0.971–0.999; Larned et al. 2010). The North Slope breeding population estimate for 2007-2009 (adjusted for detection probability = 46%) was 12,506 (90% CI: 9,365–15,646).

Spectacled Eider Recovery Criteria

The Spectacled Eider Recovery Plan (USFWS 1996) presents research and management priorities with the objective of recovery and delisting so that protection under the ESA is no longer required. Although the cause or causes of the spectacled eider population decline is not known, factors that affect adult survival are likely to be the most influential on population growth rate. These include lead poisoning from ingested spent shotgun pellets, which may have contributed to the rapid decline observed in the Y-K Delta (Franson et al 1995, Grand et al. 1998), and other factors such as habitat loss, increased nest predation, over harvest, and disturbance and collisions caused by human infrastructure (factors discussed in the *Environmental Baseline*). Under the Recovery Plan, the species will be considered recovered when each of the three recognized populations (Y-K Delta, North Slope of Alaska, and Arctic Russia): 1) is stable or increasing over 10 or more years and the minimum estimated population size is at least 6,000 breeding pairs; or 2) number at least 10,000 breeding pairs over 3 or more years, or 3) number at least 25,000 breeding pairs in one year. Spectacled eiders do not currently meet these recovery criteria.

Steller's Eiders

Status and Distribution

On June 11, 1997, the Alaska-breeding population of Steller's eiders was listed as threatened based on a substantial decrease in this population's breeding range and the increased vulnerability of the remaining Alaska-breeding population to extirpation (62 FR 31748). Steller's eiders are divided into Atlantic and Pacific populations; the Pacific population is further divided into the Russia-breeding population along the Russian eastern ACP, and the Alaska-breeding population. Although population size estimates for the Alaska-breeding population have been difficult to estimate, it was clear Steller's eiders had essentially disappeared as a breeding species from the Y-K Delta where they had historically occurred in significant numbers, and that their ACP breeding range was much reduced. On the North Slope they historically occurred east to the Canada border (Brooks 1915), but have not been observed on the eastern North Slope in recent decades (USFWS 2002*b*). The Alaska-breeding population of Steller's eiders now nests primarily on the North Slope, particularly near Barrow and at very low densities from Wainwright to at least as far east as Prudhoe Bay (Figure 6). The estimated average density of for Steller's eiders was 0.002 Steller's eiders/km^2 within the North Slope Eider Strata of the ACP Survey in 2009 (Larned et al. 2010), which is very low. A few pairs may still nest on the Y-K Delta; only 10 Steller's eider nests have been recorded on the Y-K Delta since 1970 (Hollmen et al. 2007).

Life History – North Slope Breeding

Steller's eiders arrive in pairs on Alaska's North Slope in early June, but nests have only been found intermittently near Barrow since 1991 (e.g., in 12 of 20 years; USFWS, unpublished data). Individuals foregoing breeding is common in long-lived eider species and is typically related to inadequate body condition (Coulson 1984), but reasons for Steller's eiders non-breeding may be more complex. In the Barrow area, Steller's eider nesting is correlated with lemming numbers and other environmental cues; nest success could be enhanced in years of lemming abundance because nest predators are less likely to prey-switch to eider eggs and young, or because avian predators such as pomarine jaegers (*Stercorarius pomarinus*) and snowy owls (*Bubo scandiaca*) that nest nearby (and consume abundant lemmings) may protect eider nests from mammalian predators such as arctic fox (Quakenbush and Suydam 1999, and summarized by Rojek 2006).

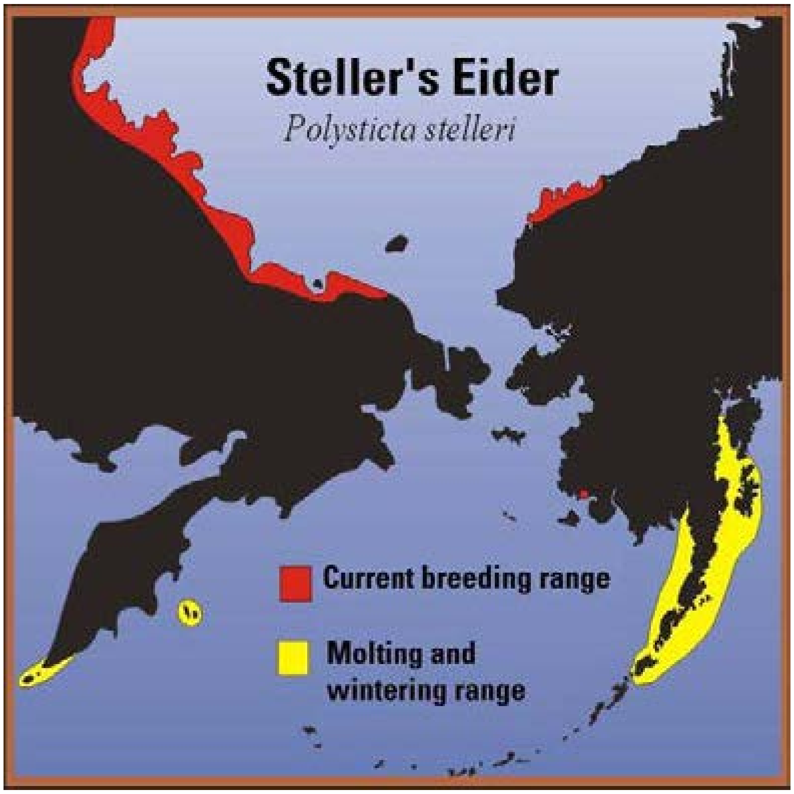


Figure 6. Steller's eider distribution in the Bering, Beaufort and Chukchi seas.

When they do nest, Alaska-breeding Steller's eiders use coastal tundra adjacent to small ponds or within drained lake basins, occasionally as far as 90 km inland. Nests are initiated in the first half of June (Quakenbush et al. 2004), and hatching occurs from mid-July through early August (Rojek 2006, 2007, and 2008). Nests located in the vicinity of Barrow were in wet tundra, in drained lake basins or low-center or low indistinct flat-centered polygon areas (Quakenbush et al. 2000). Mean clutch size at Barrow was 5.4 $\pm$ 1.680 (range = 1-8) over the nesting years from 1992 through 1999 (Quakenbush et al. 2000). Nest survival (the probability a nest will hatch at least one egg) averaged 0.23 in nesting years (1991-2004) prior to fox control, whereas nest survival during nesting years after fox control began (2005–2010) was 0.48 (USFWS, unpublished data). As with spectacled eiders, nest and egg loss was attributed to predation by jaegers, common raven (*Corvus corax*), arctic fox, and possibly glaucous gulls (*Larus hyperboreus*) (Quakenbush et al. 1995, Obritschkewitsch et al. 2001).

Within a day or two after hatch, hens move their broods to adjacent ponds with emergent vegetation, particularly *Carex* spp. and *Arctophila fulva* (Rojek 2006, 2007). Here, they feed on insect larvae and other wetland invertebrates. Broods may move up to several kilometers from the nest prior to fledging (Rojek 2006). Fledging occurs from 32-37 days post hatch (Obritschkewitsch et al. 2001, Rojek 2006). Information on breeding site fidelity of Steller's eiders is limited. However, some information is available from the breeding ecology study at Barrow. Since the mid-1990s, five birds that were originally captured as confirmed nesters near

Barrow were recaptured in subsequent years nesting near Barrow. The time between capture events ranged from 1 to 12 years and the distance between nests ranged from 0.1 to 6.3 km.

Life History – Non-breeding

Localized post-breeding movements – Departure from the breeding grounds near Barrow differs between sexes and between breeding and non-breeding years. However, prior to their migration in both breeding and non-breeding years, some Steller's eiders stage in Elson Lagoon, North Salt Lagoon, Imikpuk Lake, and the Chukchi Sea in the vicinity of Pigniq (Duck Camp; Figure 7).

Male Steller's eiders typically leave the breeding grounds after females begin incubating, around the end of June or early July (Quakenbush et al. 1995, and Obritschkewitsch et al. 2001). Groups of Steller's eiders have been observed just off the Chukchi beach from the gravel pits, which are south of Barrow, north to Nuvuk (the northern most point of the Barrow spit). In breeding years these flocks were comprised of mostly drakes and persisted until about the second week of July (J. Bacon, North Slope Borough Department of Wildlife Management [NSBDWM], *pers. comm.*).

Figure 7. Location of Steller's eider post-breeding staging areas in relation to Pigniq (Duck Camp) hunting area north of Barrow, Alaska.

Females that successfully hatch nests and fledged young depart the breeding grounds in late August to mid-September and stage in water bodies near Pigniq prior to their southward migration along the Chukchi coast. From mid-July through September single hens, hens with broods, and small groups of two to three birds have been observed in North Saltwater Lagoon, Elson Lagoon and near shore on the Chukchi Sea. The majority of observations have been of individuals swimming in North Salt Lagoon, but occasionally individuals and small groups flying between North Salt Lagoon, Elson Lagoon and the Chukchi Sea have been observed.

Hens with broods have been observed mostly near the channel that connects North Salt Lagoon and Elson Lagoon (J. Bacon, NSBDWM, *pers. comm*.). In 2008, 10-30 Steller's eider adult females and juveniles were observed daily between late August and mid-September staging in Elson Lagoon, North Salt Lagoon, Imikpuk Lake, and the Chukchi Sea (USFWS, unpublished data). Females whose nests fail may also remain near Barrow later in summer; a single failed nesting female equipped with a transmitter in 2000 remained near the breeding site until the end of July and stayed in the Beaufort Sea off Barrow until late August (Martin et al. *in prep*).
In non-breeding years, groups of Steller's eiders are observed just off the Chukchi beach from the gravel pits north to Nuvuk; however, they became absent earlier compared to breeding years and the sex ratios were more even (J. Bacon, NSBDWM, *pers. comm*.). Telemetry data showed at least 5 of 14 birds used Elson Lagoon and males and females dispersed across the area between Wainwright and Admiralty Inlet in late June and early July, with most birds entering marine waters by the first week of July (Martin et al. *in prep*.).

There is limited information available on the migratory movements of Steller's eiders, particularly connecting breeding populations with migratory routes or specific molting or wintering areas. The best information available is from two satellite telemetry studies of Steller's eiders. One study marked Steller's eiders wintering on Kodiak Island, Alaska and followed birds through the subsequent spring (n = 24) and fall (n = 16) migrations from 2004 – 2006 (D. Rosenberg, Alaska Department of Fish and Game [ADFG]). Most of the birds marked on Kodiak returned to eastern arctic Russia during the nesting period, and none of these birds (all presumed to be from the Russian breeding population) were relocated on land or the near shore waters North of the mouth of the Yukon River in Alaska (ADFG, unpublished data). The second (but earlier) study marked birds (n = 14) near Barrow, Alaska (within the range of the listed Alaska-breeding population) in 2000 and 2001(Martin et al. *in prep*.). Birds from this study were relocated subsequently along arctic coast of Alaska Southwest of Barrow to areas near Pt. Hope, on the Seward Peninsula, and in Southern Norton Sound (Martin et al. *in prep*.). The birds marked near Barrow were also relocated further South in Alaska and in eastern arctic Russia in similar locations to birds marked in Kodiak. Based on the data from two satellite telemetry studies of Steller's eiders in Alaska, it remains unclear where the Russia and Alaska breeding populations merge and diverge during molt and spring migrations, respectively.

Molt and Winter Distribution

During post-breeding migration, Steller's eiders move towards molting areas in the near shore waters of Southwest Alaska where they undergo a complete flightless molt for about 3 weeks. The combined (Russian and Alaskan-breeding) Pacific population molts in numerous locations in Southwest Alaska, with exceptional concentrations in four areas along the north side of the Alaska Peninsula: Izembek Lagoon, Nelson Lagoon, Port Heiden, and Seal Islands (Gill et al. 1981, Petersen 1981, Metzner 1993). Additionally, smaller numbers are known or thought to molt in a number of other locations along the western Alaska coast, around islands in the Bering Sea, along the coast of Bristol Bay, and in smaller lagoons along the Alaska Peninsula (Swarth 1934, Dick and Dick 1971, Petersen and Sigman 1977, Wilk et al. 1986, Dau 1987, Petersen et al. 1991).

After molt, many of the Pacific-wintering Steller's eiders disperse to additional areas in the eastern Aleutian Islands, the south side of the Alaskan Peninsula, Kodiak Island, and as far east as Cook Inlet, although thousands may remain in lagoons used for molting unless or until freezing conditions force them to move (USFWS 2002*b*). During the winter, this species congregates in select near shore waters throughout the Alaska Peninsula and the Aleutian Islands, around Nunivak Island, the Pribilof Islands, the Kodiak Archipelago, and lower Cook Inlet (Larned 2000*a*, Bent 1987, Agler et al. 1994, Larned and Zwiefelhofer 1995). Wintering Steller's eiders usually (although not always; Martin et al. *in prep*.) occur in waters less than 10 m deep, which are normally within 400 m of shore or at offshore shallows.

Northward Spring Migration

During spring migration thousands of Steller's eiders stage in estuaries along the north side of the Alaska Peninsula, including some molting lagoons, and at the Kuskokwim Shoals near the mouth of the Kuskokwim River in late May (Larned 2007, Martin et al. *in prep*.). Like other eiders, Steller's eider may use spring leads for feeding and resting, but there is little information on habitat use during spring migration. Spring migration usually includes movements along the coast, although birds may take shortcuts across water bodies such as Bristol Bay (W. Larned, USFWS, *pers. comm*. 2000*b*). Interestingly, despite many daytime aerial surveys, Steller's eiders have never been observed during migratory flights (W. Larned, USFWS, *pers. comm*. 2000*b*). Larned (1998) concluded that Steller's eiders show strong site fidelity to "favored" habitats during migration, where they congregate in large numbers to feed before continuing their northward migration.

Recovery Criteria

The Steller's Eider Recovery Plan (USFWS 2002*b*) presents research and management priorities, that are re-evaluated and adjusted every year, with the objective of recovery and delisting so that protection under the ESA is no longer required. When the Alaska-breeding population was listed as threatened, factors causing the decline were unknown, but possible causes identified were increased predation, over hunting, ingestion of spent lead shot in wetlands, and habitat loss from development. Since listing, other potential threats have been identified, including exposure to other contaminants, scientific research, and climate change but causes of decline and obstacles to recovery remain poorly understood.

Criteria used to determine when species are recovered are often based on historical abundance and distribution, or on the number needed to ensure the risk of extinction is tolerably low (with extinction risk estimated by population modeling). For Steller's eiders, information on historical abundance is lacking, and demographic parameters needed for accurate population modeling are poorly understood. Therefore, the Recovery Plan for Steller's eiders establishes interim recovery criteria based on extinction risk, with the assumption that numeric population goals will be developed as demographic parameters become better understood. Under the Recovery Plan, the Alaska-breeding population would be considered for reclassification to "endangered if the population has ≥ 20% probability of extinction in the next 100 years for 3 consecutive years, or the population has ≥ 20% probability of extinction in the next 100 years and is decreasing in abundance. The Alaska-breeding population would be considered for delisting from threatened status if it has ≤ 1% probability of extinction in the next 100 years, and each of the northern and western subpopulations are stable or increasing and have ≤ 10% probability of extinction in 100 years.

Spectacled Eider Critical Habitat: Ledyard Bay Critical Habitat Unit

Because of its importance to migrating and molting spectacled eiders, on February 6, 2001 the Service designated 13,960 km^2 (5,390.0 mi^2) of Ledyard Bay as the LBCHU (66 FR 9146). This designation includes the area within about 74 km (40 nm) of shore, excluding waters less than 1.85 km (1 nm) from shore (66 FR 9146). The Primary Constituent Elements (PCEs) for the spectacled eider in this unit are:

1) Marine waters greater than 5 m (16.4 ft) and less than or equal to 25 m (82.0 ft) in depth;
2) The associated marine aquatic flora and fauna in the water column; and
3) The underlying marine benthic community.

The Ledyard Bay benthic community likely provides an important and predictable food resource for spectacled eiders during the energetically-demanding northward migration immediately prior to egg-laying for females and during the post-breeding molt for both sexes. An inflow of nutrient-rich Pacific waters across the shallow, often ice-covered Chukchi Sea shelf supports high primary production with high edge-ice productivity in a region of limited open water. In general, pelagic secondary consumers do not directly consume the primary production, so it settles quickly to the underlying benthos, generating a rich macrobenthic community (Grebmeier 1993, Highsmith and Coyle 1992, Grebmeier and Cooper 1995). Therefore, large populations of benthic-feeding marine mammals and birds are apex predators (Grebmeier and Dunton 2000, Grebmeier and Harrison 1992, Highsmith and Coyle 1992, Hunt 1991, Oliver and Slattery 1985, Oliver et al. 1983). Available benthic biota include a nucloida clam (*Yoldia scissurata*), scallop (*Chlamys behringiana*), gastropods (*Neptunea* spp.), an acorn barnacle (*Balanus crenatus*), and a sand dollar (*Echinarachnius parma*) (Feder et al. 1989, 1994*a* and 1994*b*).

Climate Change

Benthic biodiversity, community composition and biomass in the Arctic are changing due to climate warming (Bluhm and Grebmeier 2011, Grebmeier 2012, in press). In some regions communities are changing from longer-lived and slower-growing Arctic species and/or communities to faster-growing more temperate species and/or communities, indicating increasing water temperatures. Also, recent changes in benthic biomass in some Arctic regions most likely reflect shifts in energy flux patterns due to regional sea ice loss (Bluhn and Brebmeier 2011). While changes occurring in the LBCHU are unclear, reductions of sea ice during the summer will likely alter the benthic ecosystem and thus affect PCEs important to spectacled eiders.

Summary

The vicinity of Ledyard Bay provides a predictable benthic invertebrate biomass and abundance in for the bottom-feeding spectacled eider. This food source is most important to spectacled eiders during spring migration via spring leads and during the summer/autumn molt via open water conditions. Uncertainty exists regarding whether climate change-induced shifts in prey resources in the LBCHU are taking place, but changes in other Arctic areas suggest such changes are plausible.

Yellow-billed Loons

Physical Appearance

The yellow-billed loon (*Gavia adamsii*) is the largest, rarest, and most northerly distributed of the five loon species in the family Gaviidae. Although the yellow-billed loon is similar in appearance to the common loon (*G. immer*), the yellow-billed loon is most easily distinguished by their larger yellow or ivory-colored bill. During the non-breeding season, yellow-billed loons lose their distinctive black and white plumage and molt into gray-brown plumage, with paler undersides and head, and a blue-gray bill. Similarity of plumage among loon species in non-breeding and juvenile plumages, makes distinguishing among species difficult. Yellow-billed loons are specialized for aquatic foraging with a streamlined shape and legs near the rear of the body, and are unable to take flight from land.

Status and Distribution

On March 25, 2009, the Service designated the yellow-billed loon a candidate for protection under the Act because of its small population size range-wide and concerns about levels of subsistence harvest and other potential impacts to the species (74 FR 12932). Yellow-billed loons are intrinsically vulnerable due to a combination of small population size, low reproductive rate, and very specific breeding habitat requirements. As large-bodied birds with low clutch size, yellow-billed loons are most likely “K-selected;” that is, they are long-lived and dependent upon high annual adult survival to maintain populations.

Yellow-billed loons nest from June to September near freshwater lakes in tundra on Alaska’s North Slope, northwestern Alaska, and St. Lawrence Island; in Canada east of the Mackenzie Delta and west of Hudson Bay; and in Russia on a relatively narrow strip of coastal tundra from the Chukotka Peninsula in the east and on the western Taymyr Peninsula in the west, with a break in distribution between these two areas (Earnst 2004, North 1993, Red Data Book of the Russian Federation 2001, Ryabitsev 2001, Il’ichev and Flint 1982, Pearce et al. 1998; Figure 8).

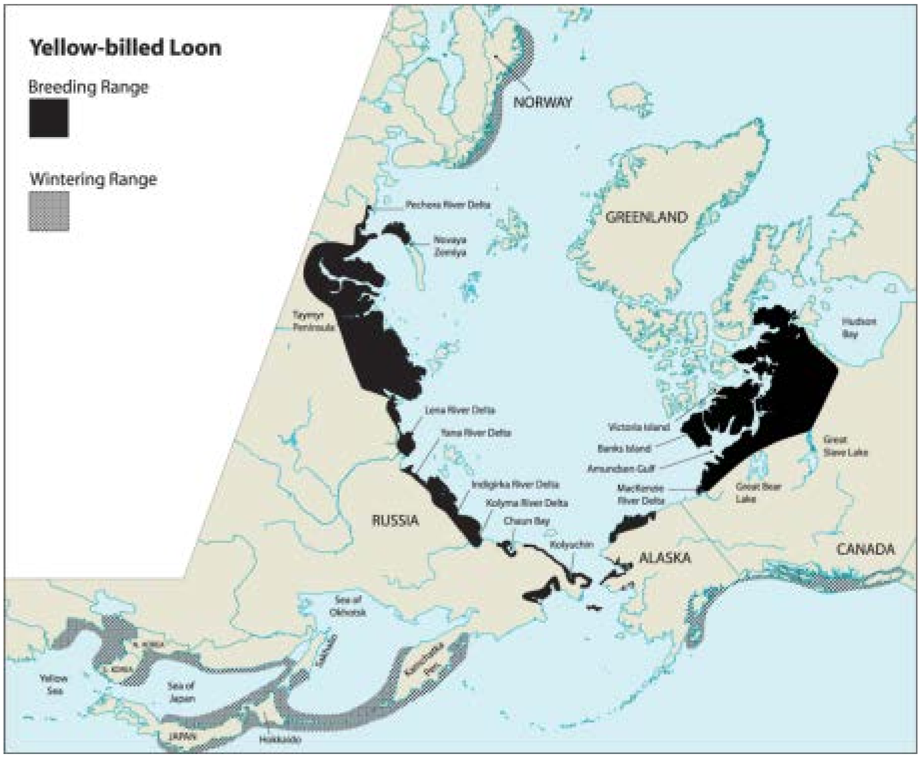
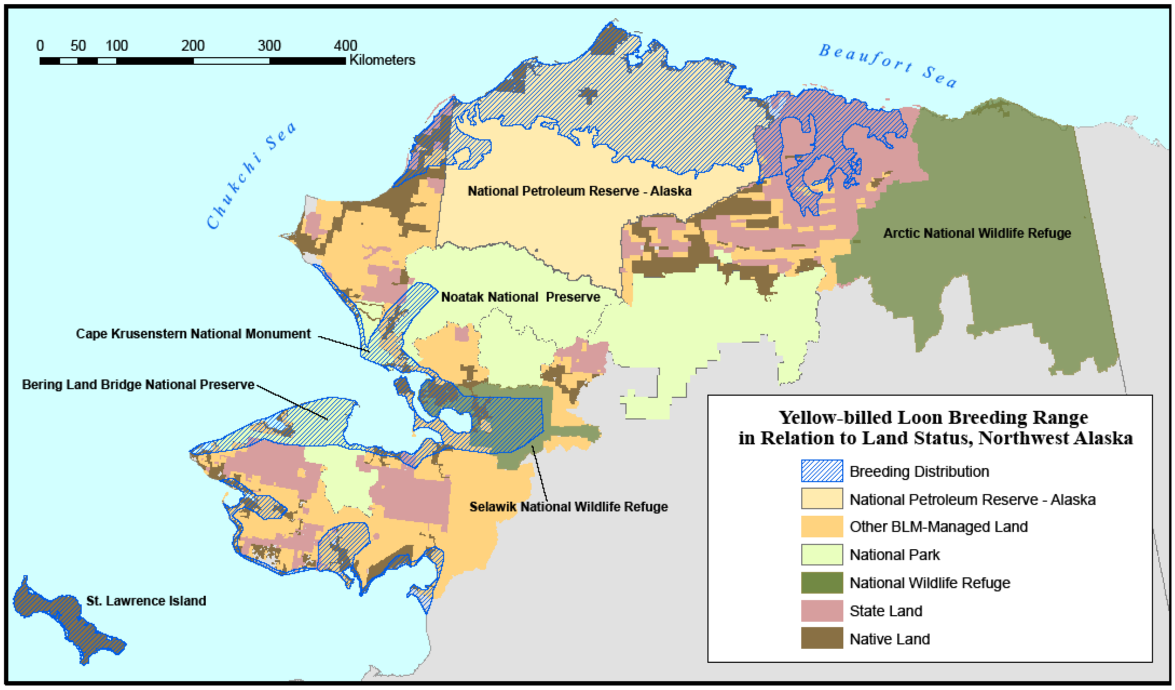


Figure 8. Range of the yellow-billed loon.

The yellow-billed loon is a migratory species. During the non-nesting season (October through May), the species winters in principally coastal marine waters at mid to high latitudes, including southern Alaska and British Columbia to Puget Sound; the Pacific coast of Asia from the Sea of Okhotsk south to the Yellow Sea; the Barents Sea and the coast of the Kola Peninsula; coastal waters of Norway; and possibly Great Britain (Earnst 2004, North 1993, Ryabitsev 2001, Schmutz *pers. comm.* December 12, 2008, Strann and Østnes 2007, Burn and Mather 1974, Gibson and Byrd 2007; Figure 8). A small proportion of yellow-billed loons may winter in interior lakes or reservoirs in North America (North 1994). Non-breeding birds remain in marine waters throughout the year, either in wintering areas or offshore from breeding grounds.

Life History – Breeding

Yellow-billed loons nest in coastal and inland low-lying tundra from latitude 62° to 74°N. Within Alaska, there are two breeding areas – the North Slope region north of the Brooks Range and the region surrounding Kotzebue Sound in northwest Alaska, primarily the northern Seward Peninsula (Earnst 2004, North 1993; Figure 9). Yellow-billed loons are sparsely distributed during the breeding season, and are somewhat clumped at a large scale, perhaps because of non-uniform habitat quality.



Yellow-billed Loon breeding distribution follows Earnst (2004); land status from Alaska Department of Natural Resources, General Land Status Database

Figure 9. Breeding distribution of the yellow-billed loon in Alaska with land status.

Nest sites are usually located on islands, hummocks, or peninsulas, along low shorelines, within 1 m of water. Nests are constructed of mud or peat, and are often lined with vegetation. It is thought that loons occupy the same breeding territory throughout their reproductive lives. One or two large eggs are laid in mid- to late June (North 1994). Egg replacement after nest predation occurs rarely as the short arctic summer probably precludes the production or success of replacement clutches (Earnst 2004). Hatching occurs after 27 to 28 days of incubation by both sexes. Although the age at which young are capable of flight is unknown, it is probably similar to common loons (8-9, possibly up to 11, weeks). Young leave the nest soon after hatching, and the family may move between natal and brood-rearing lakes. Both males and females participate in feeding and caring for young (North 1994).

Information on reproductive success is limited but significant inter-annual variation has been described. Mayfield survival rates to 6 weeks of ages for yellow-billed loons on the Colville River Delta between 1995 and 2000 ranged from 4% to 60% (Earnst 2004), with low success attributed to late ice melt or extreme flooding. Apparent nest success on the Colville River Delta recorded by aerial surveys ranged from 19% - 64% between 1993 and 2007 (ABR, Inc. 2007, ABR, Inc., unpublished data).

During the breeding season, foraging habitats include lakes, rivers, and the nearshore marine environment. Successfully breeding adults feed their young almost entirely from the brood-rearing lake (North 1994).

Life History – Migration and Wintering

Yellow-billed loon migration routes are thought to be primarily over marine areas. J. Schmutz (*pers. comm.* December 12, 2008) found that adult yellow-billed loons marked with satellite transmitters on Alaska breeding grounds generally remained between 1 and 20 miles from land during migration and winter. They migrate singly or in pairs, but gather in polynyas (areas of open water at predictable, recurrent locations in sea-ice covered regions), ice leads (more ephemeral breaks in sea ice, often along coastlines), and early-melting areas off large river deltas near breeding grounds in spring along the Beaufort Sea coast of Alaska and Canada (Barry et al.1981, Barry and Barry 1982, Woodby and Divoky 1982, Johnson and Herter1989, Barr 1997, Alexander et al. 1997, Mallory and Fontaine 2004). Satellite-transmittered yellow-billed loons from the ACP indicate these birds migrate south to Asia, predominantly along the Russian coastline from the Chukotka Peninsula (either through the Bering Strait or across the mountains from the north side of the Chukotka Peninsula to the Gulf of Anadyr), and along the Kamchatka coast (J. Schmutz; *pers. comm*. 2010, Rizzolo and Schmutz 2010); these loons wintered in the Yellow Sea and the Sea of Japan off the coasts of China, North Korea, Russia, and near Hokkaido, Japan. All the yellow-billed loons transmittered on the Seward Peninsula in 2007 and 2008 also used the Bering Strait region after leaving their breeding grounds. Five of these loons migrated to Asian breeding grounds as described above for ACP breeding birds; the other 5 wintered throughout the Aleutian Islands from Shemya Island in the west to the Semidi Islands off the coast of the Alaska Peninsula (Schmutz *pers. comm.* December 12, 2008). Most transmittered yellow-billed loons departed breeding areas in late September, arrived in wintering locations in mid-November, started spring migration in April, and arrived on breeding grounds in the first half of June; these dates are consistent with breeding ground arrival dates reported by North (1994). Non-breeders or failed nesters may start their fall migration in late June to mid-July (Rizzolo and Schmutz 2010). Satellite telemetry data indicate that many yellow-billed loons that breed on the ACP likely migrate to Asia during the winter; some also migrate to the Aleutian Islands (Figure 10; Rizzolo and Schmutz 2010: 1). However, specific wintering sites are still unknown due to a loss of signal reception of all birds once they moved west of Japan; signals reappeared during spring migration (Rizzolo and Schmutz 2010: 13).

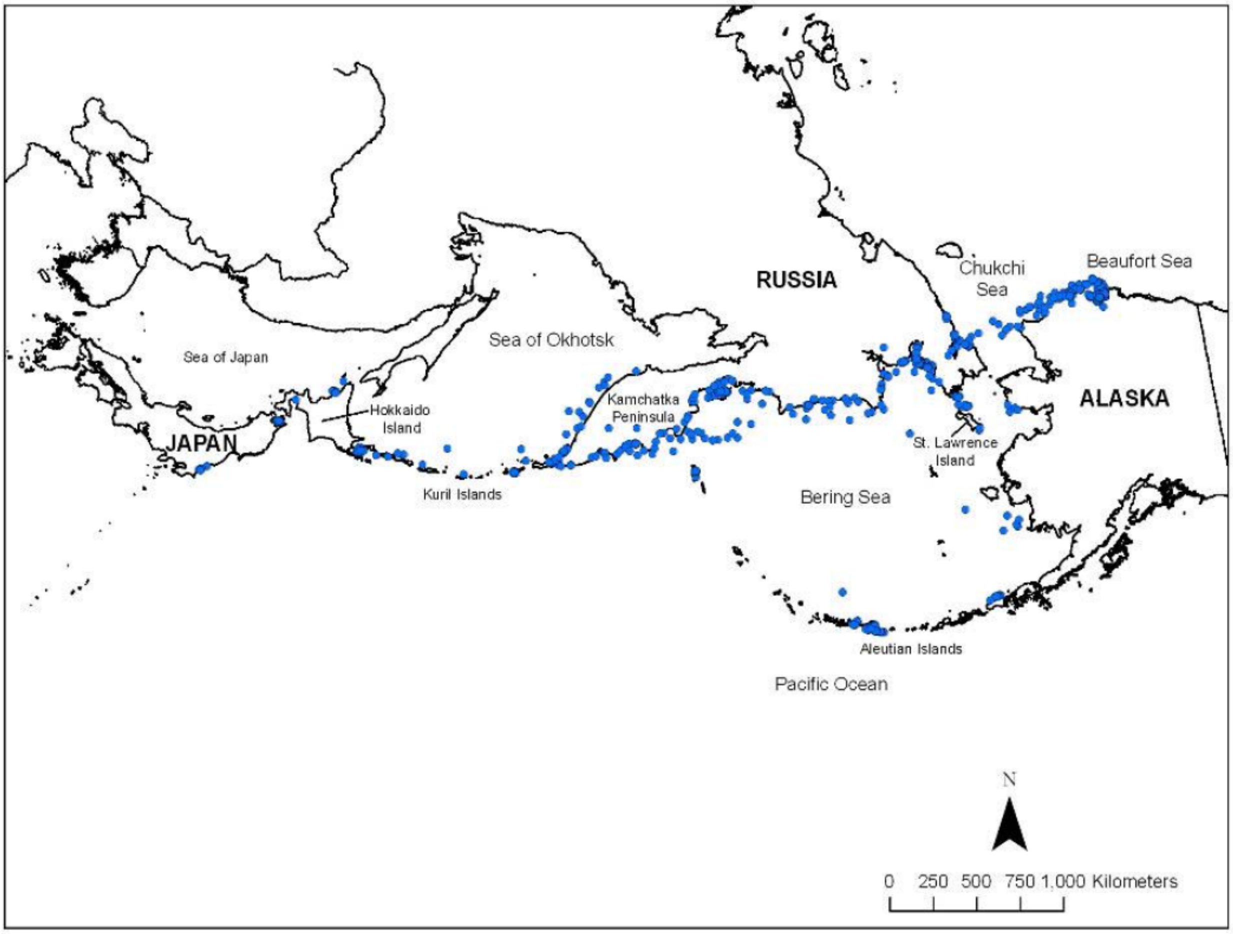


Figure 10. Satellite telemetry locations of yellow-billed loons in 2008-2010. From Rizzolo and Schmutz (2010).

Abundance and Trends

The global population size of yellow-billed loons is unknown, but probably in the range of 16,000-32,000, with of 3,000-4,000 thought to breed in Alaska (74 FR 12932). Maximum estimates based on the amount of available habitat (plus limited survey data for Canada) are 20,000 birds in Canada and 8,000 in Russia. Most of the breeding range of the yellow-billed loon has not been adequately surveyed, and only in Alaska have surveys been conducted specifically for breeding yellow-billed loons.

Until 2007, yellow-billed loon population indices on the North Slope were determined by two independent fixed-wing aerial transect surveys for waterfowl conducted each year by the Service's Migratory Bird Management program (MBM). The North Slope Eider survey was flown in early June (1992-2008) and the Arctic Coastal Plain survey in late June (1986-2006). Survey timing and coverage differed between the two surveys, and consequently the resulting yellow-billed loon population index differed. In 2007, MBM merged the two surveys into a single Arctic Coastal Plain survey flown in early June. Based on several studies and survey methods, an estimated 2,500-3,500 yellow-billed loons breed on the North Slope (USFWS unpublished data based on examining results in Earnst et al. 2005, Stehn et al. 2005, Mallek et al. 2007, Larned et al. 2009).

Population indices in western Alaska are determined from fixed-wing aerial lake-circling surveys flown on the Seward Peninsula and Cape Krusenstern (June 2005 and 2007) and transect surveys of Selawik National Wildlife Refuge (June 1996 and 1997; Platte 1999, Bollinger et al. 2008). Approximately 500 loons are estimated to breed in the Kotzebue Sound region in western Alaska.

Although there is no a recent survey estimate of yellow-billed loon nesting population on St. Lawrence Island (USFWS 2009*b*) and no published record since the late 50s (Fay and Cade 1959), the number nesting there is thought to be approximately 50 birds (Fair 2002).

Several analytical approaches have been used to estimate population trends for yellow-billed loons breeding on the North Slope. Aerial survey data adjusted for the possible confounding variation due to survey timing, phenology, and observer experience, indicated an average trend from 1986-2003 of 0.991 (95% CI: 0.964–1.018; Earnst et al. 2005). The Service recently examined a subset of the NSE data through 2008 that analyzed the pilot-observer data and estimated the average growth rate as 0.986 (95% CI: 0.967–1.006). Finally, including the most recent aerial indices for the NSE survey not adjusted by covariates, the 1992-2009 growth rate was 1.021 (90% CI: 1.005–1.037, Larned et al. 2010). These multiple analytical approaches provide varying estimates of trends ranging from slightly increasing to slightly decreasing, and those estimates with the most precision (95% CIs) include a lambda of 1.0. Thus, the population of yellow-billed loons breeding on the North Slope may be stable, slightly increasing, or slightly decreasing.

Surveys in western Alaska have not been conducted for a long enough period (only in 2005 and 2007) to detect trends. Similarly, limited surveys have been conducted only in small parts of the Russian and Canadian breeding ranges, so population sizes for these ranges are gross approximations and no information on trends is available. Therefore, we are not able to estimate trends at the species level.

Kittlitz’s Murrelet

Physical Appearance

Kittlitz’s murrelets are small diving seabirds in the family Alcidae (including puffins, guillemots, and murres) which inhabit Alaskan coastal waters. Breeding plumage is mottled golden-brown and winter non-breeding plumage is more distinct, with a white underbelly and face and dark back and chest band.

Status and Distribution

On May 4, 2004, the Kittlitz’s murrelet was designated a candidate for protection under the ESA because its numbers have declined sharply and it may warrant listing as threatened or endangered (69 FR 24875).

All of the North American and a large proportion of the known world population of Kittlitz’s murrelets breed, molt, and winter in Alaska (Day et al. 1999). The most recent population estimate of Kittlitz’s murrelet in northern Alaska was 450 birds during the breeding season

(April–August) and 8,500 birds in the post-breeding season (September–October), although 95% CIs for the post-breeding season estimate were large (Day et al. 2011). Strong evidence indicates seasonal variation in abundance (highest densities in September–October) exists (Day et al. 2011), but Day et al. (2011) found no evidence for population change between the periods 1970–1999 and 2000–2009 during either the breeding or post-breeding seasons. An estimated 10% of the world population breeds in the Russian Far East from the Okhotsk Sea to the Chukchi Sea (Day et al. 1999), but in the late 1990's large numbers of Kittlitz's murrelets were reported from the Kamchatka Peninsula (Vyatkin 1999). During the breeding season, Kittlitz's murrelets are often found in association with marine tidewater glaciers and glacial-influenced water and in protected fiords (Kuletz and Piatt 1992, Day and Nigro 1998, Day et al. 2000). Kittlitz's murrelets are also found around Kodiak Island, the Aleutian Islands, Bristol Bay, Seward Peninsula, Cape Lisburne, and Chukotka and Kamchatka peninsulas in Russia; areas not currently influenced by glaciers (Figure 11). Kittlitz's murrelets possibly nest as far north as Cape Sabine and Cape Beaufort, (inland of Ledyard Bay), although suitable habitat may not be available in that location (D.G. Roseneau, *pers. comm.*, reported by Day et al. 1999). Suitable nesting habitat disappears north of Cape Beaufort, so the species rarely occurs and probably does not breed north of there (from Wainwright to Barrow; Huey 1931, Bailey et al. 1933, Bailey 1948, Pitelka 1974).

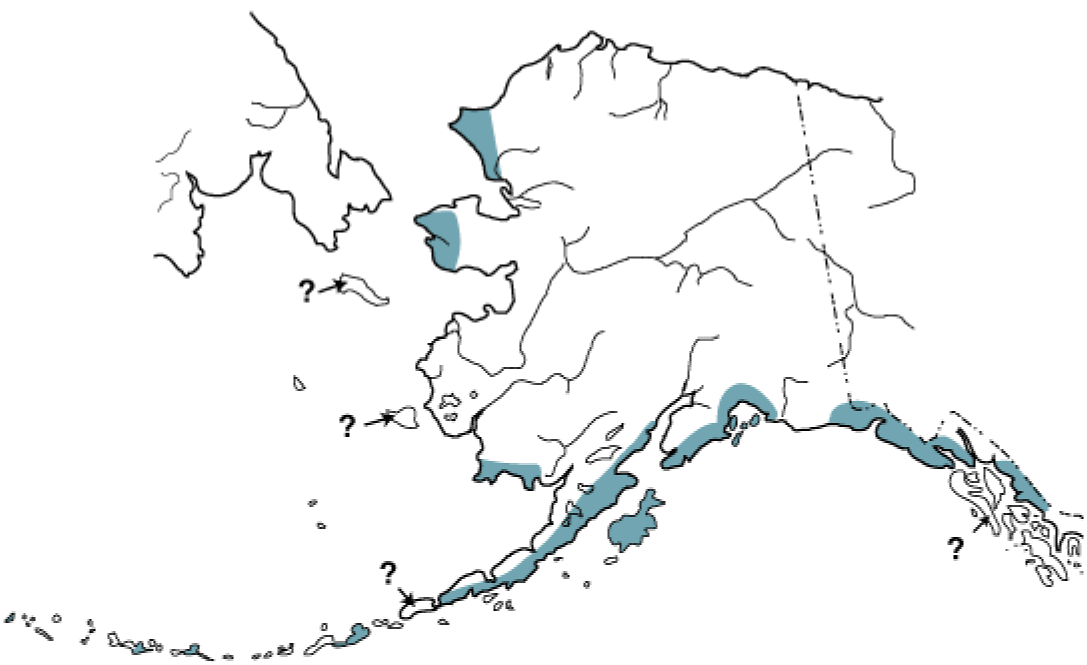


Figure 11. Breeding distribution of Kittlitz's murrelet in North America (Day et al. 1999).

Life History

Kittlitz's murrelets appear to use a predator avoidance strategy for nesting; their nests are widely dispersed in areas with sparse or no vegetation (Kaler et al. 2008). They nest solitarily on the ground, in very remote areas (Day 199,; Day et al. 1999). Nesting habitat in Alaska is believed to be unvegetated scree-fields, coastal cliffs, barren ground, rock ledges, and talus above timberline in coastal mountains, generally in the vicinity of glaciers, cirques near glaciers, or recently glaciated areas, primarily from the Alaska Peninsula to Glacier Bay (Day et al. 1983, Day 1995, Day et al. 1999, Piatt et al. 1999). Local climate, geomorphology and elevation may be important parameters determining nest site suitability (Kaler 2006). Kittlitz's murrelets lay one large egg in a stone nest bowl, and the same site may be used for nesting year after year (Piatt et al. 1999). The timing of egg-laying appears to be asynchronous (Kissling et al. 2007*a* unpublished data, USFWS 2007*b*, unpublished data). Egg laying initiates approximately 18 May through 29 June (Agness 2006, Kissling et al. 2007*a*, Kaler et al. 2009; June in northern Alaska; Day et al. 1999), and there is evidence that Kittlitz's murrelets attempt to renest (Kaler et al. 2008). Duration of incubation is 30 days (Kissling et al. 2007*a* unpublished data, USFWS 2007*b* unpublished data, Kaler et al. 2009). The chick is fed for 24 to 30 days post-hatch (Day et al. 1999, Nalsund et al. 1994, Kaler et al. 2009). Young fledge in August in the northern part of their range, including the Chukchi Sea coast (Day et al. 1999). Both males and females incubate eggs and brood the young. There is no information on annual or lifetime reproductive success but some evidence suggests this species may forego breeding in some years (Day et al. 1999).

Kittlitz's murrelets can be found over the shelf of the Chukchi Sea from mid-April to mid- or late October, with the highest densities occurring within 50 km of shore (Day et al. 2011). The Kittlitz's murrelet may be widespread and fairly common at times in the Chukchi Sea but rare and casual (not annual) in the Beaufort Sea (Day et al. 2011). Both the timing and migration routes to and from the breeding grounds are unknown, but the shift between summer and winter distribution appears to be rapid and asynchronous (Day et al. 1999). It is likely that Kittlitz's murrelets follow the retreating ice edge, feeding on the biomass associate with ice plankton blooms.

During the breeding season, Kittlitz's murrelets feed on schooling fishes such as Pacific capelin, Pacific sand lance, Pacific herring (*Clupea pallasi*), and walleye pollock (Piatt et al. 1994, Day and Nigro 2000, Agness 2006, Kissling et al. 2007*a*). Although they are considered a piscivorous species, Kittlitz's murrelets also feed on invertebrates (Sanger 1987; Hobson et al. 1994). Because the energy density of available forage fishes is seasonally influenced (Montevecchi and Piatt 1987, Litzow et al. 2004), Kittlitz's murrelets may switch prey at various times of the year (Ostrand et al. 2004). In Prince William Sound and Glacier Bay, they tend to forage as single birds or in small groups (Day and Nigro 2000, Agness 2006), and rarely forage in mixed-species feeding flocks (Day and Nigro 2000). Winter foods are unknown, although the stomach of one museum specimen contained macro-zooplankton (Day et al. 1999).

The winter range of the Kittlitz's murrelet is not well known, but is probably pelagic (open ocean; Day et al. 1999). There are records of occasional winter sightings in Southeast and western Alaska, and locally common sightings in a few locations in Southcoastal Alaska (Kendall and Agler 1998; Day et al. 1999). Kittlitz's murrelets are also reported during winter in the mid-shelf regions of the northern Gulf of Alaska (Day and Prichard 2001). Winter range of the species outside the Americas is largely unknown, but observations have been reported from the Kamchatka Peninsula and the Kuril Islands in the Russian Far East (Flint et al. 1984).

Abundance and Trends

The Kittlitz's murrelet is thought to be one of the rarest seabirds in North America. Based on compilation of information from various locations and from various years from 1999 to 2008, the Service's current Alaska population estimate of the Kittlitz's murrelet is 19,578 birds (range = 8,190 to 36,193, USFWS 2007*b*). Additionally, there may be as many as 5,000 birds along the north-eastern coast of Kamchatka (Vyatkin 1999) and perhaps 100 birds on the southeastern tip of the Chukotka Peninsula (Konyukhov et al. 1998); however, data from Russia are scarce. Given these data together, the worldwide population of Kittlitz's murrelets is estimated to be 24,678 individuals (USFWS 2007*b*).

The International Union for Conservation of Nature and Natural Resources (IUCN) considers Kittlitz's murrelets critically endangered. NatureServe categorizes Kittlitz's murrelets as Globally Imperiled (G2; NatureServe 2011; last reviewed 02 January 2008) because of population declines potentially associated with pollution, direct or indirect fishing, glacial retreat, and oceanic regime shifts (NatureServe 2011). Based on a long-term data set from Prince William Sound, Kittlitz's murrelets numbers in Alaska declined up to 18% annually from 1989 to 2000, 84% over the survey period (Kuletz et al. 2003, USFWS 2004*b*). Other documented declines of Kittlitz's murrelets in Southcentral Alaska include an estimated 74% decline along the coast of the Kenai Fjords (1986-2002; van Pelt and Piatt 2003) and 43% decline between two decadal periods (1988-1999 and 2004-2007) in Kachemak Bay, Lower Cook Inlet (Kuletz et al. 2008). In Southeast Alaska, documented declines include an estimated 80% decline in Glacier Bay (between 1991 and 1999-2000; Robards et al. 2003, Drew and Piatt 2008), 90% decline in Malaspina Forelands (Kissling et al. 2007*b*), and possibly 59% over a 3-year period in Icy Bay (2002-2005; Kissling et al. 2007*a* unpublished data). Data from two surveys around Adak Island in the Aleutians suggest an annual decline of 7.4% for marbled and Kittlitz's murrelets combined (Piatt et al. 2007). No data exist that assess declining population trends in the Russian population.

Polar Bear

Due to threats to its sea ice habitat, on May 15, 2008 the Service listed the polar bear (*Ursus maritimus*) as threatened (73 FR 28212) throughout its range under the ESA. In the U.S., the polar bear is also afforded protection under the MMPA and is managed by MMM. The polar bear is also protected under the Convention on International Trade in Endangered Species of Wildlife Fauna and Flora (CITES) of 1973.

Abundance and Distribution

Polar bears are widely distributed throughout the Arctic where the sea is ice-covered for large portions of the year (Figure 12). Sea ice provides a platform for hunting and feeding, for seeking mates and breeding, for denning, for resting, and for long-distance movement. Ringed seals are polar bear's primary food source, and areas near ice edges, leads, or polynyas where ocean depth is minimal are the most productive hunting grounds (Durner et al. 2004). While polar bears primarily hunt seals for food, they may occasionally consume other marine mammals, including via scavenging on their carcasses (73 FR 28212).

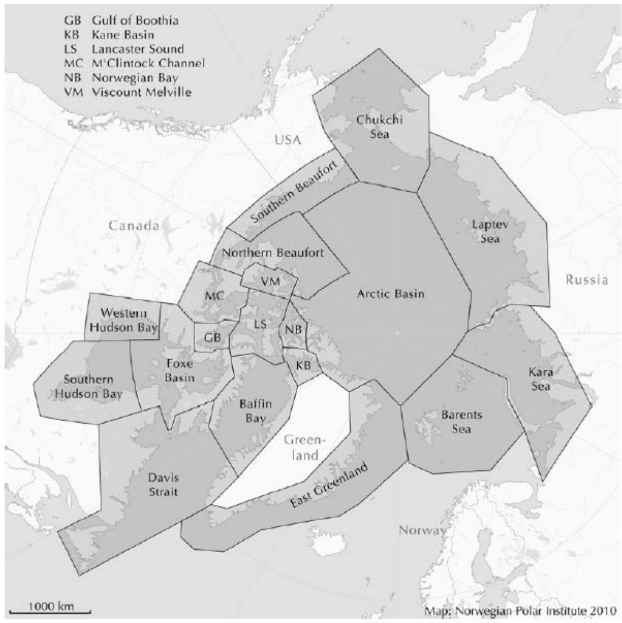


Figure 12. Distribution of polar bear stocks throughout the circumpolar basin (from Obbard et al. 2010).

The total number of polar bears is estimated to be 20,000-25,000 with 19 recognized management subpopulations or "stocks" (Obbard et al. 2010). The International Union for Conservation of Nature and Natural Resources, Species Survival Commission (IUCN/SSC) Polar Bear Specialist Group ranked 11, four, and three of these stocks as "data deficient," "reduced," and "not reduced," respectively (Obbard et al. 2010). The status designation of "data deficient" for 11 stocks indicates that the estimate of the worldwide polar bear population was made with known uncertainty.

In general the sea-ice extent is becoming much less in the arctic summer and slightly less in winter, the decline in sea-ice extent is increasing (NSIDC, 201 *a*, *b*); the thickness of arctic ice is decreasing (Haas et al. 2010), as is the distribution of sea ice (Cosimo 2011). These factors are leading to a decreasing perennial arctic ice pack. In addition, positive feedback systems (i.e., sea-ice albedo) and naturally occurring events, such as warm water intrusion into the Arctic and changing atmospheric wind patterns, can amplify the effects of these phenomena. As a result, there is fragmentation of sea ice, reduction in the extent and area of sea ice in all seasons, retraction of sea ice away from productive continental shelf areas throughout the polar basin, reduction of the amount of heavier and more stable multi-year ice, and declining thickness and quality of shore-fast ice (Parkinson et al. 1999, Rothrock et al. 1999, Comiso 2003, Fowler et al. 2004, Lindsay and Zhang 2005, Holland et al. 2006, Comiso 2006, Serreze et al. 2007, Stroeve et al. 2008). These climatic phenomena may also affect seal abundances, the polar bear's main food source (Kingsley 1979, DeMaster et al. 1980, Amstrup et al. 1986, Stirling 2002).

Warming-induced habitat degradation and loss are negatively affecting some polar bear stocks, and unabated global warming will ultimately reduce the worldwide polar bear population (Obbard et al. 2010). Loss of sea ice habitat due to climate change is identified as the primary threat to polar bears (Schliebe et al. 2006, 73 FR 28212, Obbard et al. 2010). Patterns of increased temperatures, earlier spring thaw, later fall freeze-up, increased rain-on-snow events (which can cause dens to collapse), and potential reductions in snowfall are also occurring. However, threats to polar bears will likely occur at different rates and times across their range, and uncertainty regarding their prediction makes management difficult (Obbard et al. 2010).

While the main food source of polar bears is ice seals, bowhead whale carcasses have been available to polar bears as a food source on the North Slope since the early 1970s (Koski et al. 2005) and therefore may affect their distribution locally. As many as 65 polar bears have been observed feeding at a single bowhead whale carcass (Miller et al. 2006). Barter Island (near Kaktovik) has had the highest recorded concentration of polar bears on shore (17.0 ± 6.0 polar bears/100 km) followed by Barrow (2.2 ± 1.8) and Cross Island (2.0 ± 1.8). The high number of bears on/near Barter Island is thought to be due to the proximity to ice edge and higher ringed seal density at Barter Island (Schliebe et al. 2008), rather than the amount of whale harvest as the Kaktovik harvest is lower than that at Barrow or Cross Island.

Stable isotope analysis of polar bears in 2003 suggested that bowhead whale carcasses may have contributed 11-26% (95% CI) of the late winter (i.e., February through March) diet of the sampled population (Bentzen et al. 2007). In the winter of 2003-2004, the proportion was lower, at around 0-41% (Bentzen et al. 2007). A wide range of isotope values further suggested that consumption of bowhead whales varied widely among individual bears (Bentzen et al. 2007). Because most bears feed on bowhead whale during the fall harvest and sampling from this study represented only the late winter diet, consumption may differ from what was determined in this study.

Threats to the Polar Bear

Because the polar bear depends on sea ice for its survival, loss of sea ice due to climate change is its largest threat worldwide, although polar bear subpopulations face different combinations of human-induced threats (Obbard et al. 2010). The largest human-caused loss of polar bears is from subsistence hunting of the species, but for most subpopulations where subsistence hunting of polar bears occurs, it is a regulated and/or monitored activity (Obbard et al. 2010). Other threats include accumulation of persistent organic pollutants in polar bear tissue, tourism, human-bear conflict, and increased development in the Arctic (Obbard et al. 2010). Because uncertainty exists regarding the numbers of bears in some stocks and how human activities interact to ultimately affect the worldwide polar bear population, conservation and management of polar bears at the worldwide population level is challenging.

Summary

The worldwide polar bear population is likely declining. While polar bears face some direct threats from humans, the main threat to their population is loss of sea ice habitat due to climate change.

Polar Bear Critical Habitat

The Service designated polar bear critical habitat on November 24, 2010 (75 FR 76086). The Primary Constituent Elements (PCEs) of critical habitat for the polar bear are:

1) **Sea-ice habitat** used for feeding, breeding, denning, and movements, which is sea ice over waters 300 m (984.2 ft) or less in depth that occurs over the continental shelf with adequate prey resources (primarily ringed and bearded seals) to support polar bears.

2) **Terrestrial denning habitat**, which includes topographic features, such as coastal bluffs and river banks, with the following suitable macrohabitat characteristics:
   a) Steep, stable slopes (range 15.5–50.0), with heights ranging from 1.3 to 34 m (4.3 to 111.6 ft), and with water or relatively level ground below the slope and relatively flat terrain above the slope;
   b) Unobstructed, undisturbed access between den sites and the coast;
   c) Sea ice in proximity to terrestrial denning habitat prior to the onset of denning during the fall to provide access to terrestrial den sites; and
   d) The absence of disturbance from humans and human activities that might attract other polar bears.
3) **Barrier island habitat** used for denning, refuge from human disturbance, and movements along the coast to access maternal den and optimal feeding habitat, which includes all barrier islands along the Alaska coast and their associated spits, within the range of the polar bear in the United States, and the water, ice, and terrestrial habitat within 1.6 km (1 mi) of these islands (no-disturbance zone).

Critical habitat does not include manmade structures (e.g., houses, gravel roads, generator plants, sewage treatment plants, hotels, docks, seawalls, pipelines) and the land on which they are located existing within the boundaries of designated critical habitat on the effective date of this rule.

As described in the status section for polar bear, sea ice, including ice designated as critical habitat, is rapidly diminishing. Terrestrial denning locations in Alaska do not appear to be a limiting factor. However, rain-on-snow events may decrease den quality, and later onset of freeze-up in the fall may limit sea ice in proximity and therefore access to terrestrial denning habitat (72 FR 1064). Erosion of barrier islands and the Arctic shoreline, presumably caused by climate change (Mars and Houseknecht 2008), may be changing terrestrial denning habitat by creating or destroying bluffs.

Human activities such as ground-based vehicular traffic and low-flying aircraft occur in polar bear critical habitat. These activities may temporarily create disturbance between den sites and the coast (e.g., disturbance from ice roads), and may temporarily degrade the ability of barrier island habitat from being a refuge from human disturbance. For example, vessels may need to use barrier islands to weather out a storm, and this may interfere with a polar bear's ability to use barrier islands for the same purpose. However, these activities are usually infrequent and have short-term effects.

Summary

While other activities may diminish the quality of polar bear critical habitat, the primary factor affecting its status is loss of the sea ice critical habitat unit from climate change.

Environmental Baseline

Regulations implementing the ESA (50 CFR §402.02) define the environmental baseline to include the past and present impacts of all Federal, State, or private actions and other human activities in the Action Area. Also included in the environmental baseline are anticipated impacts of all proposed Federal projects in the Action Area that have undergone section 7 consultation and the impacts of State and private actions contemporaneous with the consultation in progress. We first briefly describe past oil and gas activities in the two Planning Areas and then describe the baseline of each species, including take associated with specific Federal projects. This environmental baseline provides the context within which the effects of the proposed Action will be analyzed and evaluated.

Past Oil and Gas Activities in the Beaufort and Chukchi Sea Planning Areas

The Action Area contains 670 active lease blocks permitted by BOEM in both Planning Areas (Table 2); it is therefore reasonable to expect that industry will continue to explore for hydrocarbons using techniques such as seismic surveys. Industry has also conducted high-resolution survey activities previously and plans to conduct more in the future. Likewise, some leases have been explored with wells, and industry proposes to drill more wells in the future. In the past industry has drilled 30 exploration wells in the Beaufort Sea OCS and five exploration wells in the Chukchi Sea OCS (BOEMRE 2011*a*: 6). Shell, Inc. has received permits from the U.S. Army Corps of Engineers and the EPA to continue exploratory drilling in the Chukchi and Beaufort Seas, and will likely obtain other necessary permits in the near future, including from BOEM.

Table 2. Summary of OCS leases in the Beaufort and Chukchi Seas as of September 6, 2011 (from BOEMRE 2011*a*: 1).

Sale-Planning Area	Hectares	Active Lease Blocks	Production/ Development
BF-Beaufort Sea	3,033	2	Northstar
124-Beaufort Sea	2,235	1	Northstar
144-Beaufort Sea	3,334	2	Liberty
186-Beaufort Sea	21,311	7	None
195-Beaufort Sea	170,464	82	None
202-Beaufort Sea	196,276	89	None
193-Chukchi Sea	1,116,277	487	None
Total	1,512,930	670	

Exploration has resulted in construction of four production facilities - Endicott, Oooguruk, and Nikaitchuq which are within state waters of the Beaufort Sea OCS, and Northstar which is extracting hydrocarbons from both state and OCS lease blocks (BOEMRE 2011*a*: 6). Exploration in the Chukchi Sea Planning Area has not yet resulted in development and production activities (BOEMRE 2011*a*: 6). However, BOEM estimates that viable oil accumulations could be present in the Chukchi Sea Planning Area (BOEMRE 2011*a*: 6).

This environmental baseline also includes anticipated impacts of other proposed and ongoing Federal projects and factors affecting species in the Action Area. These include:

- Pacific walrus and polar bear abundance, distribution, and trends (when known) and factors affecting these population indices in the Action Area, including loss of sea ice resulting from climate change and subsistence harvest;
- Letters of Authorization (LOAs) issued under the Beaufort and Chukchi Sea Incidental Take Regulations pursuant to section 101(a)(5) of the MMPA;

- LOAs for intentional take pursuant to sections 101(a)(4)(A), 109(h), and 112(c) of the MMPA;
- Proposed planning area documents and permits issued by the Corps, and the EPA for Industry-related development, including CD-5 and Point Thomson;
- The oil and gas lease offerings within the NPR-A Planning Areas managed by the BLM;
- Annual summer programmatic for activities in the NPR-A (e.g., the 2011 summer programmatic BO) for the next five years;
- NPR-A permits for winter travel on- and offshore for non-oil and gas activities for the next five years;
- Research in the NPR-A and OCS;
- U.S. Coast Guard operations;
- Polar bear research by the U.S. Geological Survey, MMM Office of the Service, and the North Slope Borough;
- Passive and preventative deterrence measures;
- Non-federal activities such as snow machine and recreation in the Action Area;
- The Corps permit for the Alaska Stand-alone Gas Pipeline (ASAP);
- Relocation of the Kaktovik Airport, Kaktovik, Alaska; and
- Other stressors acting on the species and PCEs of the critical habitat units, including National Science Foundation-funded ice-breaking projects and the annual on-ice science research camp.

Spectacled and Steller's Eiders

The North Slope-breeding population of spectacled eiders (approximately 12,916 breeding birds) and Steller's eiders (approximately 576 breeding birds) occupy terrestrial and marine parts of the Action Area for significant portions of their life history. Spectacled eiders breed, molt, and migrate in the Action Area, and Steller's eiders breed and migrate in the Action Area. Spectacled eiders nest throughout much of the ACP, whereas Steller's eiders have limited distribution across the ACP and highest breeding density near Barrow. Neither species is present in the Action Area from approximately November 15 to April 15.

Both species have undergone significant, unexplained declines in their Alaska-breeding populations. Factors that may have contributed to the current status of spectacled and Steller's eiders are discussed below and include, but are not limited to, toxic contamination of habitat, increased predator populations, harvest, and impacts of development, science impacts, and climate change. Factors that affect adult survival may be most influential on population growth rates. Recovery efforts for both species are underway in portions of the Action Area. Because similar factors most likely affect the baseline of spectacled and Steller's eiders, we present these factor together for these species.

Use of the Chukchi Sea

Specific information regarding spring migration routes for these species is lacking, but it is believed the listed eiders advance northward similarly to other species of eiders as spring leads develop in the eastern Chukchi Sea ice. Spectacled eiders and Steller's eiders occupy Ledyard Bay seasonally during their north and south migrations, although the duration of each species' use is not documented in detail. In spring they presumably move through Ledyard Bay as spring leads open, and in summer and autumn they return utilizing the open waters of Ledyard Bay, with spectacled eiders remaining in the area to molt. Large numbers of molting spectacled eiders are present in Ledyard Bay from late June until late October (Figure 13; Larned et al. 1995, Petersen et al. 1999). Steller's eiders that breed on the North Slope also use Ledyard Bay and nearshore Chukchi Sea water during their southward migration (Martin et al. *in prep*.).

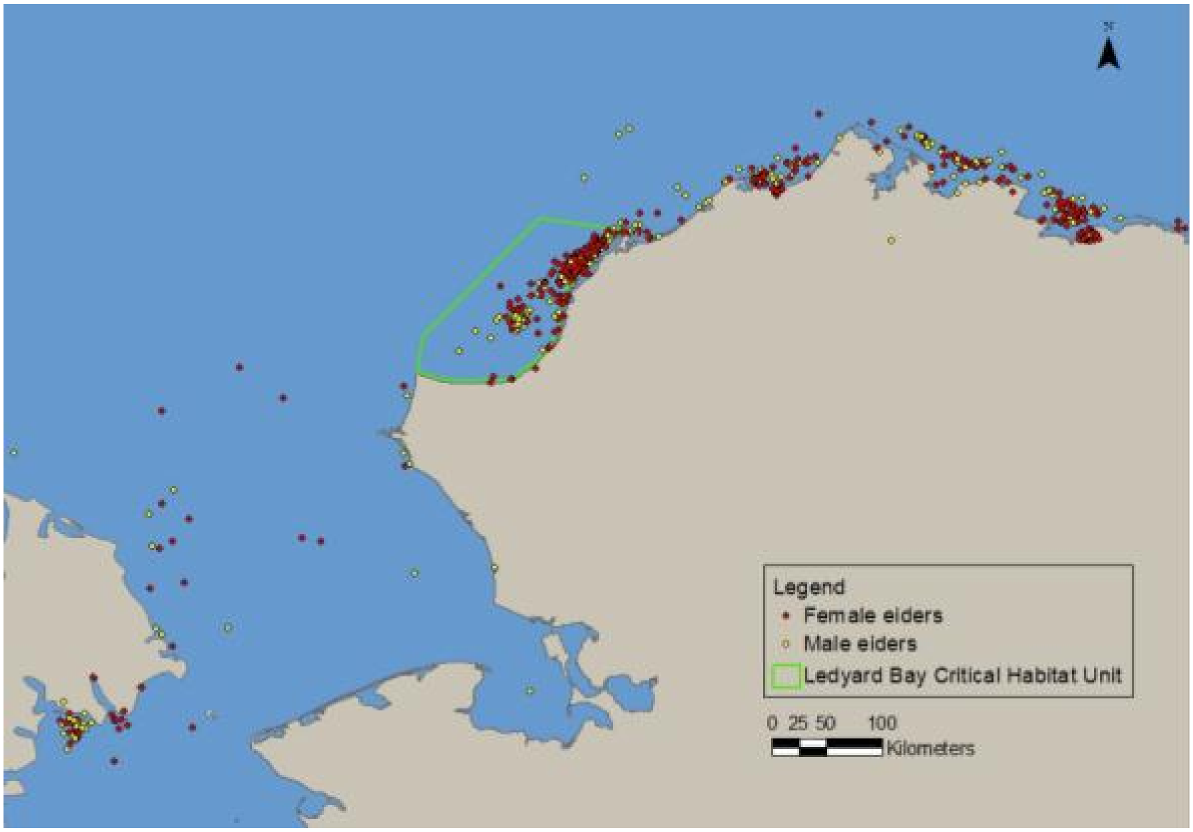


Figure 13. Satellite telemetry locations for 32 female and 23 male spectacled eiders in the eastern Chukchi and western Beaufort seas during 15 June – 15 November 2009, 15 June – 15 November 2010, and 15 June – 4 October 2011. Satellite transmitters were deployed on the North Slope during the 2009-2011 breeding seasons. Data provided by Matt Sexson, USGS Alaska Science Center (USGS, unpublished data for use only in this BO).

Use of the Beaufort Sea

Use of the Beaufort Sea by listed eiders varies over time and by breeding status, and is in part controlled by ice cover on the sea surface (Fischer and Larned 2004, TERA 2002, Schamel 1978). Breeding male spectacled eiders generally depart the terrestrial environment in late June when females begin incubation (Anderson and Cooper 1994, Bart and Earnst 2005). Use of the Beaufort Sea by departing males is variable as indicated by satellite telemetry studies (TERA 2002). Of 14 males implanted with transmitters, only 4 spent an extended period of time (11–30 days), in the Beaufort Sea (TERA 2002). Preferred areas were near large river deltas such as the Colville River where open water is more prevalent. Some appeared to move directly to the Chukchi Sea over land, although the majority moved rapidly (average travel of 1.75 days) over nearshore waters from breeding grounds to the Chukchi Sea (TERA 2002).

Females spectacled eiders generally depart the breeding grounds later, when much more of the Beaufort Sea is ice-free, allowing for more extensive use of the area. Females spent an average of 2 weeks in the Beaufort Sea (range 6-30 days) with the western Beaufort Sea the most heavily used (TERA 2002). Females also appeared to migrate through the Beaufort Sea an average of 10 km further offshore than the males (Peterson et al. 1999). This offshore migration route and the greater use of the Beaufort Sea by females is attributed to decreased sea ice later in summer when females migrate through the region (Peterson et al. 1999, TERA 2002).

Possible Threats in the Action Area

Toxic Contamination of Habitat

The main toxic threat to spectacled and Steller's eiders in the Action area is lead poisoning from lead shot in tundra or nearshore habitats used for foraging. Steller's eiders are exposed to lead near Barrow (> 0.2 ppm lead) and some have experienced lead poisoning (> 0.6 ppm; Figure 14), and lead isotope tests confirmed the lead in the Steller's eider blood was of lead shot origin (Angela Matz, USFWS, unpublished data). Use of lead shot for hunting waterfowl is prohibited statewide, and for hunting all birds on the North Slope. Hunter outreach programs are being undertaken to reduce illicit use of lead shot in this area.

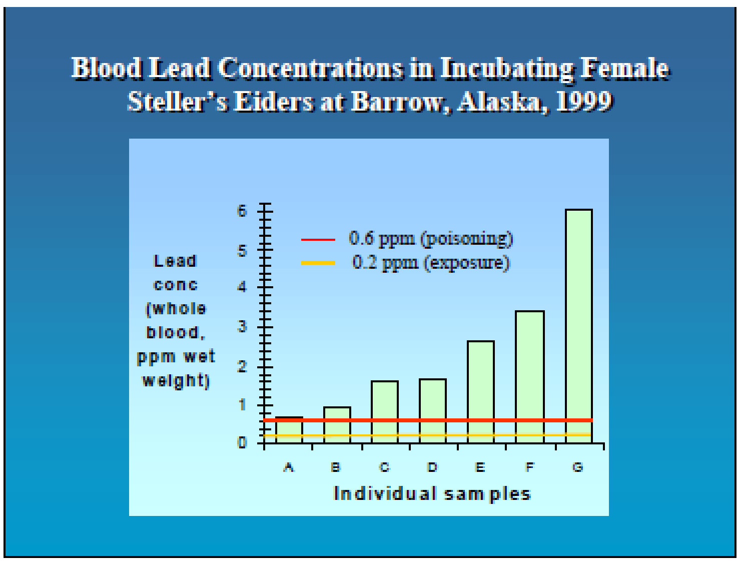


Figure 14. Blood lead concentrations in incubating female Steller's eiders at Barrow, 1999 (Service data).

Increased Predator Populations

Predator and scavenger populations may be increasing on the North Slope near sites of human habitation such as villages and industrial infrastructure (Eberhardt et al. 1983, Day 1998, Powell and Bakensto 2009). Reduced fox trapping, anthropogenic food sources in villages and oil fields, and nesting/denning sites on human-built structures may have resulted in increased fox, gull, and raven numbers (R. Suydam and D. Troy pers. comm., Day 1998). These anthropogenic influences on predator populations and predation rates may have affected eider populations, but this has not been substantiated. However, increasing predator populations are a concern, and Steller's eider studies at Barrow attributed poor breeding success to high predation rates (Obritschkewitsch et al. 2001), and in years where arctic fox removal was conducted at Barrow prior to and during Steller's eider nesting, nest success appears to have increased significantly (Rojek 2008, Service data).

Subsistence Harvest

Prior to the listing of Steller's and spectacled eiders under the ESA, some level of subsistence harvest of these species occurred across the North Slope (Braund et al. 1993). Hunting for spectacled and Steller's eiders was closed in 1991 by Alaska State regulations and Service policy, and outreach efforts have been conducted by the North Slope Borough, BLM, and Service to encourage compliance. Recent harvest data indicate that listed eiders continue to be taken during subsistence hunting on the North Slope. Although estimates of the number taken are imprecise, the Service is concerned about the scale of impacts, particularly for Steller's eiders. Continued efforts to eliminate harvest are being implemented in North Slope villages, and particularly at Barrow, where the greatest known concentrations of listed Steller's eiders occur. Intra-service consultations for the Migratory Bird Subsistence Hunting Regulations are conducted annually and harvest of all species, included listed eiders, is being monitored.

Impacts from Development and Disturbance

With the exception of contamination by lead shot, destruction or modification of North Slope nesting habitat of listed eiders has been limited to date, and is not thought to have played a major role in population declines of spectacled or Steller's eiders. While development activities may adversely affect listed eiders, these species were not listed as a result of the impacts of development. Until recently eider breeding habitat on the ACP was largely unaltered by humans, but limited portions of each species' breeding habitat have been impacted by fill of wetlands, the presence of infrastructure that presents collision risk, and other types of human activity that may disturb birds or increase populations of nest predators. These impacts have resulted from the gradual expansion of communities, coupled with cold war era military developments such as the Distant Early Warning (DEW) Line sites at Cape Lonely and Cape Simpson (circa 1957), and, more recently, the initiation and expansion of oil development since construction of the Prudhoe Bay field and Trans Alaska Pipeline System (TAPS) in the 1970s.

Oil development is gradually spreading westwards across the North Slope from the original hub at Prudhoe Bay. Given industry's interest in NPR-A as expressed by lease sales, seismic surveys, drilling of exploratory wells, and the construction of the Alpine field, expansion of industrial development is likely to continue. Development in NPR-A may also facilitate development in more remote, currently undeveloped areas such as the Chukchi Sea Planning Area or other areas of the Beaufort Sea Planning Area. Surveyors recorded a single spectacled eider in Klondike Prospect area on 8 September and a single spectacled eider off transect in Burger Prospect area on 16 September (Gall and Day 2010).

Development and other activities that may adversely affect listed eiders undergo a section 7 consultation, and the amount of impact is estimated in order to issue and Incidental Take Statement and a non-jeopardy conclusion. Table 3 summarizes recent activities in the Action Area that required formal section 7 consultations and the estimated incidental take of listed eiders. These actions are included in the environmental baseline for this consultation and were all considered in the analysis of this BO. For some actions included in this table, estimated take is likely to occur over the life of the project (often 30–50 years) rather than annually or during single years, thereby reducing the severity of the impact to the population.

Adverse effects on spectacled and Steller's eiders can range from disturbances that potentially cause nest abandonment or death of ducklings to the death of breeding adults. Because we expect only a small proportion of spectacled or Steller's eider eggs or ducklings to survive to maturity in the Action Area, loss of eggs or ducklings is less of a concern than the loss of breeding adults. Therefore, while the Service aims to minimize loss of all individuals in the population, losing an adult, especially a breeding female, negatively affects the population more than the loss of individuals that have not reached adult or breeding status. The majority of the incidental take estimated is a loss of eggs/ducklings, and this type of take has a much lower significance for survival and recovery of the species than the death of an adult bird. This take of eggs/ducklings is an estimate of potential take; actual take is likely much lower. Likewise, while we have estimated take of adult birds via collisions, no collision mortalities have been detected despite on-going project by project monitoring efforts. Thus, the take estimates in Table 3 are estimates; the actual or realized take is most likely much lower.

Table 3. Incidental take issued to federal agencies for spectacled and Alaska-breeding Steller's eiders. Con = contaminants, Col = collisions, Dis = disturbance, LOP = loss of production, C/H = capture/handling, C/H/S = capture/handling/surgery, HL = habitat loss, Res = research activities, EC = egg collection. With the exception of collisions, egg collection, and some surgery all these forms of take are non-lethal.

Project Name	Impact Type	Estimated Incidental Take
False Pass Harbor (2001)	Con	4 adult Steller's eiders
NPDES-GP (2001)	Col	1 adult Steller's eider
Chignik Lagoon Tank Farm (2001)	Con	14 adult Steller's eiders
Chignik Dock (2002)	Con	4 adult Steller's eiders
Chignik Bay Tank Farm (2002)	Con	5 adult Steller's eiders
Sandpoint Harbor (2002)	Con, Col, HL	13 adult Steller's eiders
Fairweather Seismic (2003)	Dis	66 adult Steller's eiders
Nelson Lagoon Tank Farm (2003)	Con, Col	21 adult Steller's eiders
Akutan Mooring Basin (2003)	Con, Col	10 adult Steller's eiders
Intra-Service, Issuance of Section 10 permits for spectacled eider (2000)	Dis Collection	10 spectacled eiders 10 spectacled eider eggs 25 spectacled eiders
Intra-Service, Section 10 permit for USFWS Barrow Steller's eider project (2003)	Res; EC for artificial incubation	24 Steller's eiders or Steller's eider eggs
Alpine Development Project (2004)	HL Col	4 spectacled eider eggs/ducklings 3 adult spectacled eiders
Barrow Hospital (2004 & 2007)	HL	2 spectacled eider eggs/ducklings 17 Steller's eider eggs/ducklings
Barrow Landfill (2003)	HL	1 spectacled eider nest/ year 1 Steller's eider nest/year
Barrow Tundra Manipulation Experiment (2005)	HL Col	2 spectacled eider eggs/ducklings 1 Steller's eider eggs/ducklings 2 adult spectacled eiders 2 adult Steller's eiders
Barrow Global Climate Change Research Facility, Phase I & II (2005 & 2007)	HL Col	6 spectacled eider eggs/ducklings 25 Steller's eider eggs/ducklings 1 adult spectacled eider

		1 adult Steller's eider
Barrow Wastewater Treatment Facility (2005)	HL	3 Steller's eider eggs/ducklings 3 spectacled eider eggs/ducklings
Savoonga Wind Turbine (2005)	Col	1 adult spectacled eider
ABR Avian Research/USFWS Intra-Service Consultation (2005)	Dis	5 spectacled eider eggs/ducklings
Pioneer's Oooguruk Project (2006)	HL, Col	3 spectacled eider eggs/ducklings 3 adult spectacled eiders
Barrow Artificial Egg Incubation (2006)	Removal of eggs for captive breeding program	Maximum of 24 Steller's eider eggs
Barrow Airport Expansion (2006)	HL	14 spectacled eider eggs/ducklings 29 Steller's eider eggs/ducklings
Intra-Service Consultation on MBM Avian Influenza Sampling in NPR-A (2006)	Dis	7 spectacled eider eggs/ducklings
KMG Nikaitchuq Project (2006)	HL Col	2 spectacled eiders/year 7 adult spectacled eiders
BP 69kV powerline between Z-Pad and GC 2 (2006)	Col	10 adult spectacled eiders
BP Liberty Project (2007)	HL, Col	2 spectacled eider eggs/ducklings 1 adult spectacled eider
Intra-service on Subsistence Hunting Regulations (2007)	No estimate of incidental take provided	
BLM Programmatic on Summer Activities in NPR-A (2007)	Dis	21 spectacled eider eggs/ducklings
Akutan Transportation (2007)	Dis	20 adult Steller's eiders
Unalaska Harbor (2007)	Con, Col, HL	3 adult Steller's eiders
Intra-Service Consultation on MBM Avian Influenza Sampling in NPR-A (2007)	Dis	6 spectacled eider eggs/ducklings
Goodnews Bay Processor (2008)	Dis	28 adult Steller's eiders
Intra-service on Subsistence Hunting Regulations (2008)	No estimate of incidental take provided	
BLM Programmatic on Summer Activities in NPR-A (2008)	Dis	56 spectacled eider eggs/ducklings
Intra-Service, Section 10 permit for USGS telemetry research on spectacled eider use of the Bering, Chukchi, and Beaufort Seas (2008; Yukon-Kuskokwim Delta field site)	LOP, C/H/S	156 spectacled eider eggs/ducklings 4 adults
BLM Northern Planning Areas of NPR-A (2008)	Dis, Col	87 spectacled eider eggs/ducklings/year 12 Steller's eider eggs/ducklings/year < 7 adult spectacled eiders < 1 adult Steller's eider
MBM/USFWS Intra-Service, Shorebird studies and white-fronted goose banding in NPR-A (2008)	Dis	21 spectacled eider eggs/ducklings
NOAA National Weather Service Office in Barrow (2008)	HL Dis Col	< 4 spectacled eider eggs/ducklings < 10 Steller's eider eggs/ducklings 1 adult Steller's eider
BP Alaska's Northstar Project (2009)	Col	≤ 2 adult spectacled eiders/year ≤ 1 adult Steller's eider/year

Intra-Service, Section 10 permit for USGS telemetry research on spectacled eider use of the Bering, Chukchi, and Beaufort Seas (2009; North Slope field sites)	LOP C/H	130 spectacled eider eggs/ducklings 4 adult spectacled eiders
Intra-service on Subsistence Hunting Regulations (2009)	No estimate of incidental take provided	
BLM Programmatic on Summer Activities in NPR-A (2009)	Dis	49 spectacled eider eggs/ducklings
Intra-Service, Migratory Bird Subsistence Hunting Regulations (2010)	No estimate of incidental take provided	
Intra-Service, Section 10 permit for USGS telemetry research on spectacled eider use of the Bering, Chukchi, and Beaufort Seas (2010; North Slope field sites)	LOP C/H/S	130 spectacled eider eggs/ducklings 7 adult/juvenile spectacled eiders (lethal take) 108 adult/juvenile spectacled eiders (non-lethal take)
BLM Programmatic on Summer Activities in NPR-A (2010)	Dis	32 Spectacled eider eggs
Intra-Service, USFWS Migratory Bird Management goose banding on the North Slope of Alaska (2010)	Dis	4 spectacled eider eggs/ducklings
Intra-Service, Section 10 permit for USFWS eider survey work at Barrow (2009)	Dis C/H	3 Steller's eider or spectacled eider clutches 90 Steller's and 60 spectacled eider pairs (nonlethal take; pre-nesting) 60 Steller's and 60 spectacled eider hens (nonlethal take; nesting) 1 Steller's eider or spectacled eider adult (lethal take) 7 ducklings Steller's eider or spectacled eider (lethal take) 30 Steller's eider or spectacled eider hens (nonlethal take) 40 Steller's eider or spectacled eider ducklings (nonlethal take)
Intra-Service, Section 10 permit for ABR Inc.'s eider survey work on the North Slope and at Cook Inlet (2010)	Dis	35 spectacled eider eggs/ducklings
Intra-Service, Migratory Bird Subsistence Hunting Regulations (2011)	Shooting	400 adult spectacled eiders (lethal take) 4 adult Steller's eiders (lethal take)
Olgoonik gravel pad and access road, Wainwright, Alaska (2011)	LOP	23 spectacled eider eggs/ducklings
Barrow Gas Fields Well Drilling Program, (2011)	LOP	20 spectacled eider eggs/ducklings 22 Steller's eider eggs/ducklings
Intra-Service, Migratory Bird Management Greater White-fronted Goose Banding, North Slope of Alaska (2011)	Dis	8 spectacled eider eggs/ducklings
Intra-Service, Section 10 permit for ABR Inc.'s eider survey work on the North Slope and at Cook Inlet (2011)	Dis	20 spectacled eider eggs/ducklings
Intra-Service, Section 10 permit for USFWS eider survey work at Barrow (2011)	Dis	4 Steller's and 4 spectacled eider clutches 20 additional Steller's or spectacled eider eggs 90 Steller's and 60 spectacled eider pairs (nonlethal take; pre-nesting)

	C/H	60 Steller's and 60 spectacled eider hens (nonlethal take; nesting) 20 Steller's and 20 spectacled eider hens (nonlethal take) 40 Steller's or spectacled eider ducklings (nonlethal take) 1 Steller's eider or spectacled eider adult (lethal take) 7 ducklings Steller's eider or spectacled eider (lethal take)
Intra-Service, Section 10 permit for USGS telemetry research on spectacled eider use of the Bering, Chukchi, and Beaufort Seas (2011; Colville River Delta field site)	C/H/S	65 juvenile + 13 adult spectacled eiders (non-lethal take) 7 adult/juvenile spectacled eiders (lethal take)
ConocoPhillips Alaska, Inc's CD-5 Project (Alpine reinitiation; 2011)	HL	59 spectacled eider eggs/ducklings

Research Impacts

Scientific, field-based research is also increasing in arctic Alaska as interest in climate change and its effects on high latitude areas continues. While many of these activities have no impacts on listed eiders, as they occur in seasons when eiders are absent from the area or use remote sensing tools, on-the-ground activities and tundra aircraft landings likely disturb a small number of listed eiders each year.

Climate Change

High latitude regions such as Alaska's North Slope are thought to be especially sensitive to the effects of climate change (Quinlan et al. 2005, Schindler and Smol 2006, Smol et al. 2005). While climate change will likely affect individual organisms and communities, it is difficult to predict with specificity or reliability how these effects will manifest. Biological, climatological, and hydrologic components of the ecosystem are interlinked and operate on multiple spatial, temporal, and organizational scales with feedback between the components (Hinzman et al. 2005).

Changes are occurring in the arctic worldwide, including on the Alaska's North Slope. Arctic landscapes are dominated by lakes and ponds (Quinlan et al. 2005), such as those used by listed eiders for feeding and brood rearing. In many areas these arctic water bodies are draining and drying out during summer as the underlying permafrost thaws (Smith et al. 2005, Oechel et al. 1995), and are losing water through increased evaporation and evapotranspiration resulting from longer ice-free periods, warmer temperatures, and longer growing seasons (Schindler and Smol 2006, Smol and Douglas 2007). Productivity of lakes and ponds appears to be increasing as a result of nutrient inputs from thawing soil and an increase in degree days (Quinlan et al. 2005, Smol et al. 2005; Hinzman et al. 2005, Chapin et al. 1995). Changes in water chemistry and temperature are also resulting in changes in the algal and invertebrate communities that form the basis of the food web in these areas (Smol et al. 2005, Quinlan et al. 2005).

With the reduction in summer sea ice, the frequency and magnitude of coastal storm surges has increased. These often result in breaching of lakes and low-lying coastal wetland areas, killing salt-intolerant plants and altering soil and water chemistry, and hence, the fauna and flora of the area (USGS 2006). Historically, sea ice has served to protect shorelines from erosion; however, this protection has decreased as sea ice decreases in extent and duration. Coupled with softer, partially thawed permafrost, the lack of sea ice has significantly increased coastal erosion rates (USGS 2006), potentially reducing available coastal tundra nesting habitat.

Changes in precipitation patterns, air and soil temperature, and water chemistry are also affecting tundra vegetation communities (Hinzman et al. 2005, Prowse et al. 2006, Chapin et al. 1995), and boreal species are expanding their ranges into tundra areas (Callaghan et al. 2004). Changes in the distribution of predators, parasites, and disease- causing agents resulting from climate change may have significant effects on listed species and other arctic fauna and flora. Climate change may also result in mismatched timing of migration and development of food in arctic ponds (Callaghan et al. 2004), and changes in the population cycles of small mammals such as lemmings to which many other species, including nesting Steller's eiders (Quankenbush and Suydam 1999), are linked (Callaghan et al. 2004).

Regional-scale environmental shifts may be underway in the Chukchi and the Bering seas that may affect spectacled and Steller's eider populations. Ice thickness generally increases from areas with mainly first-year ice (e.g., Russian Arctic: thickness of 2 m) to areas with multiyear ice cover (central Arctic) to a maximum north of Greenland (thickness: 7–8 m; Wadhams 2000 [from ACIA 2005]). However, recent observations show changes in annual sea ice thickness, extent (measured in September), and freeze/thaw dates. Submarine observations indicate a substantial reduction in the ice thickness from of about 15% per decade in various parts of the Arctic, a loss of summer ice extent by 3% per decade, and multiyear ice by 7% per (ACIA 2005). Since this 2004 report, satellite imagery has further documented a downward trend in September sea ice extent (historically when sea ice extent is at its minimum); 2011 was second lowest on record at 4.61 million sq km, which was only slightly above the lowest extent ever documented in 2007 (Figure 15; NSIDC 2011 [http://nsidc.org/asina/2011/100411.html, accessed 12/19/2011], Perovich et al. 2011 [Arctic Report Card]). From 1979 through 2009, satellite data from 10 Arctic regions indicated that nine of 10 regions experienced trends towards earlier spring melt and later autumn freeze onset (Markus et al. 2009). For the entire Arctic, the melt season length has increased by about 20 days during this period (Markus et al. 2009). The Chukchi/Beaufort seas region, which is part of the range of listed eiders, experienced one of the strongest trends towards a later autumn freeze date and longer melt season length (Markus et al. 2009). Such changes in sea ice extent and duration would likely affect Steller's and spectacled eider populations. While listed eider populations would likely be affected by climate change-induced ecological shifts in their terrestrial and marine environments, we are unable to predict with reasonable reliability the direction or magnitude of these impacts. Alteration of the timing and melting of sea ice also alters the ecosystem that ultimately provides prey to yellow-billed loons. Loss of sea ice could change the composition, location, and concentration of their prey.

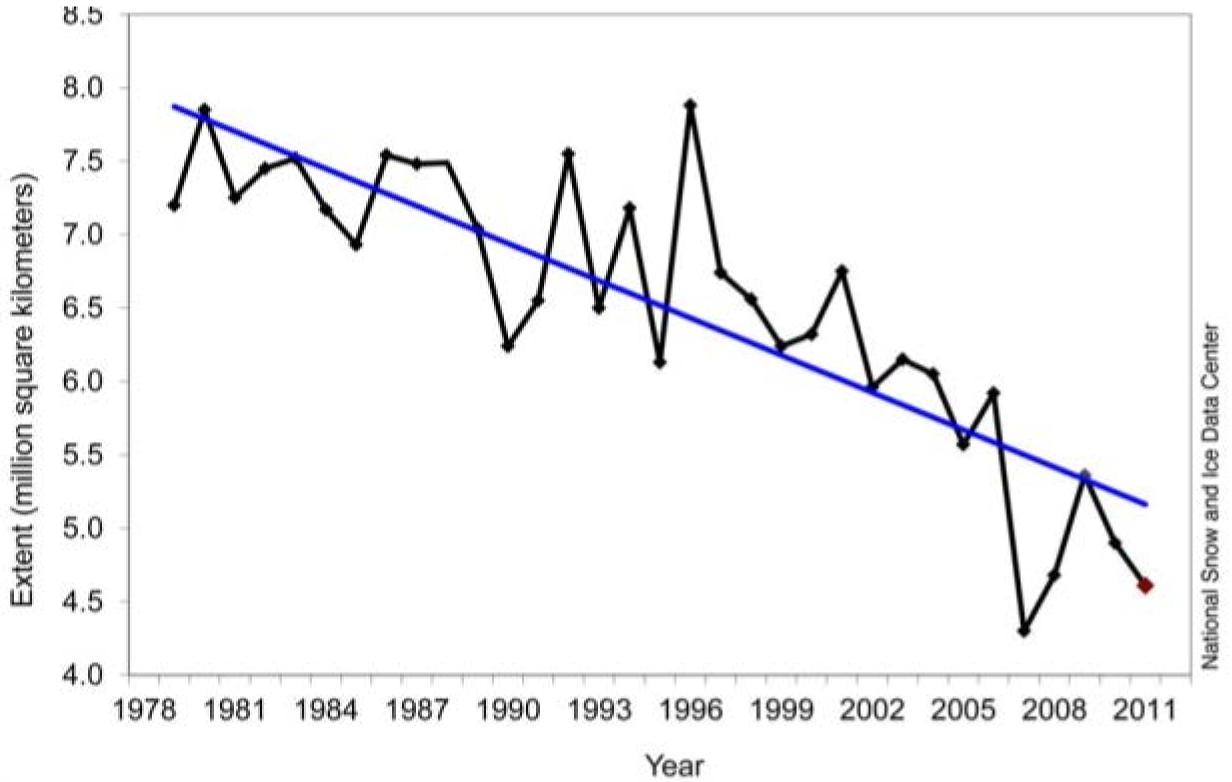


Figure 15. Average September arctic sea ice extent from 1979 through 2011. From NSIDC (2011). [http://nsidc.org/asina/2011/100411.html, accessed 12/19/2011]

Spectacled Eider Critical Habitat: Ledyard Bay Critical Habitat Unit

Due to the lack of industrial development and minimal human presence and vessel traffic in the region, the Chukchi Sea is currently largely in natural condition. Several key environmental factors, such as good water quality and lack of contamination, contribute to what can be considered the current good environmental conditions of the LBCHU. Current industrial impacts are minimal and pollution and/or sediments occur at very low levels in the area. The majority of water flowing into this marine environment is not subject to human activity or stressors and is considered unimpaired (Alaska's Final 2002/2003 Integrated Water Quality Monitoring and Assessment Report). There are no Section 303(d) impaired waterbodies identified within the Arctic Subregion by the State of Alaska. Background hydrocarbon concentrations in Chukchi Sea appear to be biogenic (naturally-occurring) and on the order of 1 part per billion or less; concentrations in the Hope Basin and Chukchi Sea are entirely biogenic in origin and are typical of levels found in unpolluted marine water and sediments. A study of heavy metals in sediments collected from portions of the eastern Chukchi in the 1990's (Naidu 2005) found concentrations were low and the environment was considered "pristine." Therefore, the LBCHU is currently largely in natural condition, free of physical modification or significant pollutants in either its water and sediments; and its physical and biological processes are functioning and promote production of a rich and abundant benthic community upon which spectacled eiders feed when they occupy the LBCHU.

A substantial portion of the LBCHU overlaps with the Chukchi Sea Planning Area (Figure 16). Molting spectacled eiders in LBCHU depend on the marine benthic community to meet their high nutritional requirements during the energetically demanding molt period. Feder et al. (1989, 1994*a*, 1994*b*) found a different substrate (muddy-gravel) and invertebrate community in the western LBCHU than sites sampled further east. This information suggests the western portion of LBCHU is less favorable for molting spectacled eiders than the central and eastern LBCHU.

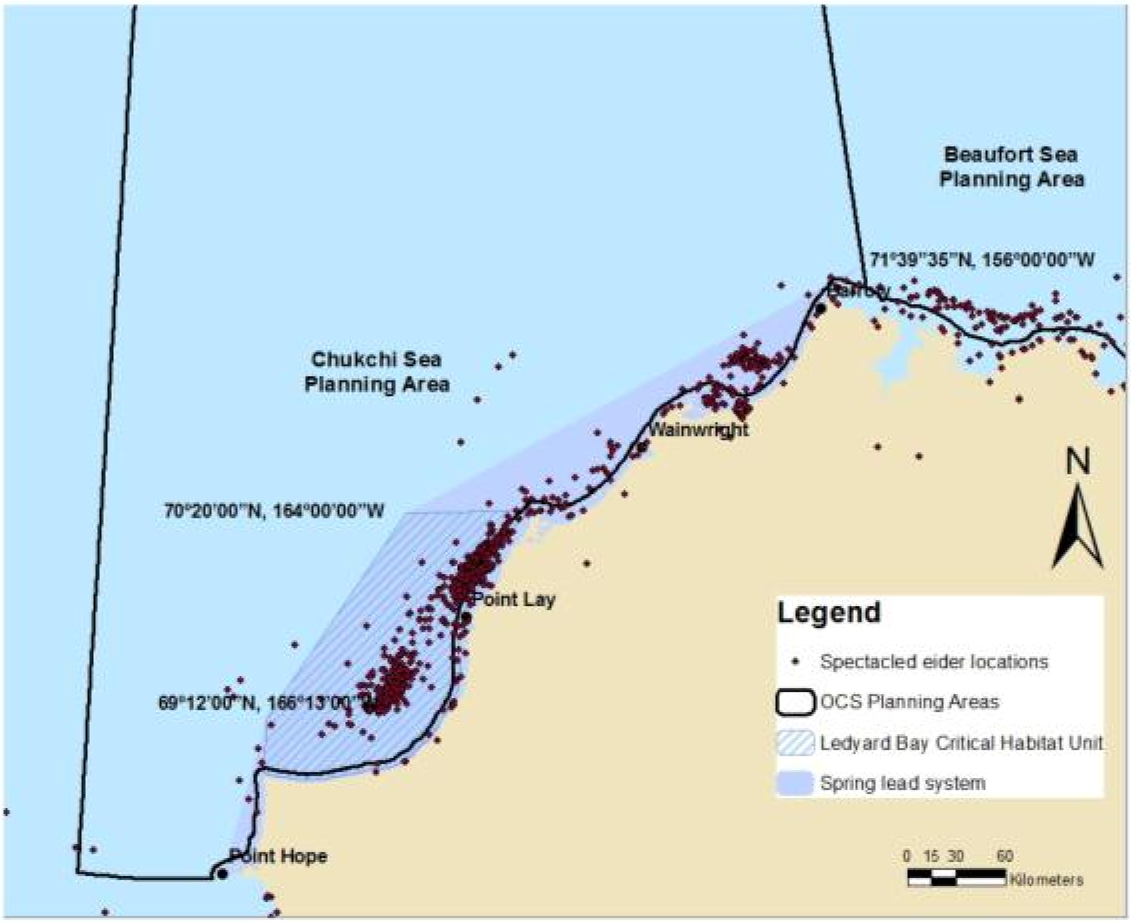


Figure 16. Spring and fall locations of spectacled eiders observed during aerial surveys in Ledyard Bay (service data) in relation to the LBCHU boundaries and the Chukchi Sea Planning Area.

Yellow-billed Loons

Yellow-billed loons use nearshore and offshore marine waters adjacent to their breeding areas for foraging in summer (Figure 17). Although some yellow-billed loons may briefly use the Beaufort Sea coast prior to migrating west, most individuals appear to migrate directly west to the Chukchi coast Schmutz *pers.* 2008, Rizzolo and Schmutz 2010). While these loons are sparsely distributed across their breeding range, at a large scale breeding birds are somewhat clumped in distribution, especially areas between the Meade and Ikpikpuk Rivers, in the Colville River Delta, and at Teshekpuk Lake (Earnst et al. 2005). Yellow-billed loons generally depart breeding areas in late September, arrive in wintering locations in mid-November, initiate spring migration in April, and arrive on breeding grounds in the first half of June (Schmutz *pers.* 2008, Rizzolo and Schmutz 2010). Non-breeders or failed nesters may start fall migration and enter Chukchi Sea marine waters in late June to mid-July (Rizzolo and Schmutz 2010).

Yellow-billed loons generally migrate along the Chukchi coast during both spring and fall, generally in nearshore marine waters; however, they have shown a general trend of greater distance from shore along the southwestern coast than the northeastern coast, particularly in Ledyard Bay (Rizzolo and Schmutz 2010). Satellite locations of loons indicated they concentrate in Peard Bay, Wainwright Inlet, Kasegaluk Lagoon, Ledyard Bay, near Cape Lisburne and near Point Hope (Rizzolo and Schmutz 2010). Based on satellite telemetry data, total time spent by loons between Point Barrow and Cape Lisburne during migrations was up to 1 month, but less than 2 weeks for most individuals (Schmutz *pers. comm.* 2008).

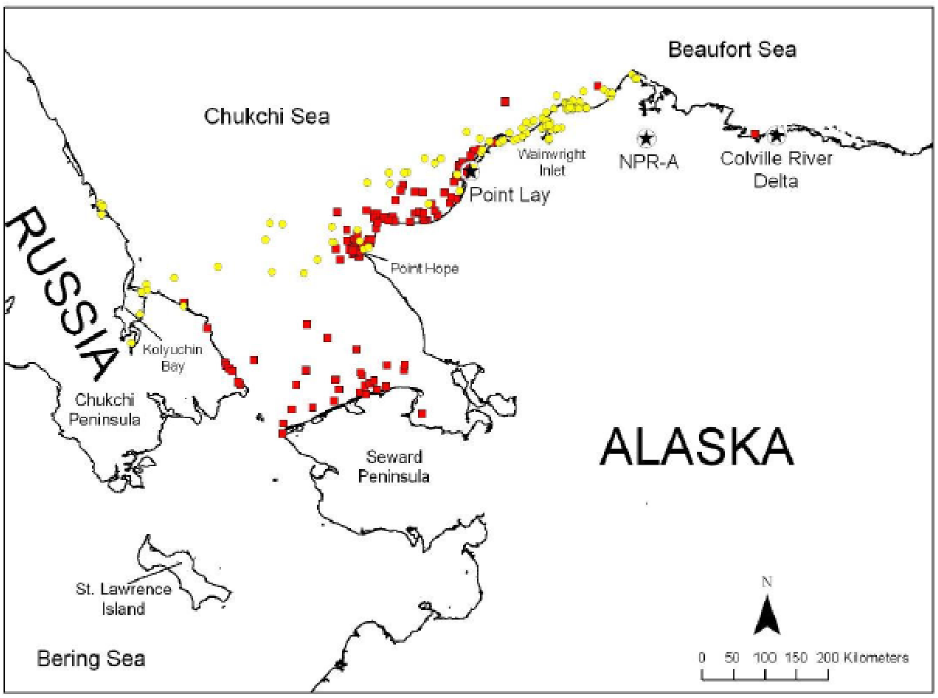


Figure 17. Chukchi Sea telemetry locations of Red-throated Loons (red squares) and Yellow-billed Loons (yellow circles) marked in with PTTs in 2010. All locations up to 13 December 2010 are presented. Capture sites are indicated by stars. From Rizzolo and Schmutz (2010).

Some yellow-billed loons occasionally use coastal areas in the Beaufort Sea; North Slope aerial surveys for common loons in June also detected yellow-billed loons in nearshore waters and along barrier islands of the Beaufort Sea (Dau and Larned 2007). Use of the Beaufort Sea by yellow-billed loons varies over time and by breeding status, and is in part controlled by ice cover on the sea surface (Fischer and Larned 2004, TERA 2002, Schamel 1978). Spring migration appears to take place over a broad front (Richardson and Johnson 1981). In early June, runoff water from large rivers such as the Colville forms shoreleads that are used by waterbirds including yellow-billed loons (Richardson and Johnson 1981). Observations of yellow-billed loons in the Beaufort Sea during migration establish that at least some yellow-billed loons breed in Canada’s Arctic Islands and along the adjacent Canadian coast use this migration route.

In designating the yellow-billed loon as a candidate species, the Service considered the best available data about factors that could affect their populations. Factors that may be affecting yellow-billed loons in the Action Area are thought to include harvest (assessed in this document in the *Effects of the Action* section), oil and gas development, inadvertent fishing by-catch, climate change, and conservation efforts.

Oil and Gas Development

Oil and gas development has occurred on the North Slope, primarily on state lands between the Arctic National Wildlife Refuge and NPR-A. Over 90% of yellow-billed loons nesting on the North Slope nest within NPR-A (USFWS 2009c). The majority of yellow-billed loon nesting habitat in NPR-A is not presently affected by development because only seismic and exploratory operations have been conducted in NPR-A to date. However, the BLM has authorized two satellite production pads (CD-6 and CD-7) as part of the ConocoPhillips Alpine Satellite Development project (Alpine) in the Northeast Planning Unit (USBLM 2004), and the USACE has recently authorized the development of another Alpine satellite facility (CD-5; USACE Permit No. POA-2005-1576, issued December 19, 2011) and associated roads and pipelines on Ukpiagvik Inupiat Corporation (UIC) lands within the Northeast Planning Unit boundary. Although additional development has been authorized and is likely to occur in the future, we expect disturbance and habitat degradation that may result from oil and gas development on BLM-managed lands in NPR-A would largely be mitigated by BLM's stipulations and required operating procedures (USBLM 2004, USBLM 2008). The remaining North Slope nesting population, particularly yellow-billed loons nesting on the Colville River Delta and lower concentrations in the Kuparuk and Prudhoe Bay oil fields, may be affected by current oil and gas development on non-Federal lands, including Alpine's existing Central Processing Facility (CPF; CD-1) and satellite production pads (CD-2, CD-3, and CD-4) on the Colville River Delta.

The potential negative effects of industrial development in yellow-billed loon nesting areas includes disturbance caused by aircraft, vehicular traffic, heavy-equipment use, maintenance activities, and pedestrian traffic. Disturbance to nesting birds from oil infrastructure has been widely discussed but poorly documented (National Research Council 2003, BLM 2008). Loons as a genus are susceptible to disturbance, although they sometimes habituate to predictable disturbance (Vogel 1995, Barr 1997, Evers 2004, Earnst 2004, Mills and Andres 2004, North 1994). Human disturbance could cause yellow-billed loons to abandon reproductive efforts or leave eggs or chicks unattended and exposed to predators or bad weather (Earnst 2004).

Both non-nesting and breeding yellow-billed loons on Alaska's North Slope use marine areas of the Beaufort and Chukchi seas to forage. Additionally, in spring yellow-billed loons gather in polynyas, ices leads, and open shorelines near river deltas offshore of breeding areas prior to dispersing to nesting grounds. Thus yellow-billed loons are at risk from spills of crude and refined oils that may result from oil and gas development in the area.

Surveyors saw a group of three yellow-billed loons in Klondike and two groups totaling three birds in the Burger Prospect area in early fall; they also saw a single bird in Klondike Prospect area in late fall (Gall and Day 2010). In 2009, surveyors saw 23 groups totaling 48 yellow-billed loons, and they were seen primarily in early fall and primarily in Burger Prospect area and the eastern half of Klondike Prospect Area (Gall and Day 2010).

Water withdrawal from freshwater lakes to construct ice roads and pads, or supply exploration camps may adversely affect nesting habitat. However, regulations by the State of Alaska and BLM will likely prevent any significant adverse effects to yellow-billed loons from water withdrawal activities (USFWS 2009*c*).

As the majority of yellow billed loon breeding areas in western Alaska are managed as wildlife refuges or national parks, they are not subject to the same broad-scale extractive industry or infrastructure as the North Slope. While future development could occur there, oil and gas development is not a threat at present.

Subsistence Fishing By-catch

Across the Alaska breeding range of the yellow-billed loon, rural residents fish using gill nets near villages and fish camps, in marine inlets and lagoons, lakes, and rivers (Craig 1987, Bacon 2008 *pers. comm*.). During the breeding season, yellow-billed loons often forage for fish in the same areas targeted for fishing (Earnst 2004), which leads to the potential for loons being inadvertently caught in nets. Yellow-billed loons may also be susceptible during spring and fall migrations when foraging in near-shore marine habitats.

While it is illegal to kill yellow-billed loons under the MBTA, fishermen on the North Slope are allowed to possess up to 20 total yellow-billed loons inadvertently caught in nets annually (USFWS 2009*b*). Little information is available regarding the number of loons caught in subsistence nets for most of the state, with the exception of the North Slope, which is discussed in more detail below.

The North Slope Borough Department of Wildlife (NSB) has asked fishermen to immediately report inadvertent entanglements of yellow-billed loons and has required such reporting by the end of each season (USFWS 2009*a*). Participation by fishermen is incomplete, and likely varies annually. NSB reports indicate that two to 14 yellow-billed loons were reported as killed in subsistence nets annually from 2005-2007 in Barrow (Acker and Suydam 2006, Acker and Suydam 2007, Hepa and Bacon 2008, Hepa and Bacon 2010). Small numbers of loons, including yellow-billed loons, were also reported as found alive and released. These numbers are likely a minimum estimate of yellow-billed loon subsistence by-catch in the Barrow area because not all fishermen were contacted (Hepa and Bacon 2008). Additionally, anecdotal evidence suggests that yellow-billed loons killed in fishing nets have been reported as part of the subsistence harvest rather than as inadvertent catch in fishing nets (USFWS 2010). Due to apparent confusion between hunting and fishing by-catch as sources of yellow-billed loon mortality on the North Slope, both sources are discussed further in the upcoming section reporting harvest survey estimates.

In summary, data is limited on the number of yellow-billed loons taken inadvertently during subsistence fishing in Alaska. We do not have enough information to extrapolate subsistence by-catch accounts to areas lacking data or to evaluate likely population-level affects. While it is possible that take of yellow-billed loons during subsistence fishing, combined with other threats, may impact recovery of the species, conservation recommendations by the Service will strive to improve estimates of this source of mortality.

Climate Change

There are multiple hypothetical mechanisms associated with climate change that could potentially affect loons and their breeding and non-breeding habitats. Currently, however, we lack predictive models on how climate change will affect yellow-billed loon terrestrial, freshwater, and marine habitats, and there is little certainty regarding the timing, magnitude, and net effect of impact. Climate may affect the yellow-billed loon population during the life of this project, but how and to what degree is unknown.

Conservation Efforts

In 2006, the Service, National Park Service, Alaska Department of Natural Resources, Alaska Department of Fish and Game, Bureau of Land Management, and the North Slope Borough entered into a "Conservation Agreement for the Yellow-billed Loon (*Gavia adamsii*)." The agreement specifies the goal of protecting the yellow-billed loon and its habitat in Alaska and identifies several strategies for achieving this goal. These strategies include: (1) implement specific actions to protect yellow-billed loons and their breeding habitats in Alaska from potential impacts of land uses and management activities, including oil and gas development; (2) inventory and monitor yellow-billed loon breeding populations in Alaska; (3) reduce the impact of subsistence activities (including fishing and hunting) on yellow-billed loons in Alaska; and (4) conduct biological research on yellow-billed loons, including response to management actions.

The Service and its Conservation Agreement partners have continued collaborating to collect and refine information about the yellow-billed loon to help guide future management. Past and continuing Service outreach efforts include trips to Gambell and Savoonga on St. Lawrence Island (Zeller 2003, Ahmasuk 2009) to gain information on loon subsistence harvest. Based on these visits and information from other villages, the Service has developed conservation measures to reduce take of yellow-billed loons and improve harvest surveys, which are included in this document. For example, the BLM has proactively worked with loon experts and the Service to identify appropriate protections for the species and its habitat. Those protections were incorporated into their Records of Decision for NPR-A management plans and oil and gas leases.

Kittlitz's Murrelet

The Kittlitz's murrelet occurs in the Action Area at low densities. Data from 31 satellite transmittered birds captured at four Gulf of Alaska (GOA) sites (Icy Bay, Glacier Bay, Prince William Sound, Kachemak Bay), and a single Aleutian Island (Atka Island) in 2009-2011 showed that Kittlitz's murrelets can use portions of the Action Area as far east as the southern Beaufort Sea (Figure 18). Point Lay was identified as a post-breeding foraging location. Surveyors saw a few (four to five) Kittlitz's murrelets in 2008 in Klondike Prospect area and in late fall (Gall and Day 2010). In 2009, surveyors recorded a single Kittlitz's murrelet in Klondike in early fall and a group of six in Burger Prospect area in late fall (Gall and Day 2010). Madison et al. (2011) speculate that Kittlitz's murrelets observed during at-sea surveys along the ice edge during winter in the northern Bering Sea may include birds that migrate from the GOA in fall, perhaps reflecting a migration strategy that exploits productive glacial-marine waters in summer and productive sea ice-edge habitat in winter. The ultimate cause for the population decline of Kittlitz's murrelet is unknown, but activities in the Action Area are not thought to be impacting the decline or recovery of this species.

Figure 18. Data from satellite-transmittered Kittlitz's murrelets in 2009-2011 in the Action Area. From Madison et al. (2011).

Kittlitz's murrelets are present in extremely low numbers in the Action Area, if at all, and likely face few human-caused threats in the Action Area.

Polar Bears

The highest number of polar bears in the Action Area occur on land during fall and winter when some polar bears enter in the coastal environment as they abandon melting sea ice, search for food on/near land (e.g., whale carcasses), or search for suitable den sites (pregnant females). Bears may also spend a short time on land to move to other areas. If fall storms and ocean currents deposit bears on land, they may remain along the coast or on barrier islands for several weeks until the ice returns. However, polar bears do not use the Chukchi Sea and adjacent Alaska coastline in the same manner they use the Beaufort Sea and North Slope (Craig Perham, MMM-FWS, *pers. com.*). The numbers of bears using and accessing the Alaska coastline of the Chukchi Sea during the open-water season would likely be lower than the number of bears using the Beaufort Sea coastline, and interactions with offshore facilities would be related to their proximity to ice.

Polar bears managed as part of the Chukchi/Bering Sea (CBS) and southern Beaufort Sea (SBS) stocks occur in the Action Area (Figure 19). Therefore, we focus our discussion on the status of these two stocks.

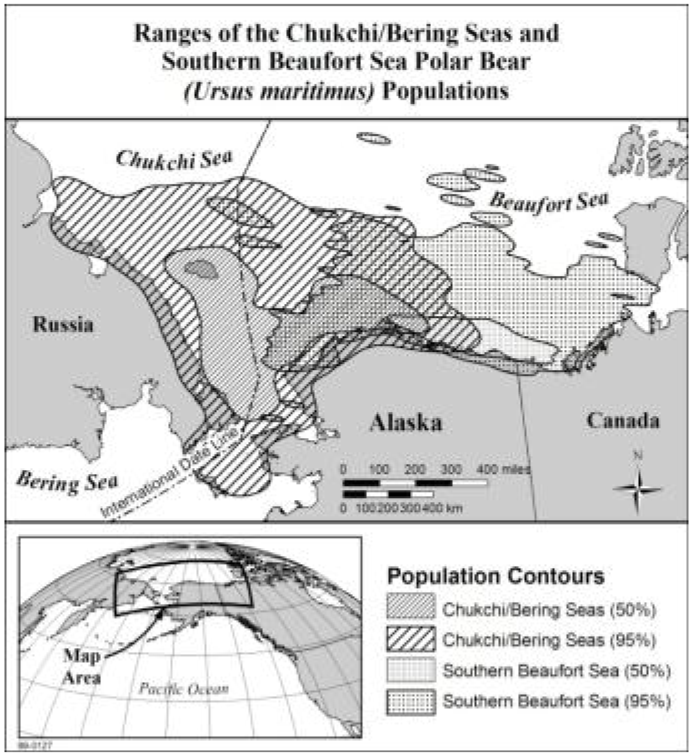


Figure 19. Ranges of Alaska polar bear stocks (73 FR 28212).

Chukchi/Bering Sea Stock

The CS stock is widely distributed on the pack ice of the northern Bering, Chukchi, and eastern portions of the Eastern Siberian seas (Figure 19; Garner et al. 1990, Garner et al. 1994, Garner et al. 1995), and the constant movement of pack ice influences the movement of these polar bears; these variables make obtaining a reliable population size estimate from mark and recapture studies challenging. For example, polar bears of this stock move south with advancing ice during fall and winter and north in advance of receding ice in late spring and early summer (Garner et al. 1990). Thus, the most recent (early 1990s) CS stock estimate of 2,000-5,000 animals (Belikov 1993) based on incomplete aerial den surveys has little management value. Expert opinion lists the size of the subpopulation was approximately 2,000 polar bears (Aars et al. 2006). Currently, the Polar Bear Specialist Group (PBSG) lists the CS subpopulation as declining based on reported high levels of illegal killing in Russia, continued legal harvest in the United States, and observed and projected losses in sea ice habitat (Table 4, Obbard et al. 2010).

Southern Beaufort Sea Stock

The SBS is distributed across the northern coasts of Alaska, Yukon, and Northwest territories of Canada (Figure 19). Estimates of the population size of the SBS were 1,778 from 1972 to 1983 (Amstrup et al. 1986), 1,480 in 1992 (Amstrup 1995), and 2,272 in 2001 (Amstrup, USGS unpublished data). Declining survival, recruitment, and body size (Regehr et al. 2006, Regehr et al. 2009, Rode et al. 2010), and low population growth rates during years of reduced sea ice (2004 and 2005), and an overall declining population growth rate of 3% per year from 2001 to 2005 (Hunter et al. 2007) suggest that the SBS is now declining, and Regehr et al. (2006) estimated the SBS to be 1,526 (95% CI = 1,211; 1,841). The status of this stock is listed as 'reduced' by the IUCN (Obbard et al. 2010) and 'depleted' under the MMPA. Based on oil and gas industry observations and Service survey data, up to 125 SBS individuals have been observed in fall in the Action Area on barrier islands or the coastline between Barrow and the Alaska-Canada border.

Table 4. IUCN and MMPA statuses of the two polar bear stocks in the Action Area.

	#IUCN Polar Bear Species Group			
Subpopulation/stock	Population status	Population trend	Population size	*MMPA Status
Chukchi Sea	Reduced	Declining	Unknown	Depleted
Southern Beaufort Sea	Reduced	Declining	1,526 (95% C.I.: 1,211 – 1,841)	Depleted

The Polar Bear Specialist Group (PBSG) is one of the research scientist groups that works under the auspice of the International Union for the Conservation of Nature (IUCN); Obbard et al. (2010)
* Marine mammals listed under the Endangered Species Act are given a "depleted" status under the Marine Mammal Protection Act (MMPA).

Threats and Possible Stressors in the Action Area

The two main stressors in the Action Area for the polar bear are loss of sea ice resulting from climate change and subsistence hunting. We discuss these factors and others that may be affecting the population in the Action Area.

Loss of Sea Ice

Declines in sea ice have occurred in optimal polar bear habitat in the southern Beaufort and Chukchi seas between 1985 to 1995 and 1996 to 2006, and the greatest declines in 21st century optimal polar bear habitat are predicted to occur in these areas (Durner et al. 2009). These stocks are vulnerable to large-scale dramatic seasonal fluctuations in ice movements which result in decreased abundance and access to prey, and increased energetic costs of hunting. The CBS and the SBS are currently experiencing the initial effects of changes in sea ice conditions (Rode et al. 2010, Regehr et al. 2009, and Hunter et al. 2007). Regehr et al. (2010) found that the vital rates of polar bear survival, breeding rates, and cub survival declined with an increasing number of ice-free days/year over the continental shelf, and suggested that declining sea ice affects these vital rates via increased nutritional stress.

Subsistence Harvest

The largest loss of polar bears from humans in the Action Area is from subsistence hunting. While the U.S. has no statutes to regulate subsistence hunting, the Service and Alaska Natives have worked internationally on agreements to self-regulate lethal take of polar bears for subsistence purposes. The signing of the Multilateral Agreement for the Conservation of Polar Bears in 1973 was the impetus for setting harvest quota levels. Quota levels are set by the Inuvialuit-Inupaiq (I-I) council and the U.S. – Russia Polar Bear Commission (Commission) for the southern Beaufort Sea and Chukchi/Bering Sea stocks, respectively.

Southern Beaufort Sea stock – The I-I council set a quota of 70 polar bears (email T. DeBruyn, August 13, 2010) based on a population estimate of 1,526 (Regehr et al. 2006; email T. DeBruyn, August 13, 2010). The reported annual average combined (Alaska-Canada) harvest for the southern Beaufort Sea from 2004 to 2009 was 44, and the 2008/2009 reported harvest for North Slope villages was 25 polar bears (DeBruyn et al. 2010).

Chukchi Sea stock – Russia and the U.S. signed the Bilateral Agreement in 2000 to manage harvest of the CS stock; implementing legislation for the Bilateral Agreement was signed in the U.S. on January 12, 2007. Based upon subsistence needs and the best available science and local information, in June 2010 the Commission placed an annual harvest limit for the CS at of 19 females and 39 males (DeBruyn et al. 2010). Harvest will be split evenly between Native peoples of Alaska and Chukotka. The Alaskan share of the harvest is 29 polar bears per year, which is slightly lower than the average of 37 polar bears harvested each year between 2004 and 2008 (USFWS, unpublished data).

Polar Bear Research

Currently, several ongoing polar bear research programs take place in the Action Area. The long-term goal of these research programs is to gain information on the ecology and population dynamics of polar bears to help inform management decisions, especially in light of climate change. These activities may cause short-term adverse effects to individual polar bears targeted in survey and capture efforts and may incidentally disturb those nearby. In rare cases, research efforts may lead to injury or death of polar bears. Polar bear research is authorized through permits issued under the MMPA. These permits include estimates of the maximum number of bears likely to be directly harassed, subjected to biopsy darting, captured, etc., and include a condition that halts a study if a certain number of deaths, usually four to five, occur during the life of the permit; permits are typically for five years.

Incidental Take Regulations

Incidental Take Regulations (ITRs) for the Beaufort (76 FR 47010) and Chukchi (73 FR 33212) seas have been issued under the MMPA for oil and gas activities in and adjacent to the Beaufort and Chukchi seas since the early 1990s. We considered effects of issuing the current ITRs on polar bears in the *Environmental Baseline* of this document. Oil and gas companies can obtain Letters of Authorization (LOAs) under the appropriate regulations based on the geographical location of their activities. As part of the LOAs issued pursuant to these regulations, the oil and gas industry is required to report the number of polar bears observed, their response, and if deterrence activities were required (see below). Reports from the area regulated under the Beaufort Sea ITRs from 2006-2009 show that on average 306 polar bears are observed by the oil and gas industry annually (the actual numbers per year ranged from 170 to 420). About 81% of bears observed showed no change in their behavior, 4% altered their behavior by moving away from (or towards) the industrial activity, while the remaining 15% were subject to intentional hazing or other deterrence actions (described below). Because few oil and gas activities occur in the Chukchi Sea, few polar bear sightings have been reported associated with these activities.

Deterrence Activities and Intentional Take Authorization

Polar bear deterrence associated with oil and gas and other activities takes place in the Action Area. The Service previously consulted on a Final Rule regarding passive and preventative deterrence measures that any person can use (e.g., acoustical and vehicular deterrence) when working in polar bear habitat (75 FR 61631). The Service concluded that these methods are not likely to adversely affect polar bears and are likely to cause, at most, only short-term changes in behavior, such as bears running away from the disturbance (75 FR 61631). These methods would not require authorization via LOAs. However, the Service issues LOAs that authorize intentional taking of polar bears for both human and bear safety pursuant to 101(a)(4)(A), 109(h), and 112(c) to appropriately-trained individuals .

Intentional-take LOAs allow trained individuals to use other mechanisms (e.g., use of projectiles) to deter polar bears away from human structures and activities. These deterrence activities are necessary tools to prevent the lethal take of polar bears or potential for injury to personnel. Intentional take LOAs would allow trained individuals to use other mechanisms (e.g., chemical repellants, electric fences, ad projectiles such as bean bags projected from a shotgun) to deter polar bears away from infrastructure and personnel, and would allow the Service to require mitigation measures and ensure minimum standardized training in the use of deterrence methods.

From August 2006 through July 2010, the oil and gas industry working in the Beaufort Sea or its adjacent coast reported the sightings of 1,414 polar bears, of which 209 (15%) were intentionally harassed, or deterred (C. Perham, pers. communication, email, July 12, 2011). Annually, the percent of total bears sighted that were deterred ranged from 9% in 2010 to 43% in 2006, with an average of 15%. In the majority of cases deterrence is accomplished using acoustical or vehicular deterrence methods. However, infrequently chemical repellants and projectiles are used. For example, from August 2006 through July 2011 between zero and five polar bears were deterred via bean bags and between zero and one were deterred via rubber bullets annually. One bear was accidentally killed in August 2011 due to the misuse of a firecracker round.

Other Activities

Polar bear viewing at sites such as the whale bone piles may result in disturbance of polar bears by humans on foot, ATVs, snow machines, and other vehicles. Although difficult to quantify, these disturbances are usually temporary and are not spatially very extensive which likely limits the extent and severity of their impact.

Summary

The primary concern for polar bears in the Action Area is loss of sea ice. While other stressors are managed, they are not currently thought to be significant threats to polar bear populations; however, each could become more significant in combination with future effects of climate change and the resultant loss of sea ice.

Polar Bear Critical Habitat

The Action Area encompasses most of the sea ice and barrier island critical habitat units and a portion of the terrestrial denning critical habitat unit. As with polar bear critical habitat as a whole, the largest threat to polar bear critical habitat in the Action Area is loss of sea ice from climate change. When evaluating the condition of the PCEs in the Action area we also considered ongoing and previously consulted on federal actions in the Action Area as part of the baseline. They include research on polar bears by USGS and FWS, summer activities and research in NPR-A, contaminated site remediation and restoration, and development projects in and adjacent to North Slope villages. We also considered the effects of the Beaufort and Chukchi Sea ITRs and LOAs issued pursuant to them.

Exposure to environmental contaminants may affect polar bear survival or reproduction. Thus, the presence of contaminants within polar bear critical habitat could affect the conservation value of the habitat. Three main types of contaminants in the Arctic are thought to pose the greatest potential threat to polar bears: petroleum hydrocarbons, persistent organic pollutants (POPs), and heavy metals. A large spill of 68,000 gallons (1,619 barrels) of heating fuel occurred on August 21, 1988 from a Crowley Barge Tanker 570 enroute to Kaktovik 3-6 miles north of the barrier islands off Brownlow Point. However, no large oil spills from oil and gas activities have occurred in the arctic OCS to date, but this does not demonstrate that the risk of such a spill is zero. Contamination of the Arctic and sub-Arctic regions through long-range transport of pollutants has been recognized for over 30 years (Bowes and Jonkel 1975, Proshutinsky and Johnson 2001, Lie et al. 2003). Arctic ecosystems are particularly sensitive to environmental contamination due to the slower rate of breakdown of POPs, including organochlorine compounds (OCs), relatively simple food chains, and the presence of long-lived organisms with low rates of reproduction and high lipid levels that favor bioaccumulation and biomagnification. Consistent patterns between OC and mercury contamination and trophic status have been documented in Arctic marine food webs (Braune et al. 2005). Presumably, these characteristics have affected the capacity of polar bear critical habitat to support polar bears, although it is difficult to estimate the extent of impairment.

While some of the federal actions and the presence of contaminants may have adverse effects to critical habitat, these effects are small-scale, short-term, and localized when considered individually and cumulatively. Therefore, the condition of PCEs in the Action Area is similar to those in the entire critical habitat designation.

Summary

The primary concern for polar bear critical habitat in the Action Area is loss of sea ice. While other stressors are managed, they are not currently thought to be significant threats to polar bear critical habitat; however, each could become more significant in combination with future effects of climate change and the resultant loss of sea ice critical habitat.

Effects of the Proposed Action

This section of the BO analyzes direct, indirect, interrelated and interdependent effects of the proposed Action on listed and candidate avian species, polar bears, polar bear critical habitat and the LBCHU. We first describe anticipated effects of the first incremental step (marine deep-penetration and high-resolution survey activities and exploratory drilling), and then we describe impacts that may result from subsequent incremental steps (development onwards) for each species and critical habitat unit. Where appropriate, impacts are separated into those associated with the Beaufort Sea Planning Area and those with the Chukchi Sea Planning Area.

After reviewing the information provided by BOEM, the Service considered the following potential effects to listed and candidate birds may result from the proposed Action:

- Habitat loss
- Disturbance and displacement

- Collisions
- Increased predation
- Small spills

For the LBCHU and polar bear critical habitat:

- Access/availability of critical habitat
- Small spills
- Other effects

For polar bears:

- Disturbance and displacement
- Human-polar bear interactions
- Small spills

Denning and non-denning polar bears may respond differently to the above threats. Therefore, we analyzed effects of the proposed Action on denning and non-denning bears separately.

With regard to oil spills, we understand that oil spills could potentially result from activities in the first and future incremental steps. BOEM described and modeled hypothetical oil spill scenarios including the geographical extent of potential spills, their initial effects, and duration based on factors such as volume and seasonal timing (BOEMRE 2011*a*). In this BO, we distinguish small oil spills (< 1,000 barrels) from large (≥ 1,000 barrels) and very large (≥ 150,000 barrels) potential oil spills, as there are substantial differences in the likelihood that small spills will occur from the Action, as opposed to large or very large spills. Our evaluation on the potential effects of large and very large oil spills follows our analysis of other effects for the first and future incremental steps.

First Incremental Step: Exploration Activities

Avian Species – First Incremental Step

Habitat Loss

Permanent structures in high-quality habitats can affect birds by rendering those habitats permanently unsuitable, thus relegating birds to lower quality habitats. The only permanent structures expected to result from deep-penetration and high-resolution surveys, and exploratory drilling in the first incremental step are abandoned exploratory wells and some other equipment (e.g., top of guide arms) on the sea floor. While listed eiders forage on the sea floor, these capped wells have an extremely small footprint. Therefore, the Service expects that any permanent habitat loss for listed and candidate species from the first incremental step would likely be extremely minor.

Contamination of benthic and other food sources for avian species from disposal of drilling muds and cuttings can occur in some instances. The Environmental Protection Agency (EPA) regulates the discharge of drilling muds (used to lubricate drill bits), cuttings (material removed from drill holes), and other materials to the marine environment. A National Pollution Discharge Elimination System (NPDES) permit for oil and gas exploration facilities on the OCS and contiguous State waters is currently in place. The EPA is in the process of writing a new

NPDES permit and expects it to be in place in October 2012. NPDES permits place limits on the location, volume, and materials that can be discharged to marine waters from exploratory drilling activities, and the new permit would likely place either the same or more restrictive requirements on permittees as the existing permit (EPA). BOEM noted that changes in species composition, abundance, or biomass of the benthic biota resulting from the release of synthetic-based mud cuttings generally were detected at distances of 50 m to 500 m from well sites. These biological effects can be attributed to chemical toxicity of discharges, organic enrichment, and deposition of fine particles in drilling wastes (MMS 2008 citing Hurley and Ellis 2004). While the recovery of benthic communities was generally documented to occur within one year of completion of the well, a decrease in benthic invertebrate richness and abundance could occur at a distance of 50 m for up to two years after exploratory drilling ceased (MMS 2008 citing Hurley and Ellis 2004). Given the relatively small impact area from structures associated with exploratory drilling in relation to the size of the Planning Areas, the low number of wells that are likely to be drilled in the area (BOEM estimates a maximum of 36 wells each for the Chukchi Sea and Beaufort Sea Planning Area), and the limits on the discharges enforced through the NPDES permit process, the Service anticipates only minor impacts to listed eiders, yellow-billed loons, or Kittlitz's murrelets from toxic contamination resulting from discharges of drilling mud and cuttings.

Disturbance and Displacement

The severity of disturbance and displacement depends upon the duration, frequency, and timing of the activity causing the disturbance. Disturbance that results in agitated behavior, flushing, or other movements in response to a stimulus can increase energy costs, especially for birds that are already energetically stressed from cold, lack of food, or physiologically demanding life cycle stages such as molt. Birds may be displaced from preferred habitats to areas where resources are less abundant or are of lower quality. Disturbance and displacement of listed eiders, yellow-billed loons, and Kittlitz's murrelets during deep-penetration and high-resolution survey and exploratory drilling activities could occur from aircraft, vessel traffic, and seismic survey acoustic sources during the first incremental step.

Aircraft – Aircraft may disturb molting and flight capable eiders and candidate species. While specific information for listed eiders is lacking, we expect that they would have a similar response as king eiders; thus we consider the responses of king eiders to be a reliable surrogate for evaluating the effects of disturbance on listed eiders. King eiders in western Greenland dove when survey aircraft approached (Mosbech and Boertmann 1999). Bird response varied with time of day, and increased with decreasing plane altitude. After a preliminary dive by nearly all birds, over 50% remained submerged until the plane passed. Also, molting king eiders appeared to be sensitive to aircraft engine noise, and flushed, dove, or swam from that disturbance, sometimes leaving the area for several hours (Frimer 1994). BOEM anticipates low numbers of aircraft operations during deep-penetration and high-resolution survey activities. Fixed-wing operations will likely be limited to marine mammal observation flights which take place at an altitude of 1,500 feet; because of this high altitude they are not anticipated to disturb and adversely affect listed or candidate species (Mosbech and Boertmann 1999).

Helicopters could be used to support most or all activities in the first incremental step. The number of flights is estimated at < 1/day for deep-penetration or high-resolution survey activities. During open water exploratory drilling activities, BOEM estimates 1-3 helicopter flights/day will occur for each drill rig operation (estimated at two drill rigs operating in each sea/year). These aircraft will transport personnel and supplies between drill ships and land, likely Barrow for operations in the Chukchi Sea and Deadhorse for operations in the Beaufort Sea. To avoid impacts to listed eiders and other avian species during sensitive life history periods, BOEM requires aircraft to avoid flying below an altitude of 1,500 feet over the LBCHU between July 1 and November 15 (the period when molting spectacled eiders are present), and over the spring lead system between April 1 and June 10 (when listed and candidate avian species may be present) unless it is unsafe to do so. With the low number of anticipated flights and additional protection provided to these avian species through the flight altitude mitigation measures, we expect only infrequent, minor, short-term effects on listed eiders or candidate species from aircraft disturbance.

Vessel transits – Vessels transiting and operating in an area may displace birds from the immediate area, presumably at some energetic cost to the bird. Deep-penetration and high-resolution survey operations use one or two self-contained vessels accompanied by a one or perhaps a few small support vessels; exploratory drilling operations may use one drill ship, one or two icebreakers, and a few support vessels. These operations only have the potential to affect listed or candidate bird species if the birds are present in the same area and at the same time as the vessels.

To prevent impacts to molting spectacled eiders that are likely less mobile and likely energetically stressed during this flightless period, BOEM will require (see Appendix A) mitigation measures to be followed such that no deep-penetration, high-resolution, or exploratory drilling vessels may operate in the LBCHU between July 1 and November 15 except for reportable marine casualties as defined in 46 CFR 4.05-1 or hazardous conditions as defined by 33 CFR 160.204, in which case the incursion must be reported to BOEM within 24 hours, and BOEM will report the activity to the Service within 48 hours. The only other exception is if an exploratory well is to be drilled on a lease block in the LBCHU. This is unlikely to occur, as there are currently no leases in the LBCHU, and the 2012-2017 proposed 5-year Program (BOEM 2011) excludes leasing within 25 miles of the Chukchi Sea coast. From November 16 to June 30, listed and candidate species are not present in numbers in this area such that vessels would contact large numbers of these species. Even if an exploratory well were drilled in the LBCHU, all drill ships and support vessels associated with the lease in the LBCHU would be required to enter and exit the LBCHU from the northwest and proceed directly to the drillsite. This would significantly reduce the probability that listed eiders would be encountered and disturbed by drill vessels, as aerial survey data indicates the portion of the LBCHU thought to receive the greatest use by eiders, based on the best available scientific information, would not be traversed by vessels working on the OCS (Figure 16).

Large numbers of listed and candidate birds are likely present in the Chukchi Sea spring lead system in spring/early summer. Vessels transiting through spring leads may cause short-term minor disturbance of these birds, but the effects are likely to be limited due to the brief duration of a vessel transit, and the relatively low numbers of vessels that may transit the area (BOEM estimates two active drillships, five deep-penetration surveys, and four high-resolution surveys in each sea annually).

Given the relatively low number of vessels (BOEM estimates no more than two active drillships, five deep-penetration surveys, and four high-resolution surveys in each sea annually), and the restrictions on vessel activity in areas where large numbers of listed and candidate species occur (LBCHU and spring lead system), it is unlikely that vessels would encounter these species. A bird that does encounter deep-penetration survey, high-resolution survey, or exploratory drilling operations will likely only experience minor, short-term displacement to adjacent, undisturbed habitat.

Deep-penetration and high-resolution seismic activity sources – The effects of seismic survey vessels are likely similar to those of transiting vessels. Seismic survey vessels typically move slowly through an area, and ramp up the airgun array when starting a survey or after a power down. The sounds generated during seismic work may cause disturbance to listed eiders and candidate species, as these sounds can travel horizontally through the water column. Little is known about avian response to seismic acoustics; however, in a study of long-tailed ducks (*Clangula hyemalis*) in the Beaufort Sea, Lacroix et al. (2003) found no significant difference in numbers of ducks in an area before and after seismic survey work. In some survey areas, long-tailed ducks were observed to dive more frequently than in undisturbed areas, but the cause (vessel versus seismic acoustic source) was unclear. We do not expect in-ice seismic surveys to affect listed and candidate avian species because these species are not likely to be present in the action area during in-ice surveys.

Temporal separation exists between areas used by high numbers of birds and deep-penetration, high-resolution, and exploratory drilling activities. Activities during the first incremental step are not permitted in the LBCHU after July 1 when molting spectacled eiders may be present. Individual birds migrating in fall may encounter these vessels, but because these birds are mobile, we anticipate they will experience only minor, short-term disturbance (e.g., flushing from water's surface) during encounters. Data from satellite telemetered spectacled eiders in 2009 and 2010 indicate that spectacled eiders are present in the eastern Chukchi Sea from, at minimum, April 1 through June 15 (Figure 13; M. Sexson, USGS, unpublished data) although there is likely some variation in timing depending on ice conditions etc. Divoky (1984) noted yellow-billed loons appeared to use the spring lead system as a migration pathway. Richardson and Johnson (1981) measured the peak period of abundance of yellow-billed loons migrating past Simpson Lagoon in the Beaufort Sea to be June 3-9, and by mid-June, yellow-billed loons are establishing nests on Alaska's North Slope (North 1994). These data suggest breeding yellow-billed loons will also have moved out of the Chukchi Sea by early to mid-June. Seismic surveys cannot logistically commence until the survey area is ice free (early June), so there would likely only be a few days in which listed eider and yellow-billed loon use may overlap with potential seismic survey activity in spring leads.

Hardwater surveys – Hardwater surveys may take place in the Beaufort Sea during winter. However, they would not adversely affect listed and candidate species through disturbance as these species are absent from the Beaufort Sea in winter.

Because of temporal separation of marine deep-penetration surveys/high resolution-survey activities and listed eiders and yellow-billed loons, and the timing restrictions on activities the

Service anticipates that these activities will result in only minor and temporary effects that do not rise to the level of adverse effects.

Exploratory drilling – In addition to vessels transiting to and from exploratory drill sites (discussed above), exploratory drilling may disturb and displace listed and candidate species from the immediate area of the exploration site. However, in the vast majority of the Planning Areas, listed and candidate species may not be present and hence, may not be impacted. Further, exploratory drilling activities disturb a relatively small area and are stationary, allowing any birds that are present to either habituate to the activities or move away to an undisturbed area. In areas where large numbers of listed eiders may be present, BOEM imposes mitigation measures on operations. For example, BOEM will require that vessels associated with deep-penetration surveys, high-resolution surveys, and exploratory drilling operations in the OCS do not operate in the spring lead system (Figure 16, Figure 20) between April 15 and June 10. Additionally, during the spring, ice covers portions of both Planning Areas, making most surveys, and thus effects of them on birds, infrequent. We discuss effects of mitigation measures for the LBCHU in the next section. Few, if any, listed or candidate bird species would be disturbed or displaced by a drilling rig operated from a gravel or artificial island in the Beaufort Sea. Because few birds are likely to encounter exploratory drilling operations and those that do will likely be displaced only a short distance, and because measures imposed by BOEM will likely minimize impacts via mitigation measures, we expect disturbance from effects of drilling to have at most only temporary and minor effects on listed and candidate avian species.

Collisions

Migratory birds can be killed from collisions with man-made structures (Manville 2004). Birds are particularly at risk of collision with objects in their path when visibility is impaired during darkness or inclement weather, such as rain, drizzle, or fog (Weir 1976). In a study of avian interactions with offshore oil platforms in the Gulf of Mexico (Russell (2005)), collision events were more common, and more severe (by number of birds) during poor weather. Certain types of lights (such as steady-state red) on structures increase collision risk (Reed et al. 1985, Russell 2005, numerous authors cited by Manville 2000). This is particularly apparent in poor weather when migrating birds appeared to get into circulation patterns around structures after being attracted to lights and becoming unable to escape the “cone of light” (Russell 2005, Gauthreaux and Belser 2002, Federal Communications Commission 2004).

Flight behavior over water by listed eiders and candidate species places them at risk of colliding with human-built structures. Day et al. (2005) suggested that eider species may be particularly susceptible to collisions with offshore structures as they fly low and at relatively high speed (~ 45 mph) over water. Johnson and Richardson (1982), in their study of migratory behavior along the Beaufort Sea coast, reported that 88% of eiders flew below an altitude of 10 m and more than 50 % flew below 5 m. Kittlitz’s murrelets also fly low and fast (>2 m above the water surface, average 94 km/hr; Day et al. 1999). Their flight was described as having a long and sweeping pattern, which renders them unable to change direction quickly (Kishchinski 1968 cited by Day et al. 1999), further increasing their risk of collision. Yellow-billed loon flight has been recorded at 64 km/h (Dixon 1916 cited by North 1994) and they fly low over water (Bailey 1948 cited by North 1994).

Depending upon location and timing of operations, vessels and exploration structures pose a collision risk for Steller's and spectacled eiders and yellow-billed loons migrating to and from Alaska's North Slope, and Kittlitz's murrelets may also be at risk for collisions from structures. In an effort to reduce collision risks resulting from bird attraction to lighted structures, BOEM will require that vessels minimize the use of high-intensity work lights, especially within the 20-m bathymetric contour. BOEM will require that exterior lights only be used as necessary to illuminate active, on-deck work areas during periods of darkness or inclement weather; otherwise they will be turned off. Interior and navigation lights will be required to remain on for safety. Lessees are also required to implement lighting protocols aimed at minimizing the radiation of light outward from exploratory drilling structures. Despite these measures, the Service expects a few listed eiders, yellow-billed loons, and Kittlitz's murrelets may die from collisions during the first incremental step and thus adverse effects could occur. The potential mortality is enumerated in the Incidental Take Statement in this BO.

Small Spills

Exposure to oil can potentially affect waterbirds in several ways, depending on the extent and severity of the exposure. Waterbirds that directly contact even small amounts of oil or fuel products usually lose the waterproof properties of their feathers and become wet. Birds whose feathers lose their waterproof properties can then become hypothermic and potentially drown (Jenssen 1994), particularly in cold environments (Piatt et al. 1990). In addition, bird embryos are highly sensitive to petroleum. Mortality of embryos in incubating eggs and nestlings has been documented by exposure to small amounts of hydrocarbon contamination (light fuel oil, certain crude oil, and weathered oil) transferred by adults with lightly oiled plumage (Parnell et al. 1984, Hoffman 1990, Szaro et al. 1980, and Stubblefield et al. 1995). Birds that ingest hydrocarbon-contaminated food could potentially experience toxicological effects including gastrointestinal irritation, pneumonia, dehydration, red blood cell damage, impaired osmoregulation, immune system suppression, hormonal imbalance, inhibited reproduction, retarded growth, and abnormal parental behavior (Albers 2003, Briggs et al. 1997, Epply 1992, Fowler et al. 1995, Hartung and Hunt 1966, and Peakall 1982). Birds have the ability to bioaccumulate or biomagnify hydrocarbons and are vulnerable to both direct and sublethal toxic effects from a contaminated food supply (Albers 2003).

Mortality following exposure to oil can potentially occur depending on the extent and duration of the exposure, and is common in waterfowl and alcids (the family that includes murrelets), which spend much time in the water and are therefore vulnerable to surface oil (Albers 2003). Clark (1984) found that seabird species most vulnerable to population-level effects of oil pollution include species such as listed eiders, yellow-billed loons, and Kittlitz's murrelet, whose life history characteristics include high adult survival, adaptation to stable and predictable marine environments, and high site fidelity.

In the case of the first incremental step of the proposed Action, although small spills are expected to occur (> 99.5% chance, Table 5), it is highly unlikely that listed eiders or candidate yellow-billed loons and Kittlitz's murrelets will be significantly affected. Small spills (< 1,000 barrels) are estimated to be of very low volumes and mostly of refined fuels; and if they occur, the oil is likely to evaporate, weather or be almost entirely recovered (BOEMRE, 2011a, Appendix A) Moreover, the density of listed eiders and candidate species is very low in most of the Action Area so that only small numbers of individuals of these species are likely to encounter oil from a small spill. Therefore, even if a small spill reaches the marine environment, there is a low likelihood these species would be affected by small spills during any portion of the first and subsequent incremental steps. Accordingly, based on BOEM's oil spill risk analysis, the low volume and small area expected to impacted by small spills, and the sparse distribution of listed and candidate avian species over much of the Action Area, we anticipate that adverse effects to listed and candidate avian species from small oil spills are likely to be minimal during the first incremental step of the proposed Action.

Spectacled Eider Critical Habitat: Ledyard Bay Critical Habitat Unit – First Incremental Step

The LBCHU is important to migrating and molting spectacled eiders, and the PCEs for the spectacled eider in this unit are: (1) marine waters greater than 5 m (16.4 ft) and less than or equal to 25 m (82.0 ft) in depth; (2) the associated marine aquatic flora and fauna in the water column; (3) and the underlying marine benthic community.

Access and Availability of the LBCHU

Certain activities in the proposed Action could occur in the LBCHU. Vessels could pass through this area prior to June 1, and the LBCHU contains some lease blocks that could be leased and subject to exploration during a future lease sale (e.g., BOEM 2011). In the section on effects to avian species above, we discussed mitigation measures required by BOEM that would minimize disturbance to spectacled eiders and their access to the LBCHU during molt. Likewise, if a well is drilled in the LBCHU, BOEM will impose mitigation measures that requiring drill rigs and support vessels to enter and exit the LBCHU and proceed only to/from the drill site from the northwest to reduce the probability that listed eiders would be encountered. Once at the drill site, operations would be relatively stationary; this would allow any spectacled eiders present to either habituate to the activities or move to an undisturbed area of the LBCHU. Therefore, we expect the first incremental step to have only minor, if any, effects on the PCEs within the LBCHU due to reduced access of eiders to area.

Small Spills

A small oil spill in the Chukchi Planning Area during the first incremental step could reach the LBCHU and potentially affect PCEs and the ability of spectacled eider to use this area for the purposes for which the critical habitat area was designated. Small spills projected to occur from the proposed Action are expected to be of very low volume and largely recoverable. As such, small spills are likely to have only short-term effects on PCEs of marina flora and fauna in the water column and the marine benthic community. Small spills could temporarily contaminate a very small area within the LBCHU boundary containing flora and fauna in the water column; although some oil from small spills could also contaminate the underlying benthic community, this is less likely than contamination within the water column. Spills would have to occur directly adjacent to or within the LBCHU for these effects to occur, and very few activities are likely to occur in this area. Additionally, effects of such contamination would be minimized through oil evaporation, weathering, and recovery efforts. Because the likelihood of small spills occurring within the LBCHU is low, and if they did occur the area affected by small spills would be small, and most of the spilled oil would evaporate, weather, or would be recovered, we do not expect small spills to have long-term effects that would diminish the function and conservation value of the LBCHU for molting spectacled eiders.

Other Effects

The Service expects some impacts to the LBCHU from activities that may occur during the first incremental step. While this first step is not likely to impact the PCE of water depth, some drilling muds and cuttings could be discharged during exploratory drilling. The well cap could make a very small area of the benthos unavailable to spectacled eiders, depending on water depth. Discharges could result in the deposition of sediment that could affect the PCEs of flora and fauna in the water column and the underlying benthic community through toxicity, or organic enrichment. However, these effects would be localized to an area up to 193.98 acres per well and would only occur in the unlikely event a well is drilled in or immediately adjacent to the LBCHU. The area affected by discharges would likely be much smaller because currents would likely carry discharged material mainly in one direction; some areas would be minimally affected by discharged material; and, recovery of an area around a well would minimize the level of disturbance with time. Any effects would be short-lived because benthic communities would likely recover in less than 10 years (BOEMRE 2011*b*: 98-99). Given the relatively small impact area from exploratory drilling discharges and their short-lived nature, significant adverse effects to the PCEs are not anticipated, and they are not expected to appreciably reduce the function and conservation value of the LBCHU for spectacled eiders even if drilling were to occur in the LBCHU.

Polar Bears – First Incremental Step

Typically, most polar bears occur in the active ice zone, far offshore, hunting throughout the year. Bears also spend a limited time on land to feed or move to other areas, although melting sea ice may result in increased numbers of polar bears moving from the offshore ice onto land. Thus, polar bears could occur in parts of the Action Area as they hunt on ice or move to coastal areas. While polar bears usually occur at low densities in the Action Area, their presence within it makes them susceptible to effects of the proposed Action.

Expected frequency of encounters – Human-polar bear interactions could result from marine deep-penetration surveys, high-resolution survey activity, and exploratory activities during the first incremental step. However, even given the potential for increased movements of polar bears across the Planning Areas to coastal areas due to melting of sea ice, we expect very few encounters between polar bears and activities during the first incremental step because of the spatial separation of the majority of the proposed activities and polar bears (most will occur when sea ice is absent), the low density of polar bears in the majority of the Planning Areas, and the small size of the area likely to be affected by the proposed activities. BOEM estimates two active drillship operations, five deep-penetration surveys, and four high-resolution survey activities in each sea annually based on previous work in the same area; these operations would infrequently encounter polar bears. Marine mammal observers were on watch for 9,745 km of seismic survey and shallow hazard and site clearance lines surveyed by Shell Offshore Inc. in the Chukchi Sea in 2008 and no polar bears were observed by either the seismic vessel or its support vessels. During a similar project, observations along 14,709 km of lines in the Beaufort Sea offshore from Harrison and Camden Bay took place in 2008, and no polar bears were observed during the open water seismic survey portion of the project, although six polar bear sightings occurred during shallow hazards and site clearance activities. Thus, we expect few polar bear encounters during the first incremental step, although personnel may observe more polar bears during activities near the ice edge, ice floes, or barrier islands.

Further, industry activities are subject to the prohibitions of the MMPA, which prohibit the taking of polar bears without authorization. Historically, to prevent human-polar bear interactions that may lead to the injury or killing of a bear in defense of human life, the oil and gas industry has requested and received authorization to deter polar bears away from facilities (e.g., exploratory wells on gravel islands). While deterring a polar bear will affect its short-term behavior, it is unlikely to significantly reduce the animal's survival. We discuss deterrence further in the *Interrelated and Interdependent Effects* section of this BO.

Differential Effects within the Chukchi and Beaufort Planning Areas

Because polar bears occur in the Action Area, activities occurring in the first incremental step may affect polar bears. Industry is more likely to encounter polar bears along the coast during the first incremental step. Because activities during the first incremental step occur mostly offshore in the Chukchi Sea and mostly in the nearshore environment in the Beaufort Sea, human-polar bear interactions would likely occur more frequently in the Beaufort Sea than the Chukchi Sea. As polar bears use the Beaufort and Chukchi seas and their adjacent terrestrial habitat in different ways, activities within the two Planning Areas will likely affect polar bears in different ways.

Polar bears generally do not den along coastal areas of the Chukchi Sea. Thus, disturbance of denning bears in the Chukchi Sea Planning Area is unlikely to occur. However, polar bears do den along the coast of the Beaufort Sea, and some activities in the first incremental step have the potential to disturb denning bears. Therefore, we first discuss impacts on non-denning bears that could occur in both Planning Areas; we then discuss effects to denning bears, which will likely take place much more frequently in the Beaufort rather than the Chukchi Planning Area.

Effects on Non-denning Polar Bears

Non-denning polar bears may encounter offshore marine deep-penetration surveys, high-resolution surveys, and exploratory drilling activities. We discuss the likely reactions of polar bears to these activities and the expected frequency of encounters.

Noise from vehicles and vessels – The first incremental step may introduce noise from the engines of vessels, ice vehicles, and icebreaking. A swimming bear may be able to hear engine noise (although encountering a swimming bear occurs only rarely), and bears on the ice may be able to hear activities near or on the ice, including icebreaking activities. If an encounter between a vessel not engaged in seismic activities and a swimming bear occurs, it would most likely result in only a minor disturbance (e.g., the bear may change its direction or temporarily swim faster) as the vessel passes the bear. Electromagnetic pulses from CSEM surveys will likely have no effect on swimming polar bears. Icebreaker support for ice breaking or ice management can introduce loud noise episodes into the marine environment, especially if a ship has to reverse and repeatedly ram thick ice (Davis and Malme 1997). Transient or hunting bears on the ice (e.g., during in-ice and hardwater surveys) may run away. The effects of fleeing from vehicles or vessels are likely minimal if the event is temporary, the animal is otherwise unstressed, and it is a cool day. However, on a warm spring or summer day, a short run may be enough to overheat a polar bear, and a bear that swims a long distance could require a long rest period prior to resuming essential life functions such as feeding. Additionally, deterrence activities may be required. Potential impacts from these activities are described in the *Interrelated and Interdependent Effects* section below.

While adverse effects such as those described above could occur, we expect them to be infrequent because historically, encountering a polar bear at sea has been a rare event, and polar bears usually have only minor behavioral changes in response to disturbance. Polar bears most likely would respond to disturbances during marine deep penetration surveys, high-resolution surveys, and exploratory drilling activities (e.g., a drill rig on a gravel or artificial island in the Beaufort Sea) by moving from their original positions (by running, trotting, or walking), or jumping into the water if on ice, or by avoiding such activities. During 26,029 km of seismic surveys in the Chukchi Sea in 2006, industry encountered four polar bears on/near ice while transiting the survey area (not during surveys; Ireland et al. 2009). Three of the bears responded to vessels by moving away. Similarly, of four polar bears observed in the Beaufort Sea in 2006 during shallow hazard and site clearance seismic surveys, one was feeding and did not alter its behavior, two (a mother and cub) entered the water, and one was observed already swimming and continued to swim (Funk et al. 2006). In 1990, during marine mammal monitoring during offshore drilling activities by Shell Western E&P, Inc., 25 polar bears were observed on the pack ice between June 29 and August 11. The bears responded to the drilling or icebreaking operations by approaching (two bears), watching (nine bears), slowly moving away (seven bears), and five bears did not respond to the activities; the bears' response was not evaluated for two bears. These examples lead us to conclude that in the rare event a polar bear is encountered, only minor, short-term behavioral changes by non-denning polar bears would likely result from disturbances during activities in the first incremental step.

Noise from seismic surveys – Seismic surveys purposefully introduce sound into the aquatic environment at various acoustical levels. As polar bears normally swim with their heads above the surface, where underwater noises are weak or undetectable (Greene and Richardson 1988, Richardson et al. 1995), it is unlikely these noises would cause auditory impairment or other physical effects. Noise produced by seismic activities could elicit several different responses in polar bears. It may act as a deterrent to bears entering the area of operation, or attract curious bears. However, no evidence exists to support the idea that airgun pulses, such as those used during seismic surveys, cause serious injury or death, even from large airgun arrays.

The Beaufort and Chukchi Sea ITRs issued under the MMPA require mitigation measures for seismic survey operations in the Beaufort and Chukchi seas. Marine Mammal Observers are required on seismic vessels, and they are responsible for instructing the vessel's captain to power-down or shut-down airgun arrays if polar bears enter the 190 db ensonification zone. This mitigation measure is expected to significantly reduce the likelihood that adverse effects might occur. These, or similar, mitigation measures will likely be required for future seismic survey work in the Planning Areas as a condition for MMPA authorization. Given the low number of seismic surveys likely to occur, the tendency for seismic surveys to avoid areas and periods of heavy sea ice (the habitat preferred by polar bears), polar bear swimming behavior, and mitigation measures required by current and likely future LOAs, the Service concludes it is unlikely a polar bear would be exposed to strong underwater seismic sounds long enough for significant impacts to occur.

Aircraft – Extensive or repeated overflights of fixed-wing aircraft for monitoring purposes or helicopters used for re-supply of operations travelling to and from offshore exploratory drilling facilities could disturb polar bears. Such disturbance is most likely to occur in the fall if overflights occur over barrier island and coastal habitat as larger numbers of polar bears are present in these areas waiting for ice to return or using the coast for movements and beginning searching for den sites. Service polar bear researchers reported that 14.2% to 28.9% of polar bears were observed to change their behavior during aerial surveys conducted at an altitude of 300 feet (Rode 2008, 2009, 2010). As with other sources of disturbance, polar bears may respond to aircraft by moving from their original positions (by running, trotting, or walking), or jumping into the water if on land or ice. BOEM anticipates up to 10 marine deep-penetration surveys and eight high-resolution survey activities annually for the two Planning Areas. The number of flights is estimated at < 1 flight/day for deep-penetration or high-resolution survey activities. Additionally, 1-3 helicopter flights/day could occur to support each of the two exploratory drilling operations that may also occur in each Planning Area annually. Fixed-wing aircraft operations during seismic surveys and exploratory drilling operations would likely be limited to marine mammal observation flights that take place at an altitude of 1,500 feet, which would minimize impacts on polar bears. Therefore, given the relatively low number of operations and the size of the Planning Areas, the low density of polar bears where activities during the first incremental step would likely take place, and implementation of mitigation measures, the number of potential helicopter overflights an individual polar bear may experience is extremely low. We expect these occasional overflights would cause only minor, short-term behavioral changes similar to other types of disturbance already described.

Mitigation measures – The above examples suggest that few bears are likely to encounter marine deep penetration surveys, high-resolution surveys, and exploratory drilling vessels in the Planning Areas. Limited impacts from previous activities likely resulted in part from the mitigation measures included in LOAs under the Beaufort and Chukchi Sea ITRs, including the use of marine mammal observers on vessels conducting deep-penetration and high-resolution surveys and exploratory drilling activities. Observers could ensure vessels remain at least ½ mile from polar bears observed on land or ice and provide the observation data to the Service. Future activities that may result from the first incremental step of the proposed Action would likely include similar mitigation measures, which would reduce potential impacts. Therefore, we expect impacts on polar bears from these activities in the future to be similar to the minor, temporary impacts of the past.

Conclusion for non-denning polar bears – While a few polar bears are likely to encounter activities authorized in the first incremental step, effects of encounters when they do occur would likely cause only minor, short-term changes in behavior of a few non-denning individuals.

Effects on Denning Polar Bears

Female polar bears typically den from mid-November until mid-April. Females entering dens and those in dens with cubs are more sensitive than other bears to disturbance and noise; however, the snow over a den muffles sound entering the den. Possible sources of disturbance could include icebreakers, aircraft, hardwater surveys, and ice road construction and associated vehicle traffic such as tracked vehicles and snowmobiles. Most activities in the first incremental step would occur during the ice-free season at sea where polar bears do not den; occasionally, activities would occur on the ice where polar bears den at extremely low densities. Polar bears disturbed early in the denning season may relocate to a new den site. Therefore, while oil and gas personnel could encounter a polar den on the sea ice, such an encounter very unlikely. However, we evaluate the effects of these possible sources of disturbance below.

Icebreakers and ice management vessels – Because in-ice surveys would most likely take place in new ice in the fall prior to den initiation, the chance of encountering a bear denning on the ice via an icebreaker is extremely low and not likely to occur. Polar bears den at extremely low densities in multi-year ice where snow drifts have built up along pressure ridges or other formations in the Beaufort Sea. Icebreakers tend to avoid these ice conditions for operational reasons (e.g., safety, time and fuel efficiency) whenever possible. Therefore, we do not expect icebreaking to have effects on denning polar bears. Ice management vessels would have no effect on denning bears because these vessels only redirect small icebergs, on which polar bears are extremely unlikely to den.

Aircraft –Few OCS activities would involve aircraft overflights during the polar bear denning season. When aircraft overflights do occur, they have the potential to disturb denning polar bears, but typically these events are occasional and short in duration. Amstrup (1993) studied the response of denning bears to research aircraft flying less than 50 to about 500 meters above the ground and recorded 40 cases of potential disruption of denning by research aircraft (44 dens were located in this study). Two bears left their dens temporarily, but disturbance did not appear to reduce cub production (Amstrup 1993). Thus, flights over dens are not expected to cause disturbance such that it affects the fitness of an individual polar bear. Additionally, the chance of flying over a polar bear den is low because dens have a low density across the landscape. Further, flights by aircraft associated with BOEM activities will likely fly higher than elevations than the Amstrup (1993) study, as minimum flight elevations over polar bears or areas of concern and flight restrictions around known polar bear dens will be required in LOAs, as appropriate, to reduce the likelihood that bears are disturbed by aircraft. Aircraft overflights during the denning season are rare, and the chance of encountering denning bears is extremely low, but if this does occur we expect the effect of aerial disturbance on denning bears to be minimal.

Hardwater surveys – These surveys would likely take place from January to May when females could be in dens with cubs. Hardwater surveys are most likely to occur in the Beaufort Sea Planning Area and would include travel over ice; however, even though they are anticipated to occur, they are expected be very infrequent. Thus, few ice roads are proposed, reducing the potential impacts from these structures. Although vehicles on ice could hypothetically travel over dens causing them to collapse, this is extremely unlikely because BOEM and BSEE need to be in compliance with the MMPA, and their lessees, permittees and agents of their lessees or permittees should contact the Service's MMM office prior to conducting any on-ice work. The Service can then determine where the proposed activities are located in relation to known dens or denning habitat and, if necessary, provide authorization under the MMPA. Authorization for similar projects in state-managed waters has typically required operators to conduct polar bear den searches. If a den is located, activities are required to be modified where necessary to provide at least a one-mile buffer around a den site to minimize disturbance of denning polar bears. We anticipate similar methods designed to eliminate impacts to denning bears will be required in the future. Because few hardwater surveys are anticipated, and the density of polar bear dens on the sea ice in the Action Area is very low, polar bear dens are not likely to be encountered, and if they do, conditions of MMPA authorizations would minimize potential effects. As a result, we expect that hardwater surveys would likely have at most only minor effects on denning polar bears.

Conclusion for denning polar bears – We expect the oil and gas industry to encounter very few polar bear dens during the first incremental step, and if they do, mitigation measures will likely prevent destruction of dens or early den abandonment.

Small Spills

Effects of oil on polar bears – Exposure to oil can potentially affect polar bears in several ways, depending on the volume of oil spilled and timing of the spill. The effects of fouling fur or ingesting oil or other chemicals could be short-term or result in death (Oritsland et al. 1981). Oiling of the pelt reduces its insulation value, and irritation or damage to the skin by oil may further contribute to impaired thermoregulation.

Oil ingestion by polar bears through consumption of contaminated prey, by grooming to restore the insulation value of the oiled fur, or by nursing could have pathological effects, depending on the amount of oil ingested and the individual's physiological state. Death could occur if a large amount of oil were ingested or if volatile components of oil were aspirated into the lungs (76 FR 47010: 47029-47030). Ingestion of sub-lethal amounts of oil can have various physiological effects on a polar bear, depending on whether the animal is able to excrete or detoxify the hydrocarbons. Petroleum hydrocarbons have the potential to irritate or destroy epithelial cells lining the stomach and intestine, thereby affecting motility, digestion, and absorption. Therefore, oiled bears could potentially suffer multiple injuries from direct contact with oil.

Polar bears may also suffer negative effects from vapors of spilled oil, depending on the extent and duration of the spill. Polar bears swimming in, or walking adjacent to, an oil spill could inhale petroleum vapors, which could in turn result in damage to various systems, such as the respiratory and the central nervous systems, depending on the amount of exposure. Thus, polar bears could suffer injury or death from an oil event without direct contact with it.

In this instance, small spills of oil are likely to occur during the first incremental step. However, polar bears are unlikely to encounter a small spill because their density across the Arctic OCS is very low, and a small spill would not cover an extensive area. Moreover, if a spill occurs and a polar bear is nearby, the bear would likely be intentionally hazed to keep it away from the spill area, further reducing the likelihood of impacts. Although hazing would likely cause stress and disturbance to individual bears, hazing events would likely be sufficiently infrequent that large numbers of individuals would not be affected. In addition, because small spills would likely be contained or weather quickly, the likelihood of a polar bear coming into contact with a small spill at any given time is extremely low, the effects of such a small spill on polar bears would be expected to be short-term, localized, and at most affect only a very small numbers of individuals.

Interdependent and Interrelated Actions

Interdependent actions are defined as actions having no independent utility apart for the proposed Action, while interrelated actions are defined as actions that are part of a larger action and depend upon the larger action for their justification (50 CFR §402.02). MMPA authorization issued to oil and gas companies has required, and likely will require the development of polar bear interaction plans, and these plans could include polar bear deterrence. Deterrence activities are necessary tools to prevent the lethal take of polar bears or potential for injury to personnel. Because polar bears could ultimately be subject to intentional deterrence, we consider such deterrence activities to be an interrelated action to the proposed Action.

The Service issues LOAs to appropriately-trained individuals which authorize intentional taking of polar bears for both human and bear safety pursuant to sections 101(a)(4)(A), 109(h), and 112(c) of the MMPA. In a separate consultation, the Service concluded that acoustical and vehicular deterrence methods that anyone can perform are not likely to adversely affect polar bears (75 FR 61631), and these methods would not require authorization via LOAs. Intentional take LOAs would allow trained individuals to use other mechanisms (e.g., pyrotechnical cartridges, heavy equipment, and direct contact deterrents such as bean bags and rubber bullets projected from a shotgun) to deter polar bears away from oil and gas infrastructure and personnel. The Service requires mitigation measures and determines minimum standardized training in the use of deterrence methods. Because most activities that may occur in the first incremental step take place at sea in non-ice conditions, intentional take from activities occurring during the first incremental step is anticipated to be extremely rare.

Even if deterrence events were to occur, most are not likely to involve contact with the bear and would likely cause only minor, temporary behavioral changes (e.g., a bear runs or swims away). Because deterrence events are more likely to occur during the future incremental steps, we evaluate the effects of deterrence events fully in the section entitled *Interrelated and Interdependent Effects* when we evaluate effects of future incremental steps.

Polar Bear Critical Habitat – First Incremental Step

The first incremental step would likely have mainly physical effects on the Sea Ice Critical Habitat Unit, although effects of disturbance would likely limit the availability of small portions of critical habitat in other units. In this section, we describe these physical effects on the sea ice unit and disturbance effects on all three units.

Sea Ice Critical Habitat Unit

Effects of ice-breaking and ice management – Ice-breaking by ice-hardened vessels operating around offshore exploratory drill rigs could temporarily create leads in the ice, thus making small, localized areas of the ice platform unavailable to polar bears, and thus cause an adverse effect to sea ice critical habitat. Mahoney et al. (2010) suggest that icebreaker activity in fall/winter, when temperatures are cold and the ice is forming quickly (the ice-forming period), has very little impact on the availability of ice as habitat because icebreaker track lines refreeze very quickly (e.g., within hours in many cases). Icebreaker effects are small compared to natural variation in land fast ice, which constantly freezes and re-breaks; these effects are less detectable in pack ice because this ice has even more fissures and moving segments than land fast ice (Mahoney et al. 2010 cited in BOEMRE 2011*a*: 78). However, in spring, when ice is melting and retreating further north (the ice-melting period), the effects of ice-breaking would be detectable (Mahoney et al. 2010 cited in BOEMRE 2011*a*: 78). Icebreaking activity in the ice-melting period could open new leads that would remain open and expand as the open water absorbed more light and further melting occurred (Mahoney et al. 2010 cited in BOEMRE 2011*a*: 78). Thus, ice-breaking in the ice-forming period would have only minor effects on sea ice critical habitat, whereas ice-breaking in the ice-melting period may adversely affect sea ice critical habitat. Therefore, in-ice seismic surveys and ice breaking activities associated with exploration drilling are expected to have minor effects.

Although the Chukchi Sea and Beaufort Sea Planning Areas encompass a large portion of sea ice critical habitat, impacts to sea ice critical habitat are expected to occur over a very small portion of the Action Area. Additionally, most activities would occur during the ice-forming period; thus, ice would likely refreeze very quickly, only temporarily affecting sea ice. Because effects are expected to be localized, of a small scale relative to the size of critical habitat, and temporary, they are not expected to affect the ability of polar bears to use the remaining sea ice critical habitat for feeding, breeding, denning, and movements.

Effects on sea ice prey resources – Sea ice with adequate prey resources (primarily ringed and bearded seals) is an element of sea ice critical habitat. Oil and gas activities could affect the abundance of ringed and bearded seal in localized areas in the nearshore environment via disturbance, or by creating an attractant for ice seals near ice-breaking/ice management activities, which could then attract polar bears; but, given the temporal nature and the small geographic area of these effects, particularly in relation to the size of the critical habitat unit, potential impacts to polar bears are unlikely.

Disturbance: Terrestrial Denning, Sea Ice, and Barrier Island Critical Habitat Units

Effects of disturbance – Because the terrestrial denning and barrier island critical habitat units include lack of human disturbance as a PCE, the Service must separately analyze effects of disturbance on polar bears from its effects on critical habitat. The section of *Polar Bears – First Incremental Step* included an analysis of possible effects of disturbance on polar bears and whether these effects rise to the level of take under the ESA. In contrast, this section contains an analysis of disturbance on the ability of critical habitat to hold the value (e.g., lack of disturbance from humans) for which it was designated. Therefore, this section references disturbance of polar bears at points where it is meaningful to the discussion of the capability of critical habitat to support polar bears, but it does not repeat the analysis of effects on polar bears and possible take.

Vehicles such as rolligons that travel on ice or ice roads (e.g., to exploratory wells on islands from the mainland or during hardwater surveys in the nearshore Beaufort Sea) could cause disturbances making small portions of all three critical habitat units temporarily unavailable for the value for which it was designated (e.g., all three units provide areas for movement by polar bears). If the road is established and used consistently prior to the onset of denning (all three units provide denning habitat), then dens most likely will not be established in that area. Thus, well-traveled roads such as those to exploratory wells may make portions of all three critical habitat units around the road unavailable to polar bears an entire season. However, more transitory ice travel such as travel during hardwater surveys may not prevent denning in an area but may cause only temporary displacement of polar bears from localized areas. Because few on-ice activities will likely take place during the first incremental step, the area affected by such disturbances is expected to be very small.

Likewise, aircraft could also make portions of all three critical habitat units temporarily unavailable for use by polar bears. Polar bears disturbed on barrier islands may run and/or enter the water and start swimming; thus they could stop using the habitat for the purpose for which it was designated (i.e., for denning, a refuge from human disturbance, and movement along the coast to access maternal den and optimal feeding habitat). Bears have been re-sighted during repeated surveys in one fall season, and this demonstrates that most aircraft disturbances are likely to be temporary (e.g., likely lasting a few moments up to five minutes; T. Evans 2011, MMM, *pers. comm.*), and the value of critical habitat will return to a zone free of human disturbance once the helicopter leaves. Thus, we expect temporary aerial disturbance will have no long-term effects on the intended purpose of designated barrier island critical habitat. Persistent aircraft travel (e.g., to and from offshore oil rigs), however, could displace polar bears from localized areas in the flight path. Thus, localized areas of critical habitat could become unavailable.

Historically, the majority of bear observations by Industry representatives occur within one mile of the coastline because bears use this area as travel corridors. Persistent disturbance from overflights or vessels operating within one mile of barrier islands could prevent use of localized areas of barrier island critical habitat. However, these industry activities would only occur temporarily in localized areas; affected areas of critical habitat would regain their value once activities cease and the activities would not be expected to prevent use of the remaining barrier island critical habitat by polar bears.

On-ice or in-ice activities occurring near the ice edge could displace seals (a component of sea ice critical habitat) from pupping lairs or haulouts, and seals could abandon breathing holes near industry activities. In-ice surveys would most likely be completed prior to when parturient seals whelp their pups in the spring. Additionally, industry could scare polar bears away from seal kills. If this occurs, the ability of sea ice critical habitat to provide foraging habitat to polar bears could be adversely affected. Few on-ice activities will likely occur during the first incremental step, and those that do would be temporary. Additionally, industry would likely only occasionally encounter seals and would very rarely encounter polar bears hunting or foraging on a seal kill. Therefore, these disturbances would likely only temporarily affect a few ice seals.

Small Spills

As described earlier, we anticipate that small spills may occur as a result of the proposed Action during the first incremental step. Small spills could make localized areas of critical habitat temporarily unavailable because of disturbance while clean up occurred or temporarily decrease the value of critical habitat through contamination. However, due to the temporary nature of the impacts from spill response activities, and the small scale of these impacts, any effects to critical habitat resulting from a small spill would likely be minor.

Future Incremental Steps: Development Scenarios

This section assesses the impact of future development activities. Considerable uncertainty exists as to whether new development will actually occur in the Planning Areas and the location, scale, type of any such new development if it does occur. However, as described in the proposed Action, BOEM has developed reasonable development scenarios (DS) for each Planning Area. These DSs were used to provide an evaluation of potential impacts to listed and avian candidate species and designated critical habitats if development were to occur. Activities associated with development and production, if it does occur, would take place in marine and terrestrial environments, and could include construction of permanent facilities (central production facility, satellite facilities, subsea and terrestrial pipelines, pump stations), associated aircraft and vessel traffic, operation of those facilities over the life of the field, and removal and/or abandonment in place of facilities. We describe potential effects to listed and candidate avian species, the LBCHU, polar bears, and polar bear critical habitat below.

Avian Species – Future Incremental Steps

Habitat Loss - Marine

If development occurs, BOEM anticipates construction of one central platform with several satellite wells connected via subsea pipelines in one or both of the Planning Areas. These facilities would impact a small area of the sea floor, with some structures above the water surface. Given the large size of the Planning Areas (approximately 33.2 million acres for the Beaufort Sea Planning Area and 40.2 million acres for the Chukchi Sea Planning Area), significant permanent habitat loss in the marine environment is not anticipated. However, if facilities were located within the Ledyard Bay, spring leads, or other areas used by large numbers or a high proportion of the populations of listed and candidate species, it is possible some adverse effects could occur, such as a reduction in the habitat available for feeding. However, given the relatively small size of the footprint described by BOEM compared with the size of Ledyard Bay and other high-use areas, adverse effects would likely occur infrequently and be limited in extent.

Habitat Loss - Terrestrial

In the terrestrial environment, direct loss of habitat could occur by placement of gravel fill onto the tundra or by excavation of materials at gravel mine sites. If development occurs in the Chukchi Sea Program Area, BOEM anticipates construction of a new shorebase on the coast between Icy Cape and Point Belcher with oil/gas pipeline(s), communications lines, and a road stretching from the shorebase approximately 300 miles to link with the TAPS. BOEM estimates an additional staging area and four pump stations would also be constructed along the route.

BOEM anticipates any further development in the Beaufort Sea Planning Area would likely use existing infrastructure. Development in the central Beaufort Sea would likely make use of existing oil development facilities at Milne Point, Northstar, or Endicott. In the western Beaufort Sea, Cape Simpson would likely serve as a shore base with road and pipeline and communications constructed through NPR-A to the Kuparuk oilfield to link with TAPS. In the eastern Beaufort Sea, BOEM anticipates Point Thomson would be the most likely location for a shorebase, although use of this site would likely require construction of an airstrip. The amount of terrestrial habitat that could be impacted by a new development project in the Beaufort Sea Planning Area would vary depending on location but is estimated to be ≤ 3.45 km^2 (MMS 2009*a*).

The location of development would determine the impacts of breeding habitat loss on listed eiders, because density varies considerably across the North Slope. Assuming the gradient in observed density reflects a gradient in habitat quality, and displacing birds from preferred habitat reduces their reproductive potential, placing fill in areas used by nesting eiders may compromise their reproductive potential. To estimate the number of pairs affected, the footprint size can be multiplied by the density of birds. If the infrastructure and associated fill were placed in areas of average spectacled eider density (0.165 spectacled eiders/km^2; Larned et al. 2010), a few pairs would be affected each year. However, given the variation in density (none to 1.531 birds/km^2; Larned et al. 2010) the total number of pairs that could be potentially affected ranges from <1 to over 15 spectacled eider pairs/year, depending on the location of facilities.

Impacts of terrestrial habitat loss on Steller's eiders are even more dependent on location. Aerial surveys optimized to detect eiders since 1992 (Larned et al. 2006) indicate Steller's eiders occur at very low densities across the ACP, with the highest density in the vicinity of Barrow. The average density of Steller's eiders observed during ACP surveys in 2002-2006 was 0.0045 birds/km^2 (Barrow 0.002 Steller's eiders/km^2; Larned et al. 2010), but near Barrow was 0.63 birds/km^2 (Rojek 2008). Thus, the proportion of the breeding population affected would vary significantly depending on how much habitat loss occurs near Barrow. While development activities, such as construction of a shorebase, are not anticipated to occur at Barrow, if such an activity actually occurred, significant impacts to Steller's eiders could result.

Yellow-billed loons are patchily distributed across the ACP due to very specific breeding habitat requirements; thus, potential impacts of terrestrial habitat loss on yellow-billed loons would also depend on location. Based on fixed-wing aerial survey data (1992 to 2003 ACP and North Slope Eider (NSE) surveys conducted by the Service), Earnst et al. (2005: 300) calculated that most of the population on the ACP of Alaska occurred within concentration areas with more than 0.11 individuals per square kilometer (km^2). Such areas comprised only 12 percent of the surveyed area yet contained 53 percent of yellow-billed loon sightings. The largest concentration area was between the Meade and Ikpikpuk Rivers, and other notable concentrations were on the Colville River Delta and west, southwest, and east of Teshekpuk Lake (Earnst et al. 2005). Estimates of average density on the Colville River Delta has varied from 0.13-0.17 birds/km^2 (Johnson et al. 2005, 2006, 2007), while in the larger area of the Northeast Planning Area of the NPR-A, density was estimated to be lower, 0.07 birds/km^2 (Johnson et al. 2005). Infrastructure and associated fill could affect a few pairs of yellow-billed loons per year, particularly if development were to occur in loon concentration areas. However, if development occurred in the NPR-A, disturbance would likely be mitigated by required operating procedures for oil and gas activities, which requires aerial surveys to be conducted prior to development of oil and gas facilities. These facilities would then be required to be designed and located to minimize impacts to nesting yellow-billed loons. The default mitigation would require that placement of facilities be avoided within one mile of a nest and 500 m around the remaining lake shoreline (BLM 2004, 2008).

The terrestrial portion of the Action Area is on the northern edge of the breeding range for Kittlitz's murrelets. This species nests near the coast in steep, rocky habitat on the Chukchi coastline, which is presumably unsuitable for a pipeline landfall and associated infrastructure. It is also likely that a road and pipeline Right of Way (ROW) connecting Chukchi Sea development facilities to the TAPS would run predominantly east-west, nearly perpendicular to the Chukchi Sea coast, which would reduce the amount of possible infrastructure within Kittlitz's murrelet habitat. Kittlitz's murrelet nesting has not been recorded on the Beaufort Sea coastline. Given these factors, we conclude that little Kittlitz's murrelet breeding habitat loss is not likely to result from activities in future incremental steps.

Disturbance and Displacement

As noted in our analysis of the effects of the first incremental step, the severity of disturbance and the effects of displacement would depend upon the duration, frequency, and timing of the activity causing the disturbance. Such activities would likely increase with development and production.

Vessels (barges and support vessels) and aircraft (both fixed-wing and helicopters) could transport materials and personnel to both onshore and offshore facilities during all phases of a development project. The number and frequency of vessel and aircraft operations would likely be significantly higher per year in the construction phase of a project than in the production phase. The effects of vessel and aircraft disturbance on listed eiders and candidate species may include flushing/flying away at some energetic cost to individual birds. Depending upon the frequency of operations and routes traversed by vessels and aircraft, impacts could range from negligible (few listed and candidate birds encountered at irregular intervals) to substantial (for example, vessels or aircraft repeatedly encounter large molting flocks of spectacled eiders in Ledyard Bay).

In the terrestrial environment, human activities such as the movement of personnel and equipment at the shore base, storage pads, along the access road and pipeline ROW could result in the repeated disturbance of listed eiders and yellow-billed loons. If disturbance were to occur during the nesting period, it could adversely affect individuals by: 1) flushing females from nests or shelter in brood-rearing habitats, exposing eggs or ducklings to inclement weather and predators; and 2) displacing adults and or broods from preferred habitats during pre-nesting, nesting, and brood rearing, leading to reduced foraging efficiency and higher energetic costs. Based upon calculations by BOEM, habitat loss due to disturbance near infrastructure could total 33.55km^2 for development in the Beaufort Sea Program Area and 197 km^2 in the Chukchi Sea Program Area (MMS 2008).

The individual tolerance and behavioral response (i.e., habituation) of these species to disturbance would likely vary. There does not appear to be a clear relationship between the movements of spectacled eiders and oil infrastructure (Troy 1995), but it is possible that females could choose to avoid nesting in habitats near repeated human activities (essentially, habitat loss). If this occurred in areas supporting high densities of listed eiders, such as near Barrow, the resulting disturbance during the nesting season could lead to significant impacts to the species. It is difficult to estimate how much habitat would be rendered less suitable for nesting as a result of disturbance, but the Service typically assumes that nesting behavior may be disrupted by human activities within 200 m of nests (USFWS 2008). If so, the potential for the habitat to support nesting would be compromised. As described in the proposed Action, new terrestrial development projects are likely to occur, but they would likely occur in the eastern Beaufort near existing development such as Deadhorse, Endicott, Milne Point, Northstar. While Cape Simpson, which is relatively close to Barrow, could serve as a landfall for developments in the western Beaufort Sea, this area is not known as a major nesting area for listed eiders at this time. Thus, future development is not currently expected to significantly affect listed species breeding in the Barrow area.

Loons as a genus are susceptible to disturbance, although they sometimes habituate to predictable disturbance (Vogel 1995, Barr 1997, Evers 2004, Earnst 2004, Mills and Andres 2004, North 1994). As described above, disturbance from development activities in NPR-A, where a large proportion of high-density yellow-billed loon nesting habitat occurs, would be expected to be mitigated by BLM‘s required operating procedures.

Increased Subsistence Hunting

Prior to the listing of Steller's and spectacled eiders under the ESA, some level of subsistence harvest of these species occurred across the North Slope (Braund et al. 1993). Harvest continues despite prohibitions against taking spectacled and Steller's eiders. BOEM‘s Chukchi DS includes a new road into previously undeveloped areas, which could provide access to previously inaccessible areas for hunters. The Service will continue to work with local communities to ensure that hunters are aware of prohibitions on hunting listed eiders and restrictions on yellow-billed loon harvest, and the recent increase in Service law enforcement on the North Slope aims to minimize additional impacts from hunting. With appropriate management and communication, development is not anticipated to result in an increase in the subsistence harvest of these species.

Toxic Contamination from Mud Cuttings during Development/Production Drilling

As stated in the previous section, toxic contamination from disposal of drilling muds and cuttings could potentially occur. However, given that the only a small fraction of the birds' prey base would likely be affected in the relatively small footprint of projected future oil development in the Planning Areas, the Service anticipates only minor impacts would occur to listed eiders, yellow-billed loons, or Kittlitz's murrelets from toxic contamination resulting from discharges of drilling mud and cuttings.

Small Spills

Although small spills are expected to occur in future incremental steps, it is highly unlikely that listed eiders or candidate yellow-billed loons and Kittlitz's murrelets would be significantly affected. As in first incremental step, small spills are expected to be of very low volumes, and if they occur, the oil is likely to evaporate, weather, or be almost entirely recovered. Moreover, the density of listed eiders and candidate species is very low in most of the Action Area so that only small numbers of individuals of these species are likely to encounter oil from a small spill. Therefore, even if a small spill reaches the marine environment, there is a low likelihood these species would be affected by small spills during any portion of the first and future incremental steps. Accordingly, based on BOEM's oil spill risk analysis, the low volume and small area expected to impacted by small spills, and the sparse distribution of listed and candidate avian species over much of the Action Area, we anticipate that adverse effects to listed and candidate avian species from small oil spills are likely to be minimal during future steps of the proposed Action.

Ledyard Bay Critical Habitat Unit – Future Incremental Steps

Disturbance within the LBCHU – If production facilities or pipelines were constructed within the LBCHU, disturbance could limit availability of portions of this unit to spectacled eiders. Vessels (barges and support vessels) and aircraft (fixed-wing and helicopters) would transport materials and personnel to onshore and offshore facilities during all phases of a development project. The number and frequency of vessel and aircraft operations would likely be significantly higher per year in the construction phase of a project than in the production phase. Depending upon the frequency of operations and routes traversed by vessels and aircraft, impacts on the availability of PCEs could range from negligible (if there were no wells located within the LBCHU and minimal traffic within it) to substantial (vessels or aircraft could repeatedly encounter large molting flocks of spectacled eiders in the LBCHU if there were wells located within the LBCHU). Effects of disturbance could last as long as wells produce oil and gas in the OCS. As for the activities in the first incremental step, BOEM would require mitigation measures to be followed during development activities to minimize effects of disturbance on the availability of the LBCHU. Exact details of this mitigation would be developed if and when a project is proposed and section 7 consultation on that project is conducted.

Other effects to PCEs – Production facilities and pipelines would also negatively physically impact PCEs within the LBCHU. The facilities would occupy small portions of marine waters greater than 5 m and equal to or less than 25 m, making those areas, as well as the PCEs of marine aquatic flora and fauna in the water column unavailable to molting spectacled eiders. As during the first incremental step, drilling muds and cuttings would leave a footprint around the well site and would impact the PCE of the benthos. Recovery of this area would not likely occur until a few years after oil and gas extraction ceased because sediments would be greatly altered; however, the footprint of these sites would likely occupy a very small portion of the overall LBCHU. Similarly, burying pipelines through the LBCHU would disturb the benthos and the PCE of the marine benthic community. Because it is unknown at this time where potential development may eventually be proposed, the precise location and extent of disturbance to the benthic community is unclear. However, the benthos that is disturbed by the buried pipeline would likely be significant if the pipelines passed within the LBCHU and would take less than a decade (BOEMRE 2011*b*: 98-99) after pipelines have been buried to provide food to spectacled eiders.

Small Spills

An oil spill in the Chukchi Planning Area could reach the LBCHU and potentially affect PCEs and the ability of spectacled eider to use this area for the purposes for which the critical habitat area was designated. The LBCHU is important to migrating and molting spectacled eiders, and the PCEs for the spectacled eider in this unit are: (1) marine waters greater than 5 m (16.4 ft) and less than or equal to 25 m (82.0 ft) in depth; (2) the associated marine aquatic flora and fauna in the water column; (3) and the underlying marine benthic community.

Small spills projected to occur from the proposed Action are expected to be of very low volume and largely recoverable. As such, small spills are likely to have only short-term effects on PCEs of marina flora and fauna in the water column and the marine benthic community. Small spills could temporarily contaminate a very small area within the LBCHU boundary containing flora and fauna in the water column; although some oil from small spills could also contaminate the underlying benthic community, this is less likely than contamination within the water column. Spills would have to occur directly adjacent to or within the LBCHU for these effects to occur, and very few activities are likely to occur in this area. Additionally, effects of such contamination would be minimized through oil evaporation, weathering, and recovery efforts. Because the chance of small spills occurring within the LBCHU are low, and if they did occur the area affected by small spills would be small, and most of the spilled oil would evaporate, weather, or would be recovered, we do not expect small spills would have long-term effects that would diminish the function and conservation value of the LBCHU for molting spectacled eiders.

Polar Bears – Future Incremental Steps

If development occurs, polar bears would experience disturbance and possibly other impacts from activities associated with offshore and onshore facilities. As with avian species, the magnitude of impacts would likely vary by project location. Many of the effects from development would be similar to those described in the first incremental step, although the scale of effects in the offshore environment and the frequency of disturbance and human-polar bear encounters on land would likely increase with the development of onshore infrastructure. The types and scale of effects would also depend on the location of facilities. We describe these effects below for non-denning and denning polar bears in the Action Area.

Effects on Non-denning Polar Bears

Effects of disturbance and human-polar bear interactions would be similar to those described for activities occurring in the first incremental step, although we would expect more interactions and an increase in disturbance as the number of development and production facilities increased. For example, if development were to occur in the Chukchi Sea, BOEM anticipates construction of a road and oil pipeline to connect with existing infrastructure. Industry would likely use existing infrastructure and would construct new infrastructure. Non-denning polar bears could be temporarily displaced, or their behavior could be modified (e.g., by changing direction or speed of travel), by traffic using this road, and such disturbances would likely result in an increase in effects on polar bears over levels within the first incremental step. We evaluated most of the effects of oil and gas industry activities on polar bears in the First Incremental Step section, but because of the likely increase in disturbance of polar bears in the terrestrial environment associated with development and production in the OCS, we evaluate these additional effects below.

Possible habituation or conditioning to noise – Polar bears near routine industrial noise may habituate to these stimuli and show less vigilance than bears not exposed to such stimuli. For example, during the ice-covered seasons of 2000–2001 and 2001–2002, active dens were found 0.4 km and 0.8 km (0.25 mi and 0.5 mi) of remediation activities on Flaxman Island in the Beaufort Sea with no observed impact to the polar bears (Smith et al. 2007). Habituation to stimulus such as noise is generally considered to be positive because polar bears could experience less stress from Industrial activity; however, it could also increase the risk of human-bear encounters.

Industry activities as attractants – Offshore/nearshore oil and gas activities during future incremental steps could lead to construction of permanent structures (e.g., gravel islands) in coastal areas and the nearshore environment. Currently, offshore developments in the nearshore environment account for the majority of the polar bear observations. To illustrate, Endicott, Liberty, Northstar and Oooguruk in the Beaufort Sea accounted for 47% of the bear observations between 2005 and 2008 (182 of 390 sightings; 76 FR 47010). Because polar bears can be curious and permanent structures can provide habitat (e.g., resting), oil and gas activities and structures could serve as attractants. In some cases, bears may benefit from the presence of infrastructure. For example, the two man-made causeways on the North Slope (the STP/West Dock Causeway and the Endicott Causeway) have created resting, traveling, and other habitat (over approximately seven miles in length) for polar bears since their construction in the 1980s. However, such use of infrastructure by bears could result in increased human – bear encounters that could, in turn, result in unintentional harassment, intentional hazing (see *Interrelated and Interdependent Effects* section below), or possibly situations in which bears are killed because it posed an immediate threat to human life. Given that most human-polar bear interactions currently occur at nearshore oil wells, activities occurring in future incremental steps could increase human-polar bear interactions above current levels. Stranding of polar bears in the nearshore environment due to melting sea ice could exacerbate this effect. Thus, adverse effects on polar bears could result from future incremental steps.

Mitigation measures – Most human-bear interactions involve transient polar bears and do not normally result in impacts to bears that affect their essential life functions. Through the MMPA LOA process, lessees would be required to develop human-polar bear interaction plans, and personnel would participate in onsite polar bear training. This training would educate field personnel about the dangers of bear encounters and how to implement safety procedures in the event of a bear sighting. It would allow on-site personnel to detect bears and respond safely and appropriately. In the past, this response often included leaving an area where bears are seen until the bear leaves the area. Occasionally, and when appropriate, the response may involve deterring the bear from the site (76 FR 13454: 13470). Effects of deterrence activities are described in more detail in the *Interrelated and Interdependent Effects* section below.

Effects on Denning Polar Bears

Polar bears can den on land and on sea ice; and, development and production activities could occur in these two habitat types. Thus, some potential for disturbance of denning bears is possible. As the potential impacts to polar bears from oil and gas activities in these two habitats would be similar, the effects described in this section are relevant to bears denning in either habitat.

Industry infrastructure as attractants – As mentioned previously, permanent structures could provide polar bears habitat; abandoned structures (e.g., abandoned gravel islands) could provide relatively disturbance-free habitat. For example, the Staging Pad, an isolated, abandoned gravel pad isolated approximately 7 km northeast of the Milne Point Central Processing Facility, is the most consistent location of polar bear denning on the North Slope; eight maternal dens have occurred on this man-made pad in the last nine years. Bears have also successfully denned on a decommissioned exploration gravel pad on Cross Island and on the runway ramp at the Bullen Point LRRS.

Effect of noise disturbance on denning bears – Female polar bears entering dens and those in dens with cubs are more sensitive than other bears to industry activities. Noise from oil and gas activities (stationary or mobile and on ice or on land) could disturb bears at den sites, and depending on the timing in the denning cycle, could have varying effects on the female bear and family group. During the early stages of denning when the pregnant female has limited investment at the site, disturbance could cause her to abandon the site in search of another one. At emergence, cubs are acclimating to their 'new environment' and the female bear is vigilant to protect her offspring. As a result, females with cubs of the year may be more sensitive than other bears, and visual, acoustic, and olfactory stimuli may disturb the female to the point of abandoning the den site before the cubs are physiologically ready to move. For example, in 2006, a female and two cubs emerged from a den 400 meters from an active river crossing construction site. The female abandoned the den site within hours of the cub emergence three days later. In 2009, a female and two cubs emerged from a den site within 100 meters of an active ice road with heavy traffic and abandoned the site within three days. Females with cubs generally remain near the den site for three days to three weeks (C. Perham 2011, MMM, *pers. comm.*) prior to abandoning a den site. Such early den abandonment occurrences, however, are infrequent and isolated. Reactions of bears to human activity are highly variable, as some bears are more tolerant of stimuli than others. For example, in the spring of 2011, a female bear emerged from a maternal den she had constructed in the bagged island armor of ENI's Spy Island Development. The island was not in use when she initiated denning, but the den was discovered when Industry returned in the spring. In coordination with the Service, personnel temporarily left the island until the female emerged naturally with a cub and abandoned the den site (i.e., did not abandon early due to human disturbance). Thus, this female and cubs tolerated oil and gas activities for some time prior to emergence; implementation of an interaction plan most likely also minimized effects on these denning bears.

The oil and gas industry develops interaction plans and receives training in association with LOAs, and known polar bear dens around oil and gas activities, discovered opportunistically or from planned surveys, are monitored by the Service. These sites are only a small percentage of the total active polar bear dens for the SBS in any given year, and LOAs issued to the oil and gas industry and polar bear interaction plans specify procedures to be followed when a bear or a bear with cubs are encountered. At that time, mitigation, such as activity shutdowns near the den and 24-hour monitoring of the den site may be implemented limiting human-bear interactions, thereby allowing the female bear to naturally abandon the den and minimize impacts to the animals. We expect that these interaction plans and training would minimize disturbance to denning bears. For example, in the spring of 2010, an active den site was observed approximately 60 meters from a heavily used ice road. A one-mile exclusion zone was established around the den, closing a 2-mile portion of the road. Monitors were assigned to observe bear activity and monitor human activity to minimize any other impacts to the bear group. These mitigation efforts minimized disturbance to the bears and allowed them to naturally abandon the den site. We expect similar mitigation methods to be used during the future incremental steps, and expect similar effectiveness at minimizing disturbance.

Impacts of mobile sources of disturbance on denning bears – Mobile sources include vessel and aircraft traffic, ice road construction and associated vehicle traffic, including tracked vehicles and snowmobiles. Additionally, if development were to occur in the Chukchi Sea, BOEM anticipates construction of a road and oil pipeline to connect with existing infrastructure. Because disturbance from traffic on the road is frequent and on-going, and confined to the road corridor, we assume denning females will either avoid the area or become habituated (Smith et al. 2007) to this source of disturbance and not suffer adverse effects from road disturbance during denning. Although vehicles on ice or land could hypothetically travel over dens causing them to collapse, this is unlikely to occur because oil and gas personnel routinely coordinate with the Service to determine where their activities are relative to known dens and denning habitat. LOA provisions require oil and gas personnel to avoid known polar bear dens by one mile and often require personnel to search for potential denning habitat using den detection techniques, such as Forward-looking Infrared (FLIR) technology. Similar provisions would likely be enacted during the future incremental steps to minimize the chance that oil and gas activities cause the destruction of dens or early den abandonment.

Occasionally, oil and gas personnel encounter an unknown den. From 2002 through 2010, six previously unknown maternal polar bears dens were encountered by Industry. Once a previously unknown den is identified, Industry must report its location to the Service, and mitigation measures described in polar bear interaction and response plans are implemented. These may include a one-mile exclusion area around the den and 24-hour monitoring of the site. Denning bears may also abandon or depart their dens early in response to repeated noise produced by extensive aircraft overflights. Mitigation measures, such as minimum flight elevations over polar bears or areas of concern and flight restrictions around known polar bear dens, will be likely be required in LOAs or other MMPA authorizations, as appropriate, to reduce the likelihood that bears are disturbed by aircraft.

Small Spills

As described earlier, we anticipate that small spills may occur as a result of the proposed Action during future incremental steps. However, due to the temporary nature of the impacts from spill response activities, the small scale of these impacts, and the relatively low density of polar bears in the action area, any effects to polar bears resulting from a small spill would likely be minor.

Interrelated and Interdependent Effects

As discussed in the Interrelated and Interdependent Effects section for polar bears in the First Incremental Step, deterrence activities are not part of the proposed Action but polar bears could ultimately be subject to intentional deterrence; thus, we consider deterrence activities to be an interrelated action to the proposed Action. Deterrence activities are most likely to occur on the mainland, production islands, and on the ice. Polar bears could experience temporary disturbance and stress from some deterrence activities (e.g., from acoustical devices, moving vehicles, spotlights) and could walk, run or swim away. For healthy bears, any stress they experience from this activity would likely be short term; bears that have walked or swam long distances could experience longer periods of stress and could need to rest elsewhere prior to resuming normal activities such as feeding. Bears that are deterred using more aggressive methods (e.g., projectiles such as bean bags and rubber bullets), would likely experience stress, short-term pain and could be bruised. In August 2011, one polar bear was accidentally killed during a deterrence event due to mistaking a firecracker round with a bean bag round. Such outcomes are extremely rare (no bears were killed during oil and gas activities from 1993 until this event).

From 2006 through 2010, the oil and gas industry working in the Beaufort Sea or coastal areas adjacent to it reported the sightings of 1,414 polar bears, of which 209 (15%) were intentionally harassed or deterred (C. Perham, *pers. comm*., email, July 12, 2011). Annually, the percent of total bears sighted that were deterred ranged from ranged from 9% in 2010 to 43% in 2006, with an average of 15%. For the purposes of this BO, we expect that with increased development, the number of bears deterred annually during the DS would increase. If polar bears become stranded in the nearshore/coastal environment due to melting sea ice from climate change, the number of deterrence events could increase further. For the majority of deterrence events, no contact with the bear is anticipated, and we expect that most of these deterrence events would cause only minor, temporary behavioral changes (e.g., a bear runs or swims away).

Polar Bear Critical Habitat – Future Incremental Steps

Many of the potential effects on critical habitat described in the *First Incremental Step* section would also be expected to occur during the future incremental steps, although the scale of these effects would likely increase. If development were to occur, industry would likely construct some structures within terrestrial denning critical habitat that would prevent use or reduce the conservation role of some localized areas. Human activities (e.g., noise produced by equipment and visual stimuli) at these facilities, especially those located on the coast where most polar bears are observed, could interfere with the capability of critical habitat adjacent to facilities to provide their intended function. This could occur, for example, if polar bears were to alter their travel routes to avoid contact with these facilities, and avoid denning, hunting, and resting near existing structures. Thus, during future incremental steps, potential effects in all three critical habitat units would likely be greater than those occurring in the first incremental step. We describe these potential effects below.

Industry structures as barriers to movement – Structures built during development, especially infrastructure that extends continuously from the coastline to the offshore facilities (e.g., causeways to production islands, possibly pipelines and the facilities supporting them), have the potential to act as barriers to movements of polar bears (76 FR 13454: 13470). During periods of ice, bears may more easily avoid human structures in all critical habitat units because they can easily travel over ice. However, during the ice-free period, bears may choose to swim to avoid human activity on the mainland, especially in areas where structures are closely spaced. Thus, existing and proposed structures could interfere with the ability of polar bears to use terrestrial denning and barrier island critical habitat for its intended purpose, and this is most likely to occur during the ice-free season. However, polar bears are able to climb and cross gravel roads and causeways, and have frequently been observed crossing existing roads and causeways in the Prudhoe Bay oilfields, suggesting that structures associated with oil and gas development typically do not act as a significant barrier to polar bear movements.

Currently, the configuration of existing structures allows for polar bears to transverse and leave the Action Area to carry out essential life functions although polar bears may alter their travel route to go around/avoid contact with structures; alternatively, polar bears may travel over infrastructure such as roads (polar bears can climb and cross gravel roads, and have frequently been observed crossing existing roads and causeways in the Prudhoe Bay oilfields). Thus, infrastructure is not currently impeding polar bears from using critical habitat for movement. We anticipate that any structures that may be constructed as a result of the proposed Action would have similar (minor) effects on the function of critical habitat.

Physical effects on PCEs – If development were to occur, new gravel pads, roads, and gravel mine sites and a pipeline could be constructed in the barrier island and sea ice critical habitat units in the both Planning Areas and the terrestrial denning unit in the Beaufort Sea Planning Area (the Chukchi Sea Planning Area does not contain any of the terrestrial denning critical habitat unit). While development could preclude the use of some areas of critical habitat, some bears could use critical habitat even after new structures are built on it and it is in use. Bears have used oil industry structures as resting areas to escape weather (e.g., a female bear rested for two days on the bank of Milne Point Road in 2007, and multiple bears have used the STP/West Dock and Endicott causeways as resting and travel habitat) and presumably for an elevated vantage point (a family group rested on an elevated pad at Oliktok Point in 2007). Denning habitat has also been created by oil and gas structures; structures constructed during future incremental steps could provide similar habitat. Potential denning habitat is protected across much of the Action Area through the Bureau of Land Management's Required Operating Procedures that preclude development within ¾ mile of the coastline, and ½ mile of many rivers. Therefore, while we expect some adverse effects would likely to occur through physical effects on critical habitat if development occurred, their construction would not prevent polar bears from using the PCEs in other areas of critical habitat.

Large Oil Spills

While small spills are almost certain to result from activities proposed in all incremental steps, BOEM considers large oil spills, defined by BOEM as spills at least 1,000 barrels in volume, unlikely to result from the proposed Action, particularly during the first incremental step (Table 5). Because they are not reasonably certain to occur, large spills do not constitute indirect effects of the proposed Action under the ESA. Nevertheless, in the interest of clarity, thoroughness and protection of listed species, we have analyzed the potential effects of the large spill (≥1,000 barrels) scenarios described by BOEM.

Table 5. Oil spill occurrence and frequency estimates in the Arctic OCS Program Areas from BOEMRE (2011a).

Beaufort Sea Program Area		
Oil spill size	1st Increment (Exploration)	Future Incremental Step (Development/Production)
Small (<1,000 barrels)	very likely, >99.5%	very likely, >99.5%
Large (≥ 1,000 barrels)		
Exploration and delineation wells	0.016[1] (mean spill no.)	Not applicable
Production wells, platform, pipeline	Not applicable	74% chance of 0 large spills; 26% chance of one or more[2]
VLOS (≥ 150,000 barrels)	2.39×10^{-5}/well[3]	2.39×10^{-5}/well[3]

Chukchi Sea Program Area		
Oil spill size	1st Increment (Exploration)	Future Incremental Step (Development/Production)
Small (<1000 barrels)	very likely, >99.5%	very likely, >99.5%
Large (≥ 1000 barrels)		
Exploration and delineation wells	0.003[1] (mean spill no.)	Not applicable

Production wells, platform, pipeline	Not applicable	60% chance of 0 large spills 40% chance of one or more[2]
VLOS (≥ 150,000 barrels)	2.39×10^{-5}/well[3]	2.39×10^{-5}/well[3]

Notes:
1. The estimated mean spill number was calculated using the average large spill frequency per 1,000 years during exploration drilling and conservatively assuming an exploration season was ½ a year over the life of the exploration wells for each Program Area.
2. Chance of one or more large oil spills occurring over the life of the estimated exploration and development. It is derived from the mean spill number summing the annual mean spill number from exploration, delineation and development wells, platforms and pipelines over the life of the project.
3. Frequency of OCS loss of well control incidents (30 CFR 250.188(c)), where fluids were lost, for spills ≥ 1,000 and ≥ 150,000 barrels during exploratory and development/production operations from 1971-2010 (i.e., these operational phases are considered together).

Large spills would most likely be in the form of crude oil. Sources of crude oil spills are wells, storage tanks on platforms, and pipelines. Because industry does not store large volumes of crude oil and construct pipelines during the first incremental step, large crude oil spills from storage tanks on drilling platforms and pipelines could only occur in future incremental steps (BOEMRE 2011*a*: A-4). However, it is possible that a well control incident followed by a long-duration flow could occur during exploratory drilling in the first incremental step, and drilling for production in a future incremental step. Therefore, it is possible, although very unlikely, for this type of event to result in a large oil spill from activities in the first and future incremental steps.

The Chance of One or More Large Spills

The Chance of a Large Spill from the Loss of a Well-control Event

The only source of a large spill during exploration, and one source of a large spill during future incremental steps, is a loss of well control incident, as defined by 30 CFR 250.188(3), followed by an uncontrolled flow event. BOEM bases estimates of large spills occurring from a loss of well control incident on the following factors:

- About 99.7% of OCS spills that have occurred to date were less than 50 barrels (Anderson and LaBelle 2000);
- Of the oil spill events leading to the low frequency of large spills in the past, only a small portion of those oil spill events were from exploration wells (Bercha Group Inc. 2006, 2008);
- From 1971-2010, one large spill occurred during exploratory and development/production operations from loss of well control out of 41,781 OCS wells, making the frequency of a large spill from a loss of well control 2.39×10^{-5}/well (BOEMRE 2011*a*: A-6); and
- Of the more than 15,000 exploration wells drilled in the OCS from 1971-2010, 15 oil spills have occurred from loss of well control, all of which were within the small spill size category except the VLOS from the Deepwater Horizon event in 2010 (BOEMRE 2011*a*: A-6).

Thus, BOEM estimates that a large spill, including a VLOS, is extremely unlikely to occur from wells during exploration or development and production because the frequency of a large oil spill from a loss of well control incident is extremely low (Table 5).

Loss of well control incidents followed by long duration flows reaching VLOS volumes – BOEM modeled the fate of oil spilled from a loss of well control incident that caused a spill to cumulatively reach the VLOS volume occurring within each Program Area. Because geological formations and response times would likely differ between the two Program Areas, their VLOS maximum oil volume differs.

- In the VLOS scenario for the Beaufort Sea, BOEM estimates 15,000 barrels/day would flow from a well for 15 days, the estimated time required for oil to be collected with the capping and containment system prior to reaching the sea surface (BOEMRE 2011*a*) resulting in a cumulative spilled volume of 225,000 barrels.
- In the VLOS scenario for the Chukchi Sea Program Area, BOEM uses a discharge model that estimates the highest possible uncontrolled flow rate that could occur within known prospects in Lease Sale 193 area. Oil would flow from a well for 74 days, the estimated time required for a second drilling platform to arrive and drill a relief well. The initial oil discharge is projected to be more than 61,000 barrels/day during Day 1 and is projected to decrease to 20,479 barrels/day by Day 74. The total oil discharged by Day 74 would be 2,160,200 barrels. A cumulative volume of 2.2 million barrels was used for purposes of analysis, but oil removed through response efforts was not considered in the analysis.

The fate of oil spilled in the two Planning Areas would also differ, and is described below.

Beaufort Sea - *loss of well control incidents followed by long duration flows reaching VLOS volumes* – In the extremely unlikely event that a VLOS were to occur, BOEM projects that some oil would evaporate, disperse, become bound with sediment or oil the coast. The remaining 180,000 barrels in open water would likely cover approximately 290 km^2 after 3 days and 5,700 km^2 of discontinuous area after 30 days, and would likely oil an estimated 275-300 km of coastline (BOEMRE 2011*a*: 118). The OSRA model assumes no clean up response and no containment. A spill of the same size occurring in broken ice conditions would likely cover 160 km^2 after three days and 3,200 km^2 of discontinuous area 30 days after meltout, and would likely oil an estimated 100-130 km of coastline (BOEMRE 2011*a*: 118). This winter spill would melt out in the following summer.

Chukchi Sea - loss of well control incident*s followed by long duration flows reaching VLOS volumes* – In the extremely unlikely event that a VLOS were to occur, BOEM projects that 27-38% of the oil would evaporate, 10-50% would likely disperse, and some would likely become bound with sediment or oil the coast (BOEMRE 2011*b*: B8). A 2.2 million barrel oil spill would contact a discontinuous area in open water of 29,000-49,000 km^2 after 3 days and 109,000 – 304,000 km^2 of discontinuous area after 30 days, and would oil an estimated 0-960 km of coastline within 3 to 30 days (BOEMRE 2011*b*: B27, B12). The OSRA model assumes no clean up response and no containment. A spill of the same size occurring in broken ice conditions would contact a discontinuous area of 26,000 – 54,000 km^2 after three days and 109,000 – 277,000 km^2 of discontinuous area within 30 days after meltout, and would oil an estimated 0-400 km of coastline (BOEMRE 2011*b*: B27, B12). This winter spill would melt out in the following summer.

The probability that a VLOS would occur in either program area is extremely low and therefore cannot be said to be reasonably certain to occur and, therefore, is not considered an indirect effect of the proposed Action. However, if such a rare event were to occur, significant impacts to listed and candidate species and their critical habitats could occur. The severity of the impacts would depend on the volume of oil spilled and spill timing and location; but, at least Steller's and spectacled eiders could be affected at the population level should a VLOS occur.

The Chance of One or More Large Oil Spills Occurring from Platforms and Pipelines – Future Incremental Steps Only

As mentioned previously, pipelines or production platforms could be a source of a large oil spill during future incremental steps. If development were to occur, BOEM estimates the chance of one or more large spill occurring as 26% for the Beaufort Sea Program Area over the estimated 20 years of production and development and a 40% for the Chukchi Sea Program Area over the estimated 25 years of production and development (Table 5; BOEMRE 2011*a*: A-29). However, it is not certain that development will actually occur in either Program Area. BOEM estimates the probability of development in the Chukchi Sea Program Area as 27% and 67% in the Beaufort Sea Program Area. Therefore, given the uncertainty that development will actually occur, coupled with the probability estimates for a large spill, this type of event is not reasonably certain to occur and does not meet the definition of an indirect effect under the ESA. While a large spill resulting from a well control incident, platform, or pipeline spill in either program area is not reasonably certain to occur and therefore, does not meet the definition of an indirect effect of the Action, in order to provide as complete an analysis as possible, we have assessed the potential effects of the large spills modeled and described by BOEM.

Volumes of oil used in BOEM's crude oil spill analyses during future incremental steps – From 1985-1999 on the OCS, the median and average pipeline crude oil spill ≥1,000 barrels was 4,600 barrels and 6,700 barrels, respectively (Anderson and LaBelle 2000, BOEMRE 2011*a*: A-5). From 1964-1999 on the OCS, the median and average platform crude/condensate oil spill, after trend analysis, was 1,500 barrels and 3,300 barrels, respectively (Anderson and LaBelle 2000, BOEMRE 2011*a*: A-5). These volumes were used by BOEM to determine the size of large spills analyzed in their oil spill weathering models. The OSRA model assumes no clean up response and no containment.

Large platform and pipeline spills during future incremental steps – BOEM analyzed oil weathering of large spills for up to 30 days using the median spill volumes from a platform (1,500 barrels) and pipeline (4,600 barrels) as the hypothetical large spill sizes, in the unlikely event a large spill were to occur. Because the fate of oil spilled in the two Program Areas differs, the spill scenarios also differ and are described separately. For the full analysis by BOEM, see MMS (2003) for the Beaufort Sea and BOEMRE (2011*b*) for the Chukchi Sea.

Spill Scenarios for the Program Areas – Future Incremental Steps

When BOEM publishes the 2012-2017 Programmatic Final EIS the document will incorporate by reference a final peer-reviewed paper which includes an updated estimate of median large OCS spill sizes. At the Service's request, BOEM reviewed the spill scenario below and determined that the draft updated estimate of median large OCS spill sizes in the Programmatic Draft EIS (BOEM 2011) would not result in substantial changes to the persistence estimate, length of coastline oiled, and discontinuous area calculations provided in the September 29, 2011, Biological Evaluation (BOEMRE 2011*a*). The spill scenarios below remain the best available information for determining the persistence, fate, and effects of large oil spills.

Beaufort Sea Program Area

Large platform spill – If development were to occur as described in the DS and a platform spill were to occur, BOEM estimates that after 30 days in summer (July–September), a 1,500-barrel platform crude oil spill would cover approximately 181 km^2 of discontinuous area, oiling an estimated 29 km of coastline. An estimated 65% of a 1,500-barrel winter crude oil spill from a platform would remain 30 days after meltout, and would cover 143 km^2 of discontinuous area and an estimated 32 km of coastline (BOEMRE 2011*a*: 118).

Large pipeline spill – If development were to occur as described in the DS, and a large pipeline spill were to occur, BOEM estimates that after 30 days 40% of a 4,600-barrel pipeline spill during the summer season would remain in the environment after weathering. The spill would cover a discontinuous area of 320 km^2 and an estimated 49 km of coastline. An estimated 69% of a 1,500-barrel winter spill from a platform would remain in the environment (after weathering) 30 days after meltout, and would cover 252 km^2 of discontinuous area and an estimated 54 km of coastline (BOEMRE 2011*a*: 118).

Chukchi Sea Program Area

Large platform spill – If development were to occur as described in the DS, and a spill were to occur, BOEM estimates that a 1,500-barrel summer platform crude oil spill (June through October) would cover approximately 577 km^2 of discontinuous area after 30 days, oiling an estimated 25 km of coastline. After meltout, a 1,500-barrel winter crude oil spill from a platform would cover an estimated 188 km^2 of discontinuous area after 30 days, and would oil an estimated 30 km of coastline (BOEMRE 2011*a*: 120).

Large pipeline spill – If development were to occur as described in the DS, and a spill were to occur, after 30 days 44% of a summer crude oil spill of 4,600-barrels from a pipeline would remain in the environment after weathering. The spill would cover approximately 1,008 km^2 of discontinuous area, oiling an estimated 42 km of coastline (BOEMRE 2011*a*: A-73). Thirty days after meltout, the remaining (after weathering) 55% of a 4,600-barrel winter crude oil spill from a platform would cover 332 km^2 of discontinuous area, oiling an estimated 51 km of coastline (BOEMRE 2011*a*: 120).

Cleanup Activities – First and Future Incremental Steps

Cleanup activities would likely occur after a large spill. Activities could include vessel traffic, aircraft traffic, in-situ burning, animal rescue, use of dispersants, booming, beach cleaning, drilling of a relief well, and bioremediation (BOEMRE 2011*b*: 148-149). Based on clean-up activities with the Exxon Valdez Oil Spill where only about 14% was recovered or disposed (Wolf et al. 1994), spill response may be largely unsuccessful in remote open water conditions, and spill response drills have had various levels of success in the cleanup of oil in broken-ice conditions (Dickens 2011). It is difficult to say how effective cleanup efforts will be at reducing the volume of oil in the environment if a large oil spill occurred.

Pollution prevention and oil spill response regulations and methods implemented by BOEM and offshore operators since the Deepwater Horizon event (BOEMRE 2011*a*, Visser 2011) have improved oil exploration and development/production operations, presumably reducing the likelihood of a large spill. However, if an oil spill does occur, cleanup efforts would likely take place. The duration of cleanup activities for a large spill would depend on the timing and amount of oil spilled, but would likely last months or years. These activities could involve multiple marine vessels and aircraft operating in the spill area for a long time (BOEMRE 2011*a*: 82).

Effects of Large Oil Spills -First Incremental Step

As stated previously, based on BOEM's oil spill risk analysis, a large spill is extremely unlikely to occur during the first incremental step because the only source of a large spill would be from a loss of well control incident followed by an uncontrolled flow event from an exploration well. However, if a large spill were to occur, it could adversely affect listed species, and in rare circumstances could possibly cause population-level effects. Critical habitat in the Action Area could also be adversely affected. We previously described the general potential effects of oil on individuals in the *Small Spills* section. The severity of these impacts would likely increase with spill volume. Below, we describe potential effects on listed/candidate species populations, habitat resources and critical habitat, as well as those resulting from cleanup efforts that would likely take place during an oil spill.

Effects of Large Oil Spills on Avian Species – First Incremental Step

A large oil spill, including a VLOS, in the Chukchi or Beaufort Sea OCS during the first incremental step has the potential to contact individuals of listed and candidate avian species as well as impact their habitat. Certain areas are of particular concern because of their importance to large numbers of these species. In the Chukchi Sea, the spring leads in sea ice along the Alaska coast and Ledyard Bay support large numbers of listed eiders and yellow-billed loons at different times of the year. The impacts of a large spill could range from no birds affected to large numbers affected. If a large oil spill occurred when significant numbers of listed or candidate birds occupied these environments (e.g., during spring or fall molt), numerous birds could be poisoned or killed from contact with oil, possibly for years if oil persisted in the environment. Such a spill could cause population declines in species such as yellow-billed loons and listed eiders.

Cleanup Activities

In the unlikely event a large spill occurred and cleanup activities are necessary, cleanup activities could disturb candidate and listed eider species by flushing and displacing them via vessels and aircraft. Also, cleanup efforts could include capturing oiled birds. These types of disturbances and capturing efforts could further stress birds already stressed from contact with oil, although it is possible that hazing birds away from an oil impacted area could reduce the numbers of individuals that contact spilled oil. The number of individuals affected by disturbance would likely increase with increasing response efforts, which would likely increase with increasing spill volume and the persistence of oil in the environment.

Effects of Large Oil Spills on the Ledyard Bay Critical Habitat Unit – First Incremental Step

If a large spill, including a VLOS, occurred within or near the LBCHU it could affect the PCEs of the critical habitat unit and the ability of spectacled eider to use this area for the reasons it was designated. The scale of effects would depend on the location, timing, and volume of the spill, and could range from virtually no effects to significant effects if an extremely large volume of oil reached the LBCHU during fall molt. Therefore, the effects of an oil spill could range from minor to one that could severely affect the ability of the PCEs to provide the function and conservation role of the LBCHU for molting spectacled eiders. The severity of these impacts would likely increase with spill volume, the persistence of oil in the environment and the closeness of the spill to the LBCHU.

Cleanup Activities

Cleanup activities could reduce the availability of the LBCHU by causing disturbance and displacement of spectacled eiders through the use of spill response vessels and aircraft. The effects of such disturbance and displacement would end once vessels and aircraft left the area. Thus, effects from cleanup efforts in any given area would likely be temporary.

Effects of Large Oil Spills on Polar Bears – First Incremental Step

In addition to the impacts that exposure to oil may cause to individual polar bears (as described in the *Small Spills* section), a large spill, including a VLOS, could result in persistent toxic subsurface oil and chronic exposure, even at sub-lethal levels. This could have long-term effects on wildlife (Peterson et al. 2003). Long-term oil effects could be substantial through interactions between natural environmental stressors and compromised health of exposed animals, and through chronic, toxic exposure as a result of bioaccumulation. Polar bears are biological sinks for pollutants because they are the apical predator of the Arctic ecosystem and are also opportunistic scavengers of other marine mammals. Additionally, their diet is composed mostly of high-fat sealskin and blubber, (Norstrom et al. 1988). Polar bears would therefore be susceptible to the effects of bioaccumulation of contaminants associated with spilled oil, which could affect the bears' reproduction, survival, and immune systems.

During the ice-covered season, mobile, non-denning bears would have a higher probability of encountering oil than non-mobile, denning females. However, these bears occur at very low densities across the Action Area and large numbers are unlikely to be impacted. The most significant impacts would occur if oil reached barrier islands where tens of polar bears are known to congregate in fall (Miller et al. 2006). Although polar bears may be injured or killed from oil contamination, it is possible mitigation measures such as deterring bears away from an oiled area could reduce the number of bears contacting oil.

In much of the Action Area, polar bears occur at extremely low densities, minimizing the potential for oiling or killing large numbers of polar bears, even in the event of a VLOS. However, it is possible that a large marine oil spill occurring or persisting into the fall in areas where large numbers of polar bears congregate could contact and kill tens of polar bears. If a large spill occurred in the Beaufort Sea Program Area, at least a few polar bears are likely to come into contact with oil. Polar bears would be most susceptible to the impacts during the open-water and broken-ice periods (summer and fall) when polar bears can be concentrated in the nearshore environment (i.e., on barrier islands), especially because the use of coastal areas during the fall open-water period has increased in recent years in the Beaufort Sea. A study using data collected from 2001 to 2005 during the fall open-water period concluded: (1) on average, approximately four percent of the estimated 1,526 (i.e., 122) polar bears in the Southern Beaufort population were observed onshore in the fall; (2) 80 percent (i.e., 98) of these bears onshore occurred within 15 km of subsistence-harvested bowhead whale carcasses, where large congregations of polar bears have been observed feeding; and (3) sea ice conditions affected the number of bears on land and the duration of time they spent there (Schliebe et al. 2006). As most oil and gas activities occur in open-water season, oil spills are most likely to occur during this time. Polar bears are most likely to contact oil along shorelines as opposed to in open water. Hence, bears concentrated on shore in the fall (e.g., in areas where beach-cast marine mammal carcasses occur) would likely be the most susceptible to oiling and thus injury or death. Estimating the number of polar bears possibly oiled in the Chukchi Planning Area is difficult because we do not have reliable population estimates in this area, but there is no data to indicate that there are areas in U.S. waters where large aggregations of polar bears occur. However, a large oil spill in the Chukchi Sea would likely oil and therefore injure or kill several bears. The number of bears affected would likely increase with spill volume and the persistence of oil in the environment.

Cleanup Activities

Cleanup activities could disturb and displace polar bears via vessels, aircraft, and workers cleaning oil on shorelines. Also, cleanup efforts could include capturing oiled polar bears. These types of disturbances and capture efforts could further stress bears already stressed from contact with oil. However, cleanup and hazing efforts could also reduce the number of bears exposed to oil and rehabilitate those exposed to oil. The number of bears disturbed or displaced during cleanup efforts would likely increase with increasing spill volume and the persistence of oil in the environment. While a few individuals may experience disturbance, we do not expect population-level effects from cleanup activities would likely occur.

Effects of Large Oil Spills Polar Bear Critical Habitat – First Incremental Step

If a large spill occurred, including a VLOS, adverse effects to the PCEs of polar bear critical habitat could occur as well as reducing the availability of critical habitat to polar bears. If large portions of critical habitat were contaminated, its function and conservation role could be compromised. The severity of these impacts would likely increase with spill volume and the persistence of oil in the environment. The sea ice and barrier island units would likely be the most severely affected. A spill that oiled a large portion of the sea ice and barrier island critical habitat units would impair their function and conservation role for polar bears. Spill response and cleanup activities, and thus the effects of these efforts, could take place for several years.

Sea ice critical habitat – Oil could remain in the water or on ice where polar bears can contact it. Spilled oil or other chemicals could concentrate and accumulate in leads and openings that occur during spring break up and autumn freeze-up periods. Such a concentration of spilled oil would increase the chance that seals would be oiled, the main food source of polar bears. For example, a portion of the ringed seal-pupping habitat in shorefast ice could be exposed to oil, which would have negative impacts on polar bears hunting in this area. A local reduction in ringed seal numbers as a result of directly affecting seals or by affecting their prey could temporarily decrease the conservation role of sea ice critical habitat for polar bears (i.e., for hunting), as could deterrence activities to keep polar bears away from contaminated areas. However, the extent of the sea ice critical habitat unit and the low density of polar bears using it, coupled with the limited area that would be impacted by these types of spills serves to reduce the severity of this type of impact to the sea ice critical habitat unit as a whole.

Barrier island critical habitat – Oil on the shores and cleanup activities on barrier islands would reduce the conservation value of the critical habitat unit for polar bears. Given the limited efficacy of cleanup efforts in the past, oil could remain on barrier islands or in the "no disturbance zone" for several years after a large spill. Oil could coat a significant portion of the shores of barrier islands, and the geographical extent of the oil would increase with spill volume. Thus, if a large oil spill reached an extensive area of the barrier island critical habitat unit, it could adversely affect all elements for which barrier island critical habitat was designated: denning, as a refuge from human disturbance, and for movements along the coast to access maternal dens and optimal feeding habitat.

Terrestrial denning critical habitat – Oil spilled in the marine environment could wash up on the coast of the mainland or on barrier islands where polar bears could contact it. Individual polar bears oiled along the coast or in sea ice or barrier island units could transport oil into the denning critical habitat unit within the Beaufort Sea Planning Area, thus contaminating portions of it. The extent and intensity of this effect would increase with increasing volume of oil spilled and future geographical extent of the slick/coastline oiled.

Cleanup Activities

Cleanup activities could limit the ability of polar bears to access all three critical habitat units via disturbance and displacement from vessels and aircraft. For example, these activities could make some barrier islands inaccessible to polar bears because polar bears may avoid human disturbance caused by cleanup activities, and workers may deter polar bears from the barrier islands. The effects of such disturbance and displacement would end once vessels, aircraft, and workers on the ground left the area. Thus, effects from cleanup efforts would be temporary in any given location. The overall duration of cleanup activities, and thus their effects, would likely increase with the persistence of oil in the environment.

Conclusion

Based on BOEM's oil spill risk analysis, we anticipate adverse effects are not reasonably likely to occur on listed species and designated critical habitat from a large oil spill, including a VLOS during the first incremental step; the only source of a large spill, including a VLOS would be from a loss of well control incident followed by an uncontrolled flow event from an exploratory well, which is extremely unlikely to occur. If a large oil spill were to occur, the severity of effects on species and critical habitat would increase with spill volume and duration of oil in the environment. Thus, effects of a large spill could range from affecting a few individuals and a small portion of critical habitat to population-level effects to the species and effects to a large portion of critical habitat.

Effects of Large Oil Spills – Future Incremental Steps

As stated previously, large oil spills during future incremental steps, including VLOS, could originate from loss of well control incidents followed by a long-duration flow, or spills from pipelines and platforms. However, if a large spill were to occur it could adversely affect listed species, and in rare circumstances, could possibly cause population-level effects. Critical habitat in the Action Area could also be adversely affected.

We previously described the effects of oil on individuals in the *Small Spills* section. In the previous section, we described the effects of a large oil spill, including a VLOS, from a loss of well control followed by a long-duration flow from an exploratory well. BOEM considered the combined frequency of a large spill from a well occurring from exploration through development and production (Table 5); the chance of such an incident occurring and effects on listed/candidate species and critical habitat occurring during exploration and production are extremely low. Therefore, the analysis in the prior section regarding the first incremental step is relevant to future incremental steps. Thus, our effects analysis below focuses on large spills from pipelines and platforms with an emphasis on a median spill volume of 4,600 barrels for the DS scenario, the larger of the two spill volumes modeled. As stated previously, if development were to occur, the chance that one or more large spills would occur in the Chukchi Sea and Beaufort Sea is 40% and 26% over the life of development and production, respectively.

Effects of Large Oil Spills on Avian Species – Future Incremental Steps
A large oil spill in the Chukchi or Beaufort Sea OCS has the potential to contact individuals of listed and candidate species as well as impact their habitat. Certain areas, the spring leads in sea ice and Ledyard Bay, are of particular concern because of their importance to large numbers of these birds during specific times of the year. Assuming that a large spill occurs from any launch area (LA), the Oil-Spill Risk Analysis (OSRA) model estimates the chance of a large spill contacting spring leads (Environmental Resource Area [ERA] 19 in BOEM's analysis) and Ledyard Bay (ERA 10) within 360 days from either a winter or summer spill during activities in the Beaufort Sea Program Area is < 0.5 to 15%, and < 0.5 to 56% from activities in the Chukchi Sea Program Area and associated pipelines running to a shorebase (BOEMRE 2011*b*). This highest chance, 56%, for oil contacting Ledyard Bay (ERA 10) within 360 days of a spill, is from a summer spill from hypothetical Pipeline Segment (PL) 6 which transects the LBCHU. The OSRA model assumes no clean up response and no containment.

The number of birds oiled, and thus the severity of population-level effects, would depend on many factors, including season of the spill, distance from congregations of birds, and oil spill volume. Thus, the impacts of a large spill could range from no birds affected to large numbers affected. BOEM's modeling suggests that a large spill some distance away from these ERAs would likely not reach these areas and oil large numbers of listed and candidate birds. However, if oil reached these ERAs when significant numbers of listed or candidate birds were present (e.g., during spring or fall molt), numerous birds could be poisoned or killed from contact with oil. The likelihood of a large spill occurring when large congregations of birds are present (e.g., in the spring leads) and then contacting large numbers of birds is extremely low. However, a large spill (e.g., 4,600 barrels) that occurred during migration when large numbers of birds are present could conceivably kill large enough numbers of birds to cause population-level impacts. The Alaska-breeding population of Steller's eiders is particularly vulnerable because of its low abundance; population-level impacts could result from the loss of as few as tens of breeding females. The nature and severity of effects, including the potential for population-level effects to avian species would be expected to increase with increasing spill volume, depending on the location and timing of the spill.

Cleanup Activities
As analyzed previously, cleanup activities could disturb candidate and listed eider species, could include capturing oiled birds, and could further stress birds already stressed from contact with oil. It is possible that hazing birds away from oiled areas may reduce the number of individuals contacting spilled oil. While a few individuals could experience disturbance, we would not

expect population-level effects to occur from cleanup activities. We would expect that the potential effects to avian species from cleanup activities would increase with increasing spill volume and oil persistence, depending on location and timing of the spill.

Effects of Large Oil Spills on the Ledyard Bay Critical Habitat Unit – Future Incremental Steps

As described for avian species above, BOEM's models suggest large pipeline or platform spills would most likely not reach the LBCHU. However, if a large spill occurred within or near the LBCHU, it could affect the PCEs of the critical habitat unit and the ability of spectacled eider to use this area for the reasons it was designated. The scale and severity of effects would depend on the location, timing, and volume of the spill and could range from virtually no effects to significant effects if a large volume of oil reached the LBCHU during fall molt. Therefore, the effects of an oil spill could range from minor to those that could severely affect the ability of the PCEs to provide the function and conservation role of the LBCHU for molting spectacled eiders.

Overall, the likelihood of a large spill from pipelines (e.g., a median 4,600 barrels) and platforms (e.g., median 1,500 barrels) severely impacting the LBCHU is low because a large oil spill is unlikely to reach the LBCHU. BOEM estimated that if development were to occur and assuming a large spill occurs, the chance of a large spill contacting LBCHU (ERA 10) within 360 days of either a winter or summer spill from the Beaufort Sea Program Area is <0.5 to 15% and <0.5 to 56% from the Chukchi Sea Program Area and its associated pipelines (BOEMRE 2011*b*). If a large spill were to reach LBCHU, it would likely adversely affect some PCEs (e.g., oil could kill benthic prey). Effects would depend on the timing of the spill, the area impacted within in the LBCHU, and spill volume. Even if a large oil spill such as those modeled by BOEM occurring from most LAs did occur, effects on PCEs would be none to slight because only a small amount of oil would likely reach the LBCHU. However, while not likely, it is possible that a large spill proximal to LBCHU could result in a large volume of oil reaching the LBCHU, resulting in adverse effects to spectacled eider food resources. While these effects would be adverse, the effects of most spills would not be severe enough to cause PCEs in a large enough portion of the LBCHU to become unavailable to spectacled eiders. Although these effects could last more than one year, the affected PCEs would eventually recover and support spectacled eiders. The nature, extent, and severity of effects on the PCEs of the LBCHU would be expected to increase with increasing spill volume, depending on the location and timing of the spill.

Cleanup Activities

Cleanup activities could reduce use of the LBCHU by causing disturbance and displacement of spectacled eiders by spill response vessels and aircraft. The effects of such disturbance and displacement would end with once vessels and aircraft left the area. Thus, effects from cleanup efforts, although they could conceivably last one or more years, would likely be temporary and, therefore, would not significantly impact the PCEs and their ability to serve their conservation function. We would expect that the extent and severity of potential effects to LBCHU from cleanup activities would increase with increasing spill volume, depending on the location and timing of the spill.

Effects of Large Oil Spills on Polar Bears – Future Incremental Steps
As mentioned previously, a large oil spill as modeled by BOEM in the Chukchi or Beaufort Sea OCS has the potential to contact and adversely affect individual polar bears. Based on BOEM's oil spill risk analysis and the sparse distribution of polar bears (low density over a large area, with only a few tens of bears congregating even in the highest density areas), we anticipate that if a large spill occurred, few polar bears would be adversely affected in the majority of cases. If a large spill were to reach areas with high concentrations of polar bears, it is possible that tens of polar bears could be killed. While this would be an adverse impact, because the polar bear is listed throughout its range, such a spill would not kill a significant portion of the worldwide polar bear population. The nature and severity of effects, including the potential for population-level effects to polar bears, would be expected to increase with increasing spill volume, depending on the location and timing of the spill.

Cleanup Activities
Cleanup activities could displace polar bears via vessels and aircraft. Also, cleanup efforts could include capturing oiled polar bears. These types of disturbances and capturing efforts could further stress bears already stressed from contact with oil. However, cleanup and hazing efforts could also reduce the number of bears exposed to oil. While a few individuals could experience disturbance, we would not expect population-level effects to occur from a large spill as modeled by BOEM. We expect the effects to polar bears from cleanup activities to increase with increasing spill volume, depending on the location and timing of the spill.

Effects of Large Oil Spills Polar Bear Critical Habitat – Future Incremental Steps
If a large spill (e.g., median spill volume of 4,600 barrels) occurred, adverse effects to the PCEs of polar bear critical habitat could occur, and the local availability of critical habitat to polar bears would be reduced. We discuss these effects below.

Sea ice critical habitat –A large spill is not likely to impact a large proportion of sea ice, especially if it first occurred in summer when no sea ice is present. On a local scale, spilled oil could concentrate and accumulate in leads and openings that occur during spring break up and autumn freeze-up periods. Such a concentration of spilled oil would increase the chance that seals would be oiled, the main food source of polar bears. For example, a localized area of the ringed seal-pupping habitat in shorefast ice could be exposed to oil, which would have negative impacts on polar bears hunting in this area. A local reduction in ringed seal numbers as a result of directly affecting seals or by affecting their prey could temporarily decrease the conservation role of sea ice critical habitat for polar bears (i.e., for hunting), as could deterrence activities to keep polar bears away from contaminated areas. However, the severity of a spill up to 4,600 barrels would likely be low given the extent of the sea ice critical habitat unit and the low density of polar bears using it, coupled with the limited area that would likely be impacted. For spills greater than 4,600 barrels, the nature and extent and severity of effects on sea ice critical habitat would be expected to increase with increasing spill volume, depending on the location and timing of the spill.

Barrier island critical habitat – A spill up to 4,600 barrels would likely oil localized portions, but not all, of the barrier island critical habitat unit. Oil on the shores of barrier islands in localized areas would reduce their conservation value to polar bears using that area. Given the likely limited efficacy of cleanup efforts, oil could remain on these barrier islands or in the "no disturbance zone" for several years after a large spill. For spills larger than 4,600, we would expect a greater severity and duration of potential effects to the barrier island critical habitat unit, depending on the location, size and other factors surrounding the spill.

Terrestrial denning critical habitat – Oil spilled in the marine environment from a spill up to 4,600 barrels could wash up on the coast of the mainland or on barrier islands in localized areas where polar bears may contact it. Individuals oiled along the coast or in sea ice or barrier island units could transport oil into the denning critical habitat unit within the Beaufort Sea Planning Area, thus contaminating portions of it. The extent and intensity of this effect would likely be low, as bears would likely only contact oil in localized areas. For spills larger than 4,600 barrels, we would expect the potential effects to the terrestrial denning critical habitat unit to increase with increasing spill volume, depending on the location and timing of the spill.

Cleanup Activities

Cleanup activities after a large spill up could limit the ability of polar bears to access localized areas of all three critical habitat units via disturbance and displacement from vessels and aircraft. For example, cleanup activities may make some barrier islands inaccessible to polar bears because polar bears may avoid human disturbance caused by cleanup activities, and workers may deter polar bears from the barrier islands. These effects would end once workers left the area, although repeated cleanup efforts in the same area may be necessary. Thus, a large oil spill reaching localized portions of the barrier island critical habitat unit could adversely affect all elements for which barrier island critical habitat was designated: denning, as a refuge from human disturbance, and for movements along the coast to access maternal dens and optimal feeding habitat. The effects of such disturbance and displacement in all three critical habitat units would end once vessels and aircraft left the area. Thus, effects from cleanup efforts would likely be localized and temporary. We expect that effects from cleanup activities would likely increase with increasing spill volume, depending on the location and timing of the spill.

Conclusion

If a large oil spill from a pipeline or a platform were to occur, oil and cleanup efforts could adversely affect individual candidate and listed species and localized areas of critical habitat. The severity of impacts would depend on many factors, including season, location of the spill, and spill volume. For polar bears and polar bear critical habitat a spill up to 4,600 barrels would likely cause adverse effects but would not be likely to cause severe population-level declines, and is only likely to impact relatively small portions of critical habitat and the PCEs within these localized areas. Avian species could experience population-level declines if large numbers of birds came into contact with oil, although this is unlikely to take place. We are especially concerned about this regarding Steller's eiders. For spills larger than 4,600 barrels, we would expect the severity and extent of effects to listed species and critical habitat to increase, depending on the location, timing and size of the spill.

Cumulative Effects

Under the ESA, cumulative effects are the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the Action Area. Future Federal actions are not considered in this section because they will require separate consultation under the ESA. In addition to the federally controlled OCS area, the Action Area is comprised of State waters, and a terrestrial component, the majority of which is under Federal management through the Bureau of Land Management. In order to assess potential cumulative impacts the Service considered the following types of activities:

Further Oil and Gas Development
Further oil and gas development, whether in Federal or State waters or in the terrestrial environment on State, private, Native-owned, or Federal lands, would require Federal permits (such as section 404 of the Clean Water Act authorization from the U.S. Army Corps of Engineers (COE), and National Pollution Discharge Elimination System permits from the Environmental Protection Agency) and, therefore, are not considered cumulative impacts under the ESA.

Natural Gas Pipeline
BOEM now considers the development and export of North Slope natural gas via pipeline to be reasonably foreseeable. While much of this line is likely to be on State lands, a project of this magnitude would require Federal permits and section 7 consultation. It is therefore, not a cumulative effect under the ESA.

Community Growth
Community growth is anticipated to continue across the North Slope. The footprints of North Slope villages will likely increase, along with associated infrastructure such as roads, powerlines, communication towers, landfills, and gravel pits and these activities may adversely affect listed species. The scale of impacts will depend not only on the amount of growth, but the location as it relates to habitat. For example, community development projects at Barrow may potentially impact Steller's eiders to a much higher degree than developments at Point Lay.

Because over 97% of the Action Area is wetlands or open water (USGS National Land Cover Database), and listed eiders breed and use wetland areas, a section 404 permit from the COE would likely be necessary for all large scale community development projects that may impact eiders. The issuance of these permits would also trigger consultation under the ESA. Smaller projects may not require a Federal permit, but are also likely to have a smaller, if any, impact to listed species.

As the population of North Slope communities increases, so does the number of subsistence hunters in the Action Area. This could adversely affect listed eiders and yellow-billed loons through direct shooting of these birds and contamination of habitat by lead shot. As human population grows, so does the probability of human-polar bear encounters and the likelihood that subsistence harvest of polar bears will occur. As described in the *Effects* section, both law enforcement and education and outreach activities are on-going across the North Slope, and aim to eliminate illegal harvest of listed eiders and yellow-billed loons.

Commercial Fishing
Reduction in the extent and duration of sea ice may increase the potential for commercial fishing; however, under the Arctic Fisheries Management Plan, NMFS has prohibited any and all commercial fishing in the Arctic. Future commercial fisheries in the Action Area would likely

be managed by the National Marine Fisheries Service (NMFS), and the issuance of regulations would require section 7 consultations, and therefore are not considered cumulative effects.

Increased Marine Traffic
As the extent of arctic sea ice in the summer has declined, and the duration of ice free periods has increased, interest in shipping within and through arctic waters (Brigham and Ellis 2004) has increased. Ships operating, or that could operate in the area include military vessels, pleasure craft, cruise ships, barges re-supplying communities, scientific research vessels, and vessels related to resource development such as oil, gas, and minerals. The potential increase in the number of vessels operating in arctic waters has been matched by an increase in United States Coast Guard (USCG) activities. The USCG has conducted a number of major exercises in Arctic waters for which section 7 consultations were conducted.

Increased marine traffic could impact listed species through disturbance, and more significantly from an accidental fuel spill. However, we have no data on the likely number of vessels that may operate in these waters in the future and the magnitude of potential risk they pose. As more information about future marine traffic becomes available, the environmental baseline may change. The effects of future increments of the proposed Action will be considered in the environmental baseline in future section 7 consultations.

Increased Scientific Research
Scientific research across the Arctic is increasing, as concern about effects of climate change in the arctic grows. While research is often conducted by universities and private institutions, many activities take place in NPR-A. These activities would require land use authorization by BLM. In addition, large-scale projects in the marine environment are generally funded by NSF or operate off U.S. Coast Guard ice breaking vessels. Because these activities have a federal nexus, they will be considered in future section 7 consultations.

Conclusion
In summary, we anticipate oil and gas development, community growth, scientific activities, and other activities will continue to occur in the Action Area in coming decades. Most notably, activities with potential to affect significant numbers of individuals of listed species (such as oil and gas development and community growth) are expected to require consultation under the ESA, whereas those that may not require consultation (e.g., small projects in developed areas such as home renovation, and non-commercial shipping) will likely have minor impacts to only a few individuals.

If additional oil and gas development resulted from the proposed Action, the development could facilitate additional oil and gas development in adjacent areas such Native-owned lands, State waters, and Federal land such as NPR-A. The nature and extent of any such additional development that may occur, however, currently is unknown. Offshore and terrestrial oil and gas development in these areas would require federal permits. Therefore, if development is proposed, issuance of federal permits would trigger a review and obligation to consult under section 7 of the ESA to ensure the proposed activity would not jeopardize the continued existence of listed or proposed species or destroy or adversely modify critical habitat.

Conclusion

Introduction

This BO evaluates the potential impacts of the proposed Action on listed and candidate avian species, polar bears, and designated critical habitats in the Beaufort and Chukchi Sea Planning Areas, and was conducted as an incremental step consultation. As an incremental step consultation, this BO must address whether:

1. Activities within the first incremental step violate section 7(a)(2) of the ESA; and
2. There is a reasonable likelihood the entire Action will violate section 7(a)(2) of the ESA.

It should be noted, however, that at this time, there is considerable uncertainty regarding what specific activities and associated impacts may culminate from the entire action. We believe some possible proposals could jeopardize listed species or cause destruction or adverse modification of critical habitat. Therefore, consultation at future incremental steps in this multi-step oil and gas program will closely examine the specific details of proposed projects and will carefully evaluate whether jeopardy or adverse modification would result.

Section 7(d) of the ESA makes clear that BOEM must avoid irreversible or irretrievable commitment of resources that would prevent implementation of reasonable and prudent alternatives to the action (development/production) at a later date. 16 USC §1536(d) clearly identifies that the obligation to prevent the irreversible or irretrievable commitment of resources falls upon the action agency and permit or license applicant. It is incumbent upon lessees proposing to develop oil/gas resources in the Action Area to design future production projects that do not result in jeopardy or destruction or adverse modification of critical habitat.

To reach a conclusion, impacts of the incremental steps of the proposed Action are not considered in isolation, but are placed in the context of the current status of the species and critical habitat, the environmental baseline, and cumulative effects (as defined by the ESA). Although the ESA does not require consultation for candidate species, by mutual agreement with BOEM, we have evaluated the potential impacts to Kittlitz's murrelets and yellow-billed loons.

Conclusion for the First Incremental Step

This portion of the BO considers impacts to listed Steller's and spectacled eiders, polar bears, critical habitat and avian candidate species that may result from the first incremental step of the proposed Action. The potential effects of these activities, taken together with cumulative effects, were considered in the aggregate and in the context of information on the current status of spectacled eiders, Steller's eiders, avian candidate species, polar bears, the LBCHU, polar bear critical habitat, and the environmental baseline for the Action Area. In our analysis of impacts to critical habitat, we relied upon the statutory provisions of the ESA.

In evaluating the impacts of this incremental step on listed species, the Service identified a number of adverse effects that may occur. These are discussed more fully in the *Effects of the Action* and are summarized below. The total number of birds and polar bears that may be affected is low and incidental take has been authorized for activities that may adversely affect listed eiders. Impacts to polar bears were assessed to ensure the activities that may result in take are compliant with section 7(a)(2). The potential incidental take of polar bears was estimated but authorization is not provided in this BO because incidental take of marine mammals must be authorized under the MMPA prior to authorization under the ESA.

Listed Eiders and Avian Candidate Species

Habitat loss and disturbance or displacement - As detailed in the *Effects of the Action*, no significant adverse effects to listed and candidate avian species from habitat loss and disturbance or displacement are anticipated to result from activities proposed in the first incremental step.

Collisions - Activities taking place during the first incremental step may result in collisions between vessels/exploratory drilling rigs and listed and candidate species. Collisions between birds and human-built structures are episodic in nature, and it is difficult to quantify the collision risk for listed eiders from vessels and drilling rigs using the short-term datasets that are currently available. Nonetheless, our estimate is based on the best information available at this time, and we believe it is unlikely that we have underestimated potential effects. We estimate that **up to 13 spectacled eiders and <1 Steller's eider** may be killed from collisions over the 14 years BOEM anticipates activities to take place. In addition, BOEM's requirements regarding lighting protocols for vessels operating in the Beaufort and Chukchi Seas will likely reduce collision risk. The ultimate effectiveness of this mitigation is unknown, however, so the incidental take estimates have not been adjusted to reflect the benefits these mitigation measures may confer. We have no data to estimate potential collision mortality of yellow-billed loons, and Kittlitz's murrelets; however, observations from existing oil and gas facilities in the Beaufort Sea have not included mortalities of these species. Therefore, we do not anticipate significant effects to yellow-billed loons and Kittlitz's murrelets from proposed activities in the first incremental step of the proposed Action at this time.

Small Spills - Although small spills are expected to occur in the first incremental step, it is highly unlikely that listed eiders (or candidate avian species) will be significantly affected because these spills will likely be of such low volume that oil is likely to evaporate, weather, or be mostly recovered. Moreover, the density of these species is very low in most of the Action Area so only very few are likely to encounter oil from small spills, and disturbance from oil spill response activities will likely displace individuals away from spill sites before they come into contact with oil.

Ledyard Bay Critical Habitat Unit

Impacts to the LBCHU from activities authorized in the first incremental step of the proposed Action are only anticipated to have only minor, short-term impacts, and are not likely to diminish the function and conservation value of critical habitat.

Small spills – Small spills, by definition, are limited in size, and as such have small areal extents, are less likely to persist long enough to reach specific areas of interest, such as the LBCHU, and in the unlikely event that one did, its effects on the marine flora and fauna PCEs would be short-term and localized and would not diminish the function and conservation value of the LBCHU for molting spectacled eiders.

<u>Polar Bears</u>

Disturbance - Non-denning (mobile) bears may be affected by human presence and activities such that they change their behavior and move away from the source of disturbance, or in rare cases may be attracted, which can occasionally result in the need to haze the individual(s) involved. Based on records reported from previous operations, we estimate that **up to 5 polar bears** may be seen from each marine deep-penetration and high-resolution survey activity, **and an estimated 22 polar bears** may be seen from each exploratory drilling operation annually. Based on successful management of human-bear interactions in recent decades, we do not anticipate lethal take will occur, and if lessees, permittees, or their agents apply for take authorizations under the MMPA, effects will be minimized by implementation of the conditions of authorizations.

Small Spills – As noted above, small spills are expected to occur in the first incremental step. However, it is highly unlikely that polar bears will be significantly affected because these spills will likely be of a very low volume such that the oil is likely to evaporate, weather, or be almost entirely recovered. Moreover, the density of polar bears is low in most of the Action Area so that only very small numbers of individuals are likely to encounter oil from a small spill. Further, oil spill response activities would cause a significant local disturbance which would likely displace individuals away from the spill site before they come into contact with oil.

<u>Polar Bear Critical Habitat</u>

Physical effects to PCEs - Ice-breaking and ice-management activities may have minor adverse effects on the PCEs of polar bear critical habitat, but these activities will be limited to a very small proportion of the very extensive critical habitat unit and are not likely to affect the ability of critical habitat to support polar bears.

Availability of critical habitat - While disturbance within polar bear critical habitat may prevent some polar bears from using very small portions of critical habitat for essential life functions either temporarily (e.g., disturbance caused by land vehicles) or persistently (e.g., disturbance at permanent facilities adjacent to critical habitat), polar bears are still likely to be able to carry out essential life functions, in remaining unaffected critical habitat. Thus, the three critical habitat units will maintain their intended function and conservation role.

Small Spills – It is possible that small spills could make localized areas of polar bear critical habitat temporarily unavailable because of disturbance while clean up occurred or temporarily decrease the value of critical habitat through contamination. However, due to the temporary nature of the impacts from spill response activities, and the small scale of these impacts, any effects to critical habitat resulting from a small spill will likely be minor.

<u>Large and Very Large Oil Spills</u>

As described in the *Effects of the Action* section BOEM concludes the only source of a large or very large oil spill during the first incremental step would be from a loss of well control incident followed by an uncontrolled flow event from an exploration well. BOEM considers the chance of this type of event occurring during the first incremental step to be extremely low because these types of incidents are extremely rare and rarely reach large spill volumes. Because such an event is extremely rare the effects that may result from it cannot be said to be reasonably certain to occur and are therefore not considered a direct or indirect effect of the proposed Action.

Summary – First Incremental Step

After considering these aggregate effects on the species and critical habitat, it is the Service's biological opinion that effects of the activities that may occur during the first incremental step, taken together with cumulative effects, are not likely to jeopardize the continued existence of any of these species by reducing appreciably the likelihood of survival and recovery of these species in the wild by reducing their reproduction, numbers, and distribution, nor are they likely to destroy or adversely modify spectacled eider or polar bear critical habitat such that it fails to retain the intended function and conservation role for which it was designated.

Conclusion for the Entire Proposed Action

In addition to considering the effects of activities proposed in first incremental step, we analyzed the effects of the entire proposed Action, including development in the Chukchi and Beaufort seas, as described in BOEM's DSs, to determine if there is a reasonable likelihood that the entire proposed Action would violate section 7(a)(2) of the ESA. BOEM developed a hypothetical DS for each Planning Area based on currently available information, and these were used as the basis for our evaluations of potential impacts.

It should be noted, however, that at this time, considerable uncertainty exists regarding what specific activities the entire action may ultimately entail and, therefore, estimating potential impacts of future activities with precision is not possible at this time. As specific projects are proposed at future incremental steps in this multi-step oil and gas program, additional consultation that closely examines the specific details of the particular projects, (including their scale, location and proposed technology) and carefully evaluates their likely effects will be essential in order to determine whether those activities are reasonably likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat.

In this section of the BO, we discuss some of the uncertainties that exist at this time, followed by a discussion of the range of possible effects of the entire proposed Action. We will then explain the legal framework within which our conclusion must be made. Finally, we will discuss some of the important considerations in our final analysis, and then provide and explain our conclusion as to whether the entire proposed Action is reasonably likely to jeopardize the continued existence of threatened or endangered species or to result in the destruction or adverse modification of critical habitat.

A. Uncertainty

Evaluating the effects of development and production is made difficult by significant uncertainty in the following areas:

How much development would occur and where it would occur – BOEM has provided development scenarios for both the Beaufort and Chukchi Sea Program Areas, and our current estimation of potential impacts of development is necessarily based on these scenarios. For the Beaufort Sea Program Area, BOEM's DS estimates one 0.5 billion barrel project with one offshore facility collecting oil from up to three fields before transporting product via subsea pipeline to a shore base at either Cape Simpson, Deadhorse, or Point Thompson. Product would then be transported to TAPS or a gas line. For the Chukchi Sea Program Area, the scenario includes one 1 billion barrel field with a single offshore facility and satellite wells with subsea pipelines transporting product to a shorebase at an unknown location with a terrestrial pipeline moving the product to the TAPS or a gas line. As BOEM notes, once development occurs in frontier areas, such as the Chukchi Sea, more projects are likely to follow. At this time, however, it is difficult to precisely estimate the amount of development that will actually occur.

The likelihood of one or more large marine oil spills – The greatest identified population-level risk to listed species and critical habitat from development and production is from a large marine oil spill. BOEM stated that large ($\geq$ 1,000 barrels) spills could originate from three sources: wells, production platforms, and production pipelines. According to BOEM, a large OCS oil spill from a loss of well control incident followed by an uncontrolled flow event is extremely rare (2.39×10^{-5}/well), and such spills rarely reach large spill volumes. For platforms and pipelines, BOEM estimates a 26% chance of one or more large spills in the Beaufort Sea Planning Area over 20 years of development and production and a 40% chance of one or more large spills in the Chukchi Sea Planning Area over 25 years of development and production.

Effectiveness of oil spill response and cleanup efforts – Were an oil spill to occur a response effort would immediately be implemented and cleanup efforts would begin. Because there have been no large marine oil spills in either planning area the effectiveness of these efforts is unknown. However, efficacy would likely be affected by timing (i.e., presence of ice, broken ice, or open water), location (i.e., proximity to infrastructure, spill response equipment, and ease of logistics), weather and current conditions, and volume of oil spilled. Given these variables, in some cases spill response and cleanup activities may be effective at reducing oil spill impacts to listed species and critical habitat units and in others they may have little beneficial effect to these resources.

The likelihood that a spill would encounter listed and candidate species or designated critical habitat - In the event that oil is spilled in the marine environment, a number of factors would influence whether listed or candidate species and critical habitat would be affected. First, effects would depend in part by the amount of oil spilled, and this would be influenced by the location of infrastructure, technology used to transport oil, the length of pipelines, and other factors. Further, the location of a spill would have a great bearing on the likelihood that listed and candidate species would be exposed. For example, the probability of spills reaching concentrations of listed eiders in the LBCHU varies considerably depending on spill location and source. According to the OSRA model from BOEM, the chance of a large oil spill contacting the spring lead system (ERA 19) or LBCHU (ERA 10) during summer or winter ranges from < 0.5% to 15% for the Beaufort Sea DS, and from < 0.5% to 56% for the Chukchi Sea DS, with spills originating from the majority of launch areas having low probabilities of contacting these areas within 360 days. Finally, the seasonal timing of spills would influence the number of individuals present in the region and their location, the efficacy of spill response, and the likelihood that oil would persist long enough in important habitats to cause lasting impacts to the primary constituent elements of critical habitat.

B. Range of Possible Effects

1. Possible Effects Not Related to Large Oil Spills

Avian Species

In addition to effects described in the first incremental step, development and production could impact avian species in the following ways:

Collisions, predation, subsistence hunting, toxic contamination and small spills - We conclude that collisions with structures (in the marine and terrestrial environments), increased predation as a result of anthropogenic influences on predator population size or distribution, increased subsistence hunting as a result of new roads, toxics contamination, and small oil spills may adversely affect listed eiders and avian candidate species at the individual level. In all cases, however, we also conclude that these potential effects are very unlikely to cause population-level impacts based on the best information available at this time.

Habitat loss, disturbance and displacement – We conclude that habitat loss and disturbance in, and displacement from, preferred habitats may adversely affect listed eiders. In both the marine and terrestrial environments, some habitat could be completely and permanently lost when structures or fill render the habitat unusable. Additionally, the capability of immediately adjacent habitat to support eiders may be completely or partially compromised by nearby structures and the associated human activity. The width of this zone of influence remains unknown, and it is also unknown whether eiders are simply displaced from this zone (presumably at compromised fitness) or continue to use it but possibly at reduced fitness. The impact of habitat loss and disturbance/displacement on listed eiders could vary substantially, from virtually none to potentially significant at the population level, depending on location and nature of the infrastructure and activity. Disturbance and displacement in the marine environment could have significant impacts if there is repeated or prolonged vessel and aircraft traffic in the spring lead system while birds occupy this area (prior to June 10), in the central LBCHU, or in the western LBCHU. In the terrestrial environment, significant impacts could occur if landfall, storage pads, pipelines, pump stations, and roads are placed in important nesting habitat. The potential for significant impacts to nesting habitat is particularly acute for the Steller's eider because its numbers appear to be very low, and its density varies substantially within its breeding range on the North Slope. Thus, if impacts are concentrated within important nesting habitat (especially near Barrow), there could be a population-level response. While such impacts could be minimized by avoiding the placement of infrastructure within important eider habitat, the description of the entire action provided at this time does not provide certainty that this would occur.

Ledyard Bay Critical Habitat Unit

Development, production and other activities in subsequent incremental steps could impact the LBCHU by affecting access to and availability of the critical habitat unit for spectacled eiders:

Access/availability of critical habitat – Production facilities and pipelines could negatively impact PCEs within the LBCHU. Drilling muds and cuttings would leave a footprint around the well site and would impact the PCE of the benthos. Recovery of this area is not likely to occur until a few years after oil and gas extraction ceases because sediments would be greatly altered; however, the footprint of these sites would likely occupy a very small portion of the overall LBCHU. Similarly, burying pipelines through the LBCHU would disturb the benthos and the PCEs of the marine benthic community but this is likely a short term effect, as benthos will likely recolonize the area. While development, production, and other activities may adversely affect the LBCHU, these effects on the marine flora and fauna PCEs would be localized and would not diminish the function and conservation value of the LBCHU for molting spectacled eiders.

Polar Bears

In addition to effects described in the first incremental step, development and production could impact polar bears in the following ways:

Disturbance, human polar bear interactions, and small oil spills – Effects from development and production in the OCS and in the terrestrial environment could adversely affect polar bears. However, only a small proportion of the worldwide population is likely to be impacted. Also, based on the successful management of human-polar bear interactions in existing industrial areas in recent years, largely through mitigation measures in LOAs issued under the MMPA, we expect few, if any, polar bears would die as a result of disturbance, human-polar bear interactions or small oil spills.

Polar Bear Critical Habitat

In addition to effects described in the first incremental step, activities that may occur in subsequent incremental steps could affect polar bear critical habitat through:

Structures as impediments to movement, effects of physical features – Development of infrastructure within terrestrial denning and barrier island critical habitat would likely cause some adverse effects by preventing use of or reducing the conservation role of elements of PCEs in some localized areas. Human activities (e.g., noise produced by equipment and visual stimuli) at these facilities, especially those located on the coast where most polar bears are observed may interfere with the capability of critical habitat adjacent to facilities to provide their intended function. However, we do not anticipate that development would diminish the function and conservation value of polar bear critical habitat.

2. Possible Effects from Oil Spills

As noted previously, the factor thought to have the greatest potential to cause population-level impacts to listed species and/or significant impacts to designated critical habitat is a substantial oil spill in the marine environment. The BA and associated documents provide considerable information on the risks of oil spills of various sizes occurring, and provide estimates of hypothetical spills reaching areas of resource interest, such as spring leads or the LBCHU, when oil is released from numerous launch points within both Program Areas. In order for spilled oil to actually impact listed or candidate species or designated critical habitat, a series of events would have to occur: oil would need to be spilled; oil would need to be spilled in, or transported to, critical habitat or areas where species are present; and spilled oil would have to contact the species of interest or impact the PCEs of designated critical habitat. Therefore, there is a wide range of potential effects from spills of oil to marine waters. These impacts range from virtually no impacts where few or no individuals are oiled to potentially catastrophic when large volumes of oil reach the LBCHU or areas where large concentrations of listed species are present.

3. Range of All Possible Effects Collectively

Accordingly, we determine that the impacts of development and production on listed species and designated critical habitat would range from (1) none, if no development occurs, to (2) negligible, if development occurs in areas or is managed in ways that minimize oil spill risk and the juxtaposition of infrastructure and activities and important habitats, to (3) potentially problematic if development is proposed in areas that would compromise the ability of the marine or terrestrial environment to support listed species, to (4) potentially catastrophic in the event that one or more oil spills contacts a large number or large proportion of North Slope breeding spectacled or Steller's eiders or results in long-term impacts to the LBCHU. Thus, we determine that the **possible** effects of development and production range from zero to potentially catastrophic. Because of the large spatial extent of designated Polar Bear Critical Habitat and the global distribution of the species, the **possible** effects of development and production range from zero to serious.

C. Legal Framework

While a wide range of effects of the entire proposed Action is possible, the applicable legal standards require us to base our conclusion on not what is possible, but rather what is reasonably likely or reasonably expected to occur. In particular, the following requirements and definitions from the ESA and its implementing regulations (at 50 CFR. 402) provide the foundation for our conclusion:

- Section 7(a)(2) of the ESA requires that each "Federal agency shall, in consultation with . . . the Secretary, insure 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 result in the destruction or adverse modification" of critical habitat.

- When consulting on the first increment in an incremental step consultation, regulations (50 CFR. 402.14(k)) require that we look forward to completion of the entire action and conclude that "there is a *reasonable likelihood* that the entire action will not violate 7(a)(2) of the [ESA]."

- To "jeopardize the continued existence of" means "to engage in an action that *reasonably would be expected*, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species." (italics added) (50 CFR. 402.02)

- This biological opinion does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR 402.02. (See Marshall Guidance.) Instead, we have relied upon the statutory provisions of the ESA to form the basis of our analysis with respect to critical habitat – namely whether there are direct and indirect alterations that appreciably diminish the value of critical habitat for the conservation of the species.

These definitions make clear that in reaching a conclusion on the final action, we must consider and base our conclusion upon what is *reasonably likely* and *reasonably expected* to occur, not what is merely possible.

D. Important Considerations

In our analysis of whether the entire proposed Action is reasonably likely to jeopardize the continued existence of listed or candidate species or result in the destruction or adverse modification of critical habitat, we took into account a number of important consideration, including, but not limited to, the following:

- With the exception of the LBCHU and spring lead system, listed and candidate species occur at low or very low densities across both Program Areas. Therefore, for large numbers of individuals to be affected a very large volume of oil would need to be spilled such that it affected a significant extent of the Action Area.

- BOEM will consult with FWS before the next incremental step and mitigation measures can be developed for the site specific nature of those activities at the time when more information is known.

- Because of the extent of polar bear critical habitat only those spills that affect a very large area would impact the PCEs to an extent that it would compromise their ability support polar bears.

- During spring migration large numbers of Steller's and spectacled eiders and possibly yellow-billed loons and Kittlitz's murrelets are present in the spring lead system. During the molting season large numbers of spectacled eiders are present in the LBCHU. Oil reaching these areas during these high use periods has the potential to contact and kill large numbers of these birds and for less abundant species, most notably the Steller's eider, the potential for population-level impacts from spill-caused mortality certainly exists.

- BOEM considers the potential sources of large and very large spills during the future incremental steps to be from production wells, platforms, and pipelines.

- An oil spill from a loss of well control incident followed by an uncontrolled flow event from a well are extremely rare and, even if it does occur, are unlikely to reach large spill volumes.

- For wells, platforms, and pipelines, BOEM estimates a 26% chance of one or more large spills over the 20 year exploration and production life in the Beaufort Sea Program Area and a 40% chance of one or more large spills over the 25 year exploration and production life in the Chukchi Sea Program Area.

- BOEM modeled spills originating from hypothetical launch points distributed throughout the Program Areas which were grouped to represent platforms and pipelines. Assuming a large spill occurs from any Launch Area, the OSRA model estimates the chance of a large spill contacting the spring lead system or LBCHU is < 0.5 to 15% from the Beaufort Sea DS and < 0.5 to 56% for the Chukchi Sea DS within 360 days during summer or winter, with the majority of Launch Areas having low probabilities of contacting these areas.

In light of these considerations, and our obligation to determine whether the entire proposed Action is reasonably likely to jeopardize the continued existence of listed or candidate species or result in the destruction or adverse modification of critical habitat, we conclude as follows:

E. Conclusion Summary

Avian Species

Population-level impacts from habitat loss and disturbance/displacement, although possible, are not reasonably expected to occur due to the unlikely juxtaposition of oil and gas infrastructure and activities and eider concentration areas. To have population-level impacts, we expect that there would need to be significant development or repeated disturbance in listed eider concentration areas in the LBCHU, spring leads, nesting habitat near Barrow, or in spectacled eider breeding concentrations in NPR-A. We expect that repetitive disturbance of birds and/or collisions between birds and vessels are unlikely in the LBCHU because disturbance can be avoided by routing vessels and aircraft around identified molting habitat. A large portion of the spring leads would not be leased, and we expect that significant vessel traffic in spring leads prior to June 10 is unlikely due to lingering sea ice. The necessary terrestrial infrastructure would occupy only a very small proportion of the available landscape, so we expect that it is unlikely that development would be proposed for the limited areas with eider concentrations, and these areas could easily be avoided with appropriate planning. In summary, we conclude that the likelihood of population-level impacts is reduced by the minimal overlap between likely activities and eider concentrations in marine areas, and the fact that traffic routes and terrestrial infrastructure could easily be located to avoid important habitat following future consultation.

Population level impacts from oil spills, although possible, are not reasonably expected to occur. For population-level impacts to occur, all of the following would have to take place: 1) one or more large oil spills from a well, platform or pipeline would have to take place (the occurrence estimates vary between Program Areas, but in both instances are less than or equal to 40% over the 20-25 year life); 2) spilled oil would actually have to reach an area used by large congregations of listed/candidate species, (i.e., Ledyard Bay or the spring lead system), and areas used by large concentrations of these birds are a small subset of the Action Area ; 3) the spill would have to reach or persist in these areas when concentrations of the listed or candidate species are actually present ; and 4) the oil would have to actually contact a significant portion of the population. While *any* of these events is possible, we conclude that it is not reasonably likely/reasonably expected that *all* of these events would occur, based on the best information currently available.

Therefore, the Service concludes the effects of all incremental steps, considered together with uncertainty regarding the scale of potential development and oil spills, cumulative effects and in the context of the status of the species, environmental baseline, and cumulative effects, *are not reasonably likely to jeopardize the continued existence of listed Steller's and spectacled eiders and the candidate species yellow-billed loons and Kittlitz's murrelets by reducing appreciably the likelihood of survival and recovery of these species in the wild by reducing their reproduction, numbers, and distribution*.

Ledyard Bay Critical Habitat Unit

Destruction or adverse modification of the LBCHU, although possible, is not reasonably likely to occur. The direct loss of habitat caused by placing infrastructure in areas of the LBCHU would likely be very small if it did occur. Further, even if infrastructure were to be placed in the LBCHU impacts to the PCEs of the critical habitat unit would be less significant than in other areas as the portion of the LBCHU known to be used by concentrations of spectacled eiders is not within the Chukchi Sea Planning Area. Infrastructure such as pipelines linking production facilities in the Planning Area with landfall would likely be routed to avoid the known molt concentration areas given the availability of alternate routes and the legal obligation of Federal agencies to minimize impacts to listed species.

As with the impacts of oil spills to spectacled eiders, we conclude that significant impacts from oil spills to the LBCHU are possible but not reasonably likely to occur. For spilled oil to appreciably diminish the value of critical habitat for the conservation of the species, (1) a significant volume of oil from a well, platform or pipeline would have to reach the LBCHU to cause large-scale impacts, and (2) the oil would need to persist in the area long enough to affect the biotic and abiotic components and PCEs of the ecosystem. BOEM's analysis of the chance of an oil spill occurring and then actually reaching the LBCHU is highly variable depending on the location of development. While possible, we conclude that all of these events occurring together is not reasonably likely to occur.

In conclusion, the critical habitat unit is still likely to provide the conservation function for which it was designated, namely to provide a rich source of benthic invertebrates and aquatic flora and fauna in waters of an appropriate depth to support molting spectacled eiders. Therefore, the Service concludes the effects of all incremental steps, considered together with uncertainty regarding the scale of potential development and oil spills, cumulative effects and in the context of the status of the species, environmental baseline, and cumulative effects, are *not reasonably likely to destroy or adversely modify spectacled eider critical habitat, and the critical habitat would retain the intended function and conservation role for which it was designated.*

Polar Bears

Given the sparse distribution of polar bears (low density over a large area, with only a few tens of bears congregating even in the highest density areas), we anticipate that while adverse effects to polar bears may occur at most, even under the worst circumstances a very large spill could potentially contact and kill tens of polar bears. This level of impact is not likely to cause population-level declines. Therefore, the Service concludes the effects of all incremental steps, considered together with cumulative effects and in the context of the status of the species, environmental baseline, and cumulative effects, *are not reasonably likely to jeopardize the continued existence of polar bears by reducing appreciably the likelihood of survival and recovery of these species in the wild by reducing their reproduction, numbers, and distribution*.

Polar Bear Critical Habitat

The spatial extent of Polar Bear Critical Habitat is large and there is a wide distribution of each of the PCEs within the designated habitat area. Therefore, even were significant development and a large oil spill to occur only a relatively small area of the habitat would be impacted. Hence, while adverse effects to polar bear critical habitat may occur after considering the indirect and direct effects of the entire proposed Action, together with the cumulative effects, as well as the effects of interrelated and interdependent actions, when considered in conjunction with the environmental baseline, and given the size of the critical habitat unit, it is the Service's biological opinion that *the effects of all incremental steps of the proposed Action are not reasonably likely to destroy or adversely modify polar bear critical habitat, and the critical habitat would retain the intended function and conservation role for which it was designated.*

F. Future Consultation

Consultation prior to future incremental steps in this phased oil and gas process would take place to fully evaluate project-specific information regarding specific development and production plans and whether or not they are reasonably likely to jeopardize candidate or listed species or destroy or adversely modify critical habitat. As stated previously, considerable uncertainty regarding specific activities of the entire action exist. We believe that effects from some development projects that could potentially be proposed in the future could jeopardize the continued existence of listed eiders and possibly yellow-billed loons or cause destruction or adverse modification of critical habitat by significant adverse effects to PCEs within the LBCHU. Therefore, when future incremental steps are proposed and specific information is provided about the nature and extent of proposed future activities, including the scale and location of the activities and a description of specific technology to be employed to reduce oil spill risks, more precise estimation of the actual risk of impacts to listed and candidate species critical habitat will be possible at that time. As a result, Section 7 consultation to evaluate these specific proposals at future incremental steps will be crucial to ensuring that future steps do not jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat.

Avoiding Jeopardy and Destruction/Adverse Modification in Future Incremental Steps

Under the incremental step consultation approach, BOEM and BSEE have continuing obligations to:

- Avoid irreversible or irretrievable commitment of resources that would prevent implementation of reasonable and prudent alternatives to the Action (development/production) at a later date; and
- Obtain sufficient data upon which to base the final BO(s) for future incremental steps.

We wish to provide clear notification that some potential development proposals could conceivably jeopardize listed species or cause destruction or adverse modification of critical habitat. If actual development is within, or proximal to areas used by large numbers of listed eiders (e.g., nesting habitat near Barrow, portions of the LBCHU and spring lead system, portions of the NPR-A, or significant areas of Barrier Island systems), or poses significant risk of a spill that could reach concentrations of listed species or destroy food resources or other important habitat components, the impacts could be significant and could result in jeopardy or could destroy or adversely modify critical habitat. It is incumbent upon lessees proposing to develop oil and gas resources in the Chukchi and Beaufort Sea Planning Areas to design future production projects that are not likely to result in jeopardy or destruction or adverse modification of critical habitat. However, as described above, at this time we cannot say that these impacts are reasonably likely.

Therefore, BOEM, BSEE and the oil and gas industry must remain fully aware of the need to consult on future increments and the potential for jeopardy or destruction/adverse modification conclusions to be reached in future consultation. Further, we believe that BOEM, BSEE, and the oil and gas industry should recognize the need to incorporate binding mitigation measures into their proposed Actions to avoid jeopardy or destruction or adverse modification of critical habitat from development/production and the impacts of potential oil spills.

To reduce the likelihood of jeopardy or destruction/adverse modification conclusions during future incremental steps, we recommend that BOEM, BSEE, and the oil and gas industry:

- Avoid proposing infrastructure in important eider habitats, including the LBCHU, spring leads, nesting habitat near Barrow, and areas with high density of nesting spectacled eiders in NPR-A;
- Avoid proposing development in areas where spilled oil has a high risk of reaching the LBCHU or spring leads; and
- Improve technology to reduce the maximum amount of oil that can be spilled in marine areas.

Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. “Harm” is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. “Harass” is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, but not the purpose of, carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement (ITS).

The measures described below are non-discretionary, and must be undertaken by BOEM and BSEE so they become binding terms and conditions in leases, permits, or other authorizations for the exemption in section 7(o)(2) to apply. These Terms and Conditions (T&Cs) also apply to marine deep-penetration and high-resolution survey activities. BOEM and BSEE has a continuing duty to regulate activities covered by this incidental take statement. **If the BOEM or BSEE (1) fails to implement the T&Cs, or (2) fails to require any lessee, permittee or the agents of their permittees and lessees to comply with the T&Cs of the ITS through enforceable terms/stipulations of the permit/lease, the protective coverage of section 7(o)(2) may lapse.** To monitor the impact of incidental take, BOEM and BSEE must report the progress of the proposed Action and its impact on the species to the Service as specified in the ITS.

This ITS first discusses listed eiders and then polar bears. For Kittlitz’s murrelets and yellow-billed loons, prohibitions against taking species found in section 9 of the ESA do not apply unless these species are listed; therefore no incidental take is authorized. However, implementation of the reasonable and prudent measures to reduce impacts to listed eiders will likely benefit these candidate species due to similarities in habitat use and the mechanisms through which oil and gas development may affect marine birds.

Spectacled and Steller’s Eiders

This BO only authorizes incidental take for activities in the first incremental step of the Action. BOEM and BSEE must continue consultation for each future incremental step as appropriate, and incidental take for future incremental steps may be authorized when the proposed developments are evaluated. As described in the *Effects of the Action*, deep penetration surveys, high-resolution seismic surveys, and exploratory drilling may adversely affect Steller’s and spectacled eiders through collisions with structures and oil spills.

Collisions

During exploratory operations, large drill rigs would be present in the marine environment posing a collision risk for listed eiders. Collision risk is a function of proximity of structures to habitats used by these species, including migratory routes. Estimating the number of collisions is complicated by: 1) a lack of information on listed eider migration routes, behavior, and vulnerability to collisions with these types of structures; 2) uncertainty over locations of activities in the Action Area; and 3) the extent to which lease stipulations/permit requirements governing lighting and operations will reduce collision risk.

Because spectacled and Steller's eiders are believed to stage, molt, and winter in the Chukchi and Bering seas to the west of their North Slope nesting range, in the absence of information about vessel location, the Service assumes the entire North Slope population of each species could conceivably pass by an exploratory drillsite in the Chukchi Sea during fall migration and be at risk of collision.

In the Beaufort Sea there is likely a significant longitudinal gradient in the distribution of eiders reflecting their nesting distribution. Data from aerial surveys for breeding eiders (1993–2006) on the North Slope was combined to provide a longitudinal distribution of spectacled eider observations (Service Migratory Bird Management data). These data indicate that 58% of spectacled eider observations occurred east of Barrow, by Deadhorse this had dropped to 7% and <1% of observations were made east of Point Thompson. There are comparatively few Steller's eider observations, but they are concentrated in the area around Barrow. About 63% of eider observations occurred east of Barrow, with only 12% of observations east of Cape Simpson. No Steller's eiders were observed at, or east, of Deadhorse.

Therefore, the location of exploratory activity in the Beaufort Sea will determine the number of listed eiders that may encounter these structures. Without knowing the location of future exploration activities, to ensure we do not underestimate the potential incidental take through collisions, the Service assumes all listed eiders that nest east of Barrow may encounter exploratory activity in the Beaufort Sea during their spring and fall migrations.

Some estimate of vulnerability is required to estimate collision risk, but no specific data on spectacled or Steller's eider collision rates are available. We therefore used recorded numbers of common eider (*Somateria mollissima*) collisions at the human-built Northstar Island in the Beaufort Sea as a surrogate. In 2000-2006, respectively 5, 8, 0, 3, 5, 0, and 0 common eiders were recorded as colliding with the island, for an average of 3/year (data reported by BP Alaska to the Service).

A strike rate (percent of population killed per year) was then estimated as the annual average of Northstar Island common eider strikes divided by 176,109, the population estimate of common eiders migrating across the Beaufort Sea at that time (Quakenbush and Suydam 2004), according to the following formula:

(Annual avg. no. of strikes/popul. estimate) x 100 = % of population killed annually by collisions

or: 3/176,109 x 100 = **0.0017%**

We assume spectacled and Steller's eider collision risk is similar to that of common eiders at Northstar, and this strike rate was applied to the population migrating through the area. For the Chukchi Sea, we used the current North Slope breeding population estimates for spectacled and Steller's eiders (12,916 and 576, respectively, as described in the *Description of the Species*). For the Beaufort Sea, the populations of listed eiders occurring east of Barrow was estimated at 58.43% of 12,916 = 7,547 spectacled eiders; and 62.67% of 576 = 361 Steller's eiders. The mortality rate was estimated as follows:

Strike rate x population estimate = number killed per year per drill structure.

BOEM estimates a maximum of two drill structures may operate in each of the Beaufort and Chukchi Sea Planning Areas annually until 2026, i.e., there could be 28 drill structures / Planning Area, based on two drilling operations in each Planning Area for 14 years. In the Beaufort Sea listed eiders may encounter them in both spring and fall migrations, thus a total of 56 drill structures were used in the Beaufort Sea calculations. Incidental take was estimated by multiplying the mortality rate by number of drill structures for each Planning Area, as shown below:

Chukchi Sea

Steller's eider mortality rate = 0.0017% (strike rate) of 576 (population estimate) = 0.01 birds/structure. Total estimate of number killed = 0.01 birds x 28 structures = 0.28 Steller's eiders.

Spectacled eider mortality rate = 0.0017% of 12,916 (population estimate) = 0.22 birds/structure. Total estimated number killed = 0.22 birds x 28 structures = 6.16 spectacled eiders.

Beaufort Sea

Steller's eider mortality rate = 0.0017% (strike rate) of 361 (estimated population at Barrow) = 0.006. Total estimated number killed = 0.006 x 28 structures x 2 migration seasons = 0.336 Steller's eiders.

Spectacled eider mortality rate = 0.0017% (strike rate) of 7,547 (estimated population at Barrow) = 0.128. Total estimated number killed = 0.128 x 28 structures x 2 migration seasons = 7.168 spectacled eiders.

This provided a total estimate of **13.33 (13) spectacled eiders** and **0.616 (<1) Steller's eiders killed** through collisions over 14 years of exploration.

We have likely significantly overestimated the incidental take that may occur as a result of collisions as they are based on the following assumptions: 1) the maximum amount of exploration predicted occurs in every year; 2) the lease stipulations and permit conditions controlling lighting and other aspects of exploration do not reduce the amount of incidental take; and 3) all listed eiders nesting east of Barrow would encounter a structure in the Beaufort Sea Planning Area. However, the take was estimated using the best available data and we do not believe we are underestimating impacts to listed species by using this approach.

Polar Bear

Consistent with the ESA and regulations at 50 CFR 402.14(i), incidental take for marine mammals are not included in formal consultations until regulations, authorizations, or permits under the MMPA 101(a)(5) are in effect. The Service is not including incidental take for polar bears at this time because the incidental take of marine mammals has not been authorized under the MMPA. However, authorization for incidental take under the MMPA will likely be available for oil and gas activities throughout the entire Action Area in the form of Letters of Authorization (LOAs) issued pursuant to the Chukchi Sea (73 FR 33212) and Beaufort Sea (76

FR 47010) Incidental Take Regulations (ITRs) if the project includes appropriate mitigation measures.

Reasonable and Prudent Measures

These reasonable and prudent measures (RPMs) and their implementing terms and conditions aim to minimize the incidental take anticipated for the first incremental step (marine deep-penetration surveys, high-resolution activities, and exploratory drilling) of the proposed Action. Additional RPMs will be developed and implemented during consultation on future incremental steps in this project.

Listed Eiders
Activities authorized under the first incremental step may lead to incidental take of Steller's and spectacled eiders through collision mortality. As described in the *Effects of the Action*, crude or refined oil or toxic substance spills that result in take of listed eiders are possible, and RPMs have been developed to minimize their effects. However, because spills are not an otherwise legal activity, no incidental take is authorized for take in connection with oil spills.

As part of the proposed Action BOEM and BSEE will require their lessees, permittees, the agents of their lessees and permittees to implement a series of mitigation measures, including lighting protocols aimed at reducing collisions between vessels and exploratory drilling structures and listed eiders. These stipulations/typical permit conditions are provided as Appendix A of this BO.

Polar Bears
Activities authorized under the first incremental step may occasionally lead to the incidental and intentional take of polar bears. As stated previously, the Service is not authorizing incidental take for polar bears at this time; therefore, this ITS does not include RPMs or implementing T&Cs for this species. This BO is predicated on compliance with the MMPA. BOEM/BSEE cannot require that a lessee or permittee (or the agent of a lessee or permittee) request an LOA under the MMPA. Should the lessee or permittee (or the agent of a lessee or permittee) decline to apply for an LOA, BOEM/BSEE would need to consult separately under the ESA if the proposed activity may affect the polar bear or polar bear critical habitat. Once a lessee or permittee (or the agent of a lessee or permittee) receives an LOA for incidental take pursuant to section 101(a)(5) or intentional take pursuant to sections 101(a)4(A), 1019(h), and 112(c) of polar bears, the Service will update this BO/ITS by incorporating the conditions of the LOAs into the RPMs, pursuant to section 7(b)(4) of the ESA.

To ensure the best available information is used in developing mitigation for listed species and critical habitats, BOEM and BSEE are required to:

RPM 1 – Work jointly with the Service to develop and implement strategies to avoid and minimize bird collisions.

RPM 2 – Work jointly with the Service to avoid and minimize impacts of disturbance from aircraft, vessels, and drilling operations on listed eiders.

RPM 3 – Avoid or minimize oil spills during the first incremental step.

Terms and Conditions

To be exempt from the prohibitions of Section 9 of the ESA, BOEM and BSEE will require their lessees, permittees, or agents of their lessees and permittees to comply with the following non-discretionary terms and conditions, which implement the RPMs described above.

To monitor the effectiveness of these RPMs and T&Cs, an annual reporting requirement is required (see *Reporting Requirements* below).

RPM 1 – Work jointly with the Service to develop and implement strategies to avoid and minimize bird collisions.

T&C 1a. BOEM and BSEE will require lessees and their contractors to implement on drilling rigs lighting protocols aimed at minimizing the radiation of light outward from exploratory drilling structures. These requirements establish a coordinated process for a performance-based objective rather than pre-determined prescriptive requirements. The performance-based objective is to minimize the radiation of light outward from exploration structures while operating on a lease or if staged within nearshore Federal waters pending lease deployment. Lessees must provide BOEM with a written statement of measures that will be or have been taken to meet the lighting objective, and must submit this information with an EP when it is submitted for regulatory review and approval pursuant to 30 CFR 550.203.

T&C 1b. BOEM and BSEE will require their lessees, permittees or agents of their lessees and permittees to minimize the use of high-intensity work lights on vessels, especially within the 20-m bathymetric contour. Exterior lights will only be used as necessary to illuminate active, on-deck work areas during periods of darkness or inclement weather; otherwise they will be turned off. Interior and navigation lights should remain on as needed for safety.

T&C 1c. BOEM and BSEE will require their lessees, permittees, and agents of their lessees and permittees to report avian collisions with vessels or drilling structures within three days to BOEM/BSEE (whichever authorized the activity) who will then provide these avian collision reports to the Endangered Species Branch Chief, USFWS, Fairbanks Fish & Wildlife Field Office (FFWFO) within 7 days. Minimum information for strike reporting will include species, date/time, location, weather, and identification of the vessel or drilling structure involved and its operational status when the strike occurred. Bird photographs are not required, but would be helpful in verifying species. The FFWFO should be contacted regarding the recovery or transport of dead birds.

RPM 2 – Work jointly with the Service to avoid and minimize impacts of disturbance from aircraft, vessels, and drilling operations on listed eiders.

T&C 2a. To prevent impacts to molting spectacled eiders that are likely less mobile and energetically stressed during this flightless period, BOEM and BSEE will require their lessees, permittees, and agents of their lessees and permittees to implement mitigation measures requiring that aircraft not fly below 1,500 ft over the spring lead system between April 1 and June 10 and over the LBCHU between July 1 and November 15. If weather prevents attaining this altitude, aircraft will use pre-designated flight routes. Predesignated flight routes will be established by the lessee/permittee and BOEM, in collaboration with the FWS, during review of the exploration activity. This requirement applies during the performance of marine deep penetration surveys, high-resolution survey activities, and exploration drilling activities. Low-level flights associated with a medical or other emergency must be reported within 24 hours to BOEM or BSEE (whichever authorized the activity), who will then provide these reports to the Endangered Species Branch Chief, USFWS FFWFO within 7 days. Any lessee, permittee or agent of a lessee or permittee that does not report a low-level flight ($\leq$1500 ft) within 24 hours to BSEE will be considered out of compliance with this condition.

T&C 2b. To prevent impacts to molting spectacled eiders that are likely less mobile and more energetically stressed during this flightless period, BOEM and BSEE will impose mitigation measures on their lessees, permittees and agents of their lessees and permittees requiring that no marine deep penetration survey, high-resolution survey, or exploratory drilling vessels (and any vessels supporting, accompanying, or otherwise assisting them) operate in the LBCHU[3] after July 1 of each year. The only exceptions for such vessels to enter the LBCHU after July 1 are to support any exploratory wells that could be drilled on a lease block in the LBCHU or for reportable marine casualties as defined in 46 CFR 4.05-1 or hazardous conditions as defined by 33 CFR 160.204. Entries into the LBCHU after July 1 due to marine casualties or hazardous conditions will be reported to BSEE within 24 hours, and BSEE will report the activity to the Endangered Species Branch Chief, USFWS FFWFO, within 7 days. Any lessee, permittee or agent of a lessee or permittee that does not report an entry into the LBCHU within 24 hours to BSEE will be considered out of compliance with this condition.

T&C 2c. To prevent impacts to migrating listed eiders in the spring, BOEM and BSEE will require their lessees, permittee, and agents of their lessees or permittees to impose and implement mitigation measures requiring that no marine deep penetration survey, high-resolution survey, or exploratory drilling vessels (and any vessels supporting, accompanying, or otherwise assisting them) may operate in the spring lead system[3] between April 1 and June 10 of each year. The only exceptions for such vessels to enter the spring lead system between April 1 and June 10 are to support exploratory wells that could be drilled on a lease block in the spring lead system or for reportable marine casualties as defined in 46 CFR 4.05-1 or hazardous conditions as defined by 33 CFR 160.204. Entries into the spring lead system between April 1 and June 10 due to marine casualties or hazardous conditions will be reported to BSEE within 24 hours, and BSEE

[3] If the final 2012-2017 OCS Oil and Gas Leasing Program or subsequent sales excludes LBCHU, there would be no expressed need for lessees or their agents to enter the LBCHU for exploration drilling purposes.

will report the activity to the Endangered Species Branch Chief, USFWS FFWFO, within 7 days. Any lessee, permittee or agent of a lessee or permittee that does not report vessel entries into the spring lead system between April 1 and June 10 within 24 hours to BSEE will be considered out of compliance with this condition.

T&C 2d. For any drill sites located within the LBCHU[3], drill ships and supporting, assisting, or accompanying vessels are required to enter and exit the LBCHU in a manner that minimizes travel within the LBCHU. Supporting, assisting, or accompanying vessels are required to remain in close association with the drill ship, for reportable marine casualties as defined in 46 CFR 4.05-1 or hazardous conditions as defined by 33 CFR 160.204. BOEM and BSEE will require their lessees, permittees, and agents of their lessees and permittees to regularly report any eiders observed within the LBCHU during drilling operations to the BSEE. BSEE will provide these reports to the Endangered Species Branch Chief, USFWS FFWFO on a monthly basis.

For the purposes of **T&C 2a** (minimizing disturbance by aircraft) and **T&C 2c** (minimizing disturbance by drilling activities within the LBCHU), the spring lead system is defined as the area landward of a line drawn from Point Hope to the corner of the LBCHU at 69º12’00”N x 163º13’00”W, to the corner of the LBCHU at 70º20’00”N x 164º00’00”W to 71º39’35”N x 156º00’00”W (Figure 20).

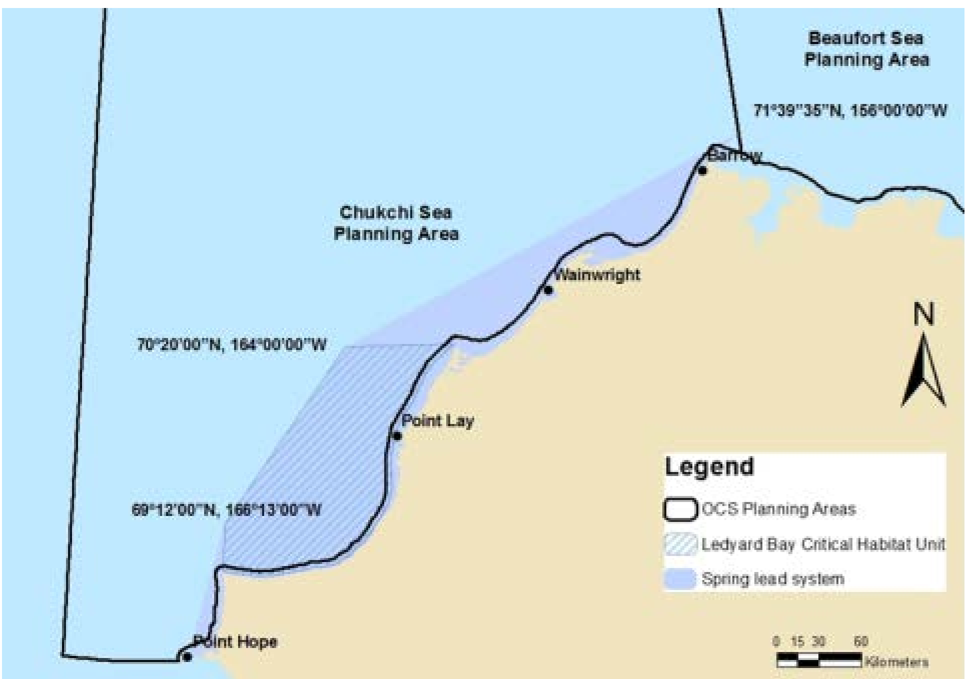


Figure 20. Spring lead system for the purposes for the *Terms and Conditions* section.

RPM 3 – Avoid or minimize oil spills during the first incremental step.

> **T&C 3**. BSEE shall report oil spills $\geq$ 1 barrel as defined by 30 CFR 254.46, if the spill contacted water or ice, to the Endangered Species Branch Chief, USFWS FFWFO within 7 days. A follow-up report by BSEE is required within 30 days after the first report if the oil contacted any birds in the area. The follow-up report should describe the nature of that contact (e.g., swam or dove into it).

The RPMs, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed Action. The Service believes that no more than **13 spectacled eiders or one Steller's eider will be incidentally taken**. If, during the course of the action, this level of incidental take is exceeded, BOEM must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the RPMs. Additionally, re-initiation of consultation will be required.

Reporting Requirements

The BSEE, Alaska OCS Region, must submit an Annual Monitoring Report by March 30th of each year to the Endangered Species Branch Chief, USFWS, FFWFO, and the Regional Supervisor – Environment, BOEM, Alaska OCS Region. The purpose of this report is to monitor the effectiveness of RPMs/T&Cs and effects of the first incremental step on critical habitat. The Annual Monitoring Report will include the following information:

- A summary of avian collisions reported to BSEE during the previous calendar year (RPM 1).
- A summary of low-level flights over LBCHU and spring lead system reported by the lessees, permittees of BOEM or BSEE or the agents of lessees or permittees for medical or other emergency (RPM 2/LBCHU);
- A summary of vessel entries into LBCHU after July 1 for marine casualty or hazardous conditions (RPM 2/LBCHU);
- A summary of vessel entries into spring lead system from April 1st to June 10th (RPM 2/LBCHU);
- A summary of the location and number of OCS wells drilled in the preceding calendar year (RPM 2/LBCHU); and
- A summary of all reported spills $\geq$ 1 barrel for the preceding calendar year (RPM 3)

Please see the *Conservation Recommendation* section for recommended measures that will likely minimize effects on polar bear critical habitat. To monitor impacts on critical habitat we request reporting of:

- number of days during drilling operations where ice management is required; please report any ice seal sightings, and effect ice breaking has on these species during these operations (Polar Bear Critical Habitat).

The Annual Monitoring Report should also include:

- A summary of any notices of non-compliance issued to the lessees and permittees of BOEM or BSEE and the agents of their lessees and permittees for activities conducted in the preceding year. If new incidents of non-compliance from previous years emerge, report these incidents in the next annual report.
- A summary of how BOEM and BSEE are implementing conservation recommendations (see below).

Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

As described in the *Conclusion* section under incremental consultation regulations (50 CFR 402.14(k)), BOEM/BSEE is required to fulfill its continuing obligation to obtain sufficient data upon which to base the final BO on the entire proposed Action. In addition to management-specific research needs, BOEM/BSEE is encouraged to support research that may provide information to strengthen our understanding of Steller's and spectacled eiders, polar bears, and candidate species, the reasons for their decline, and assist in focusing and conducting recovery efforts. Specific research needs include:

- Characterizing locations and use of marine habitats of spectacled and Steller's eiders, yellow-billed loons, and Kittlitz's murrelets, particularly in the Chukchi Sea. For spectacled eiders, yellow-billed loons, and Kittlitz's murrelets, distribution and habitat use could be evaluated by combining currently on-going satellite telemetry work with marine aerial surveys in spring and fall to refine our understanding of the proportion of the population, and the sex and age classes that use areas identified by the locations of marked birds;
- Ecosystem research in the spring lead system, the LBCHU (especially changes to benthic communities), and other marine habitats used by spectacled and Steller's eiders, yellow-billed loons and Kittlitz's murrelets, and evaluation of current and potential future impacts of environmental change on these habitats;
- Fund studies that analyze USGS and Service telemetry data in conjunction with data on metrics (e.g., ice to edge ratio, open water to sea ice ratio, size of leads) of sea ice to gain a better understanding how polar bears use sea ice habitat. Additionally, information regarding the use by polar bears of certain characteristics of sea ice (e.g., the mean distance of polar bears from leads) may inform future section 7 consultations and conservation efforts. .
- Developing technologies for reducing migratory bird collisions with offshore and onshore oil and gas development infrastructure, particularly for listed eiders;
- Monitoring abundance, trends, habitat use, and productivity of listed and candidate species to assist with understanding potential effects of human activities on populations;

- For yellow-billed loons, conducting surveys specifically designed to assess abundance, population trends, habitat use, and productivity of populations that may be affected by oil and gas development (i.e., lake circling surveys on the ACP during the breeding season);
- Characterization of habitat use and distribution of non-breeding yellow-billed loons; and,
- Research on breeding ecology and demography of yellow-billed loons, such as estimating vital rates like breeding probability, age at first reproduction, etc.
- As suggested by Gall and Day (2010: 56), fund efforts to synthesize data in reports authored by Gall and Day (2010) Blanchard et al. (2010), and Hopcroft et al. (2010) to elucidate the ecosystem differences between the Burger (possibly benthic dominated) and Klondike Study Areas (possibly pelagic-dominated).

Further, BOEM/BSEE and the oil and gas industry can reduce potential impacts to listed species and critical habitat by:

- Avoiding proposing infrastructure in important eider habitats, including the LBCHU, spring leads, nesting habitat near Barrow, areas with high density of nesting spectacled eiders in NPR-A, and on or adjacent to areas where large number of polar bears are known to congregate (e.g., Barter and Cross Islands);
- Avoiding proposing development in areas where spilled oil has a high risk of reaching the LBCHU, spring leads, or areas used by large numbers of polar bears (e.g., Barter and Cross Islands);
- Avoiding and minimizing adverse impacts to polar bear critical habitat by avoiding unnecessary approaches to the barrier island and terrestrial denning units of polar bear critical habitat along the Beaufort Sea from November through April. We further recommend minimizing adverse impacts to the sea ice unit of critical habitat that supports polar bear prey (i.e., ice seals) by avoiding ice-breaking or ice-management of ice from January 1 to July 15th;
- When practicable, restrict icebreaker traffic in the Arctic OCS from January 1 until the onset of the open water season, July 1;
- Improving technology to reduce the maximum amount of oil that can be spilled in marine areas, which has great bearing on potential risk to wildlife in marine areas.;
- Working with the Service and other species experts to develop strategies that could be implemented to prevent oil contacting listed species in the event of a large marine spill; and
- Re-initiating consultation if the chance of a large oil spill from loss of well control, pipelines, or platforms increases, or if another source of an oil spill (e.g., from vessels) increases such that it becomes an indirect effect of the proposed Action.

As mentioned in the *Reporting Requirements*, for the Service to be kept informed of actions affecting listed species or their habitats, the Service requests notification of implementation of any conservation recommendations.

Re-initiation Notice

This concludes formal consultation on the Action described. This BO authorizes activities in the first incremental step (deep-penetration surveys, high-resolution surveys, and exploratory drilling), and has considered the entire action as required under 50 CFR 402.14(k). As provided in 50 CFR 402.16, re-initiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and:

1) If the amount or extent of incidental take is exceeded;
2) If new information reveals effects of the action agency that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion;
3) If the agency action is subsequently modified in a manner that causes an effect to listed or critical habitat not considered in this opinion;
4) If a new species is listed or critical habitat designated that may be affected by the action.

Also, additional consultation will be required before future incremental steps of the proposed Action may be authorized.

Thank you for your cooperation in the development of this BO. If you have any comments or require additional information, please contact Ted Swem, Endangered Species Branch Chief, Fairbanks Fish and Wildlife Field Office, 101 12th Ave., Fairbanks, Alaska, 99701.

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Appendix A. Existing Lease Sale Stipulations and Geological and Geophysical Permit Stipulations for Oil and Gas Activities in Arctic OCS Waters:

BOEM and BSEE's lease and permit stipulations are described in the following:

- Lease Stipulations for Oil and Gas Lease Sale 186, Beaufort Sea, September 24, 2003.
- Lease Stipulations, Oil and Gas Lease Sale 195, Beaufort Sea, March 30, 2005.
- Lease Stipulations, Oil and Gas Lease Sale 202, Beaufort Sea, April 18, 2007.
- Final Lease Stipulations, Oil and Gas Lease Sale 193, Chukchi Sea, February 6, 2008.
- Geological and Geophysical Permit Stipulations for Oil and Gas Activities in Alaska OCS Waters (30 CFR 251).

Please find these stipulations in the attached document.

Leasing Activities Information

MMS

U.S. Department of the Interior
Minerals Management Service
Alaska OCS Region

Lease Stipulations for Oil and Gas Lease Sale 186
Beaufort Sea
September 24, 2003

Stipulation No. 1. Protection of Biological Resources
Stipulation No. 2. Orientation Program
Stipulation No. 3. Transportation of Hydrocarbons
Stipulation No. 4. Industry Site-Specific Bowhead Whale-Monitoring Program
Stipulation No. 5. Conflict Avoidance Mechanisms to Protect Subsistence Whaling and Other Subsistence-Harvesting Activities
Stipulation No. 6. Pre-Booming Requirements for Fuel Transfers
Stipulation No 7. Lighting of Lease Structures to Minimize Effects to Spectacled and Steller's Eider

Stipulation No. 1. Protection of Biological Resources. If biological populations or habitats that may require additional protection are identified in the lease area by the Regional Supervisor, Field Operations (RS/FO), the RS/FO may require the lessee to conduct biological surveys to determine the extent and composition of such biological populations or habitats. The RS/FO shall give written notification to the lessee of the RS/FO's decision to require such surveys.

Based on any surveys that the RS/FO may require of the lessee or on other information available to the RS/FO on special biological resources, the RS/FO may require the lessee to:
(1) Relocate the site of operations;
(2) Establish to the satisfaction of the RS/FO, on the basis of a site-specific survey, either that such operations will not have a significant adverse effect upon the resource identified or that a special biological resource does not exist;
(3) Operate during those periods of time, as established by the RS/FO, that do not adversely affect the biological resources; and/or
(4) Modify operations to ensure that significant biological populations or habitats deserving protection are not adversely affected.

If any area of biological significance should be discovered during the conduct of any operations on the lease, the lessee shall immediately report such findings to the RS/FO and make every reasonable effort to preserve and protect the biological resource from damage until the RS/FO has given the lessee direction with respect to its protection.

The lessee shall submit all data obtained in the course of biological surveys to the RS/FO with the locational information for drilling or other activity. The lessee may take no action that might affect the biological populations or habitats surveyed until the RS/FO provides written directions to the lessee with regard to permissible actions.

Stipulation No. 2. Orientation Program. The lessee shall include in any exploration or development and production plans submitted under 30 CFR 250.203 and 250.204 a proposed orientation program for all personnel involved in exploration or development and production activities (including personnel of the lessee's agents, contractors, and subcontractors) for review and approval by the RS/FO. The program shall be designed in sufficient detail to inform individuals working on the project of specific types of environmental, social, and cultural concerns that relate to the sale and adjacent areas. The program shall address the importance of not disturbing archaeological and biological resources and habitats, including endangered species, fisheries, bird colonies, and marine mammals and provide guidance on how to avoid disturbance. This guidance will include the production and distribution of information cards on endangered and/or threatened species in the sale area. The program shall be designed to increase the sensitivity and understanding of personnel to community values, customs, and lifestyles in areas in which such personnel will be operating. The orientation program shall also include information concerning avoidance of conflicts with subsistence, commercial fishing activities, and pertinent mitigation.

The program shall be attended at least once a year by all personnel involved in onsite exploration or development and production activities (including personnel of the lessee's agents, contractors, and subcontractors) and all supervisory and managerial personnel involved in lease activities of the lessee and its agents, contractors, and subcontractors.

The lessee shall maintain a record of all personnel who attend the program onsite for so long as the site is active, not to exceed 5 years. This record shall include the name and date(s) of attendance of each attendee.

Stipulation No. 3. Transportation of Hydrocarbons. Pipelines will be required: (a) if pipeline rights-of-way can be determined and obtained; (b) if laying such pipelines is technologically feasible and environmentally preferable; and (c) if, in the opinion of the lessor, pipelines can be laid without net social loss, taking into account any incremental costs of pipelines over alternative methods of transportation and any incremental benefits in the form of increased environmental protection or reduced multiple-use conflicts. The lessor specifically reserves the right to require that any pipeline used for transporting production to shore be placed in certain designated management areas. In selecting the means of transportation, consideration will be given to recommendations of any advisory groups and Federal, state, and local governments and industry.

Following the development of sufficient pipeline capacity, no crude oil production will be transported by surface vessel from offshore production sites, except in the case of an emergency. Determinations as to emergency conditions and appropriate responses to these conditions will be made by the RS/FO.

Stipulation No. 4. Industry Site-Specific Bowhead Whale-Monitoring Program. Lessees proposing to conduct exploratory drilling operations, including seismic surveys, during the bowhead whale migration will be required to conduct a site-specific monitoring program approved by the RS/FO; unless, based on the size, timing, duration, and scope of the proposed operations, the RS/FO, in consultation with the North Slope Borough (NSB) and the Alaska Eskimo Whaling Commission (AEWC), determine that a monitoring program is not necessary. The RS/FO will provide the NSB, AEWC, and the State of Alaska a minimum of 30 but no longer than 60 calendar days to review and comment on a proposed monitoring program prior to approval. The monitoring program must be approved each year before exploratory drilling operations can be commenced.

The monitoring program will be designed to assess when bowhead whales are present in the vicinity of lease operations and the extent of behavioral effects on bowhead whales due to these operations. In designing the program, lessees must consider the potential scope and extent of effects that the type of operation could have on bowhead whales. Experiences relayed by subsistence hunters indicate that, depending on the type of operations, some whales demonstrate avoidance behavior at distances of up to 35 miles. The program must also provide for the following:

(1) Recording and reporting information on sighting of other marine mammals and the extent of behavioral effects due to operations,
(2) Inviting an AEWC or NSB representative to participate in the monitoring program as an observer,
(3) Coordinating the monitoring logistics beforehand with the MMS Bowhead Whale Aerial Survey Project (BWASP),
(4) Submitting daily monitoring results to the MMS BWASP,
(5) Submitting a draft report on the results of the monitoring program to the RS/FO within 60 days following the completion of the operation. The RS/FO will distribute this draft report to the AEWC, the NSB, the State of Alaska, and the National Oceanic and Atmospheric Administration - Fisheries (NOAA).
(6) Submitting a final report on the results of the monitoring program to the RS/FO. The final report will include a discussion of the results of the peer review of the draft report. The RS/FO will distribute this report to the AEWC, the NSB, the State of Alaska, and the NOAA-Fisheries.

Lessees will be required to fund an independent peer review of a proposed monitoring plan and the draft report on the results of the monitoring program. This peer review will consist of independent reviewers who have knowledge and experience in statistics, monitoring marine mammal behavior, the type and extent of the proposed operations, and an awareness of traditional knowledge. The peer reviewers will be selected by the RS/FO from experts recommended by the NSB, the AEWC, industry, NOAA - Fisheries, and MMS. The results of these peer reviews will be provided to the RS/FO for consideration in final approval of the monitoring program and the final report, with copies to the NSB, AEWC, and the State of Alaska.

In the event the lessee is seeking a Letter of Authorization (LOA) or Incidental Harassment Authorization (IHA) for incidental take from the NOAA - Fisheries, the monitoring program and review process required under the LOA or IHA may satisfy the requirements of this stipulation. Lessees must advise the RS/FO when it is seeking an LOA or IHA in lieu of meeting the requirements of this stipulation and provide the RS/FO with copies of all pertinent submittals and resulting correspondence. The RS/FO will coordinate with the NOAA - Fisheries and advise the lessee if the LOA or IHA will meet these requirements.

This stipulation applies to the following blocks for the time periods listed and will remain in effect until termination or modification by the Department of the Interior, after consultation with the NOAA-Fisheries and the NSB.

Spring Migration Area: April 1 through June 15

OPD: NR 05-01, Dease Inlet. Blocks included:

6102-6111	6302-6321	6508-6523	6717-6723
6152-6167	6354-6371	6560-6573	
6202-6220	6404-6423	6610-6623	
6252-6270	6455-6473	6659-6673	

OPD: NR 05-02, Harrison Bay North: Blocks included:

6401-6404	6501-6506	6601-6609	6701-6716
6451-6454	6551-6556	6651-6659	

Central Fall Migration Area: September 1 through October 31

OPD: NR 05-01, Dease Inlet. Blocks included:

6102-6111	6354-6371	6610-6623	6856-6873
6152-6167	6404-6423	6659-6673	6908-6923
6202-6220	6455-6473	6706-6723	6960-6973
6252-6270	6508-6523	6756-6773	7011-7023
6302-6321	6560-6573	6806-6823	7062-7073
			7112-7123

OPD: NR 05-02, Harrison Bay North. Blocks included:

6401-6404	6601-6609	6801-6818	7001-7023
6451-6454	6651-6659	6851-6868	7051-7073

6501-6506	6701-6716	6901-6923	7101-7123
6551-6556	6751-6766	6951-6973	

OPD: NR 05-03, Teshekpuk. Blocks included:

6015-6024	6067-6072

OPD: NR 05-04, Harrison Bay. Blocks included:

6001-6023	6157-6173	6309-6324	6461-6469
6052-6073	6208-6223	6360-6374	6513-6519
6106-6123	6258-6274	6410-6424	6565-6566

OPD: NR 06-01, Beechey Point North. Blocks included:

6901-6911	6951-6962	7001-7012	7051-7062
			7101-7113

OPD: NR 06-03, Beechey Point. Blocks included:

6002-6014	6202-6220	6401-6424	6618-6624
6052-6064	6251-6274	6456-6474	6671-6674
6102-6114	6301-6324	6509-6524	6722-6724
6152-6169	6351-6374	6569-6574	6773

OPD: NR 06-04, Flaxman Island. Blocks included:

6301-6303	6451-6459	6601-6609	6751-6759
6351-6359	6501-6509	6651-6659	6802-6809
6401-6409	6551-6559	6701-6709	6856-6859

Eastern Fall Migration: August 1 through October 31

OPD: NR 06-04, Flaxman Island. Blocks included:

6360-6364	6560-6574	6760-6774	6961-6974
6410-6424	6610-6624	6810-6824	7013-7022
6460-6474	6660-6674	6860-6874	7066-7070
6510-6524	6710-6724	6910-6924	7118-7119

OPD: NR 07-03, Barter Island. Blocks included:

6401-6405	6601-6605	6801-6803	7012-7013
6451-6455	6651-6655	6851-6853	7062-7067
6501-6505	6701-6705	6901-6903	7113-7117
6551-6555	6751-6753	6962-6963	

OPD: NR 07-05, Demarcation Point. Blocks included:

6016-6022	6118-6125	6221-6226	6324-6326
6067-6072	6169-6175	6273-6276	

OPD: NR 07-06, Mackenzie Canyon. Blocks included:

6201	6251	6301	6351

<u>Stipulation No. 5. Conflict Avoidance Mechanisms to Protect Subsistence Whaling and Other Subsistence-Harvesting Activities</u>. Exploration and development and production operations shall be conducted in a manner that prevents unreasonable conflicts between the oil and gas industry and subsistence activities (including, but not limited to, bowhead whale subsistence hunting).

Prior to submitting an exploration plan or development and production plan (including associated oil-spill contingency plans) to MMS for activities proposed during the bowhead whale migration period, the lessee shall consult with the directly affected subsistence communities, Barrow, Kaktovik, or Nuiqsut, the North Slope Borough (NSB), and the Alaska Eskimo Whaling Commission (AEWC) to discuss potential conflicts with the siting, timing, and methods of proposed operations and safeguards or mitigating measures which could be implemented by the operator to prevent unreasonable conflicts. Through this consultation, the lessee shall make every reasonable effort, including such mechanisms as a conflict avoidance agreement, to assure that exploration, development, and production activities are compatible with whaling and other subsistence hunting activities and will not result in unreasonable interference with subsistence harvests.

A discussion of resolutions reached during this consultation process and plans for continued consultation shall be included in the exploration plan or the development and production plan. In particular, the lessee shall show in the plan how its activities, in combination with other activities in the area, will be scheduled and located to prevent unreasonable conflicts with subsistence activities. Lessees shall also include a discussion of multiple or simultaneous operations, such as ice management and seismic activities, that can be expected to occur during operations in order to more accurately assess the potential for any cumulative affects. Communities, individuals, and other entities who were involved in the consultation shall be identified in the plan. The RS/FO shall send a copy of the exploration plan or development and production plan (including associated oil-spill contingency plans) to the directly affected communities and the AEWC at the time they are submitted to the MMS to allow concurrent review and comment as part of the plan approval process.

In the event no agreement is reached between the parties, the lessee, the AEWC, the NSB, the National Oceanic and Atmospheric Administration-Fisheries (NOAA), or any of the subsistence communities that could be affected directly by the proposed activity may request that the RS/FO assemble a group consisting of representatives from the subsistence communities, AEWC, NSB, NOAA - Fisheries, and the lessee(s) to specifically address the conflict and attempt to resolve the issues before making a final determination on the adequacy of the measures taken to prevent unreasonable conflicts with subsistence harvests. Upon request, the RS/FO will assemble this group if the RS/FO determines such a meeting is warranted and relevant before making a final determination on the adequacy of the measures taken to prevent unreasonable conflicts with subsistence harvests.

The lessee shall notify the RS/FO of all concerns expressed by subsistence hunters during operations and of steps taken to address such concerns. Lease-related use will be restricted when the RS/FO determines it is necessary to prevent unreasonable conflicts with local subsistence hunting activities.

In enforcing this stipulation, the RS/FO will work with other agencies and the public to assure that potential conflicts are identified and efforts are taken to avoid these conflicts.

Subsistence whaling activities occur generally during the following periods:

August to October: Kaktovik whalers use the area circumscribed from Anderson Point in Camden Bay to a point 30 kilometers north of Barter Island to Humphrey Point east of Barter Island. Nuiqsut whalers use an area extending from a line northward of the Nechelik Channel of the Colville River to Flaxman Island, seaward of the Barrier Islands.

September to October: Barrow hunters use the area circumscribed by a western boundary extending approximately 15 kilometers west of Barrow, a northern boundary 50 kilometers north of Barrow, then southeastward to a point about 50 kilometers off Cooper Island, with an eastern boundary on the east side of Dease Inlet. Occasional use may extend eastward as far as Cape Halkett.

Stipulation No. 6 - Pre-Booming Requirements for Fuel Transfers. Fuel transfers (excluding gasoline transfers) of 100 barrels or more occurring 3 weeks prior to or during the bowhead whale migration will require pre-booming of the fuel barge(s). The fuel barge must be surrounded by an oil-spill-containment boom during the entire transfer operation to help reduce any adverse effects from a fuel spill. This stipulation is applicable to the blocks and migration times listed in the stipulation on Industry Site-Specific Bowhead Whale-Monitoring. The lessee's oil-spill-contingency plans must include procedures for the pre-transfer booming of the fuel barge(s).

Stipulation No. 7. Lighting of Lease Structures to Minimize Effects to Spectacled and Steller's Eider. To minimize the likelihood that migrating spectacled or Steller's eiders will strike lease structures associated with offshore drilling, all structures so identified by MMS must be lighted and/or marked in a manner that does not attract them and minimizes the likelihood they would collide with the structures. The MMS and the Fish and Wildlife Service will cooperatively develop lighting requirements and identify where, when, and on what type of structures the requirements should be applied. Specific lighting requirements will be developed by April 1, 2004, at which time MMS will issue these requirements.

The radiation of light outward from structures must be minimized by shading and/or light fixture placement to direct light inward and downward to living and work surfaces while minimizing light radiating upward and outward. These requirements will not apply between October 31 and May 1 of each year, when eiders are not likely to be present.

Lessees are required to report spectacled and/or Steller's eiders injured or killed through collisions with lease structures, to the Fairbanks Fish and Wildlife Field Office, Endangered Species Branch, Fairbanks, Alaska at (907) 456-0499 for instruction on the handling and disposal of the injured or dead bird.

Leasing Activities Information

MMS

U.S. Department of the Interior
Minerals Management Service
Alaska OCS Region

Lease Stipulations
Oil and Gas Lease Sale 195
Beaufort Sea
March 30, 2005

Stipulation No. 1. Protection of Biological Resources
Stipulation No. 2. Orientation Program
Stipulation No. 3. Transportation of Hydrocarbons
Stipulation No. 4. Industry Site-Specific Bowhead Whale-Monitoring Program
Stipulation No. 5. Conflict Avoidance Mechanisms to Protect Subsistence Whaling and Other Subsistence-Harvesting Activities
Stipulation No. 6. Pre-Booming Requirements for Fuel Transfers
Stipulation No. 7. Lighting of Lease Structures to Minimize Effects to Spectacled and Steller's Eider

Stipulation No. 1. Protection of Biological Resources. If biological populations or habitats that may require additional protection are identified in the lease area by the Regional Supervisor, Field Operations (RS/FO), the RS/FO may require the lessee to conduct biological surveys to determine the extent and composition of such biological populations or habitats. The RS/FO shall give written notification to the lessee of the RS/FO's decision to require such surveys.

Based on any surveys that the RS/FO may require of the lessee or on other information available to the RS/FO on special biological resources, the RS/FO may require the lessee to:

(1) Relocate the site of operations;
(2) Establish to the satisfaction of the RS/FO, on the basis of a site-specific survey, either that such operations will not have a significant adverse effect upon the resource identified or that a special biological resource does not exist;
(3) Operate during those periods of time, as established by the RS/FO, that do not adversely affect the biological resources; and/or
(4) Modify operations to ensure that significant biological populations or habitats deserving protection are not adversely affected.

If any area of biological significance should be discovered during the conduct of any operations on the lease, the lessee shall immediately report such findings to the RS/FO and make every reasonable effort to preserve and protect the biological resource from damage until the RS/FO has given the lessee direction with respect to its protection.

The lessee shall submit all data obtained in the course of biological surveys to the RS/FO with the locational information for drilling or other activity. The lessee may take no action that might affect the biological populations or habitats surveyed until the RS/FO provides written directions to the lessee with regard to permissible actions.

***Stipulation No. 2. Orientation Program*.** The lessee shall include in any exploration or development and production plans submitted under 30 CFR 250.203 and 250.204 a proposed orientation program for all personnel involved in exploration or development and production activities (including personnel of the lessee's agents, contractors, and subcontractors) for review and approval by the RS/FO. The program shall be designed in sufficient detail to inform individuals working on the project of specific types of environmental, social, and cultural concerns that relate to the sale and adjacent areas. The program shall address the importance of not disturbing archaeological and biological resources and habitats, including endangered species, fisheries, bird colonies, and marine mammals and provide guidance on how to avoid disturbance. This guidance will include the production and distribution of information cards on endangered and/or threatened species in the sale area. The program shall be designed to increase the sensitivity and understanding of personnel to community values, customs, and lifestyles in areas in which such personnel will be operating. The orientation program shall also include information concerning avoidance of conflicts with subsistence, commercial fishing activities, and pertinent mitigation.

The program shall be attended at least once a year by all personnel involved in onsite exploration or development and production activities (including personnel of the lessee's agents, contractors, and subcontractors) and all supervisory and managerial personnel involved in lease activities of the lessee and its agents, contractors, and subcontractors.

The lessee shall maintain a record of all personnel who attend the program onsite for so long as the site is active, not to exceed 5 years. This record shall include the name and date(s) of attendance of each attendee.

***Stipulation No. 3. Transportation of Hydrocarbons*.** Pipelines will be required: (a) if pipeline rights-of-way can be determined and obtained; (b) if laying such pipelines is technologically feasible and environmentally preferable; and (c) if, in the opinion of the lessor, pipelines can be laid without net social loss, taking into account any incremental costs of pipelines over alternative methods of transportation and any incremental benefits in the form of increased environmental protection or reduced multiple-use conflicts. The lessor specifically reserves the right to require that any pipeline used for transporting production to shore be placed in certain designated management areas. In selecting the means of transportation, consideration will be given to recommendations of any advisory groups and Federal, state, and local governments and industry.

Following the development of sufficient pipeline capacity, no crude oil production will be transported by surface vessel from offshore production sites, except in the case of an emergency. Determinations as to emergency conditions and appropriate responses to these conditions will be made by the RS/FO.

***Stipulation No. 4. Industry Site-Specific Bowhead Whale-Monitoring Program*.** Lessees proposing to conduct exploratory drilling operations, including seismic surveys, during the bowhead whale migration will be required to conduct a site-specific monitoring program approved by the RS/FO; unless, based on the size, timing, duration, and scope of the proposed operations, the RS/FO, in consultation with the North Slope Borough (NSB) and the Alaska Eskimo Whaling Commission (AEWC), determine that a monitoring program is not necessary. The RS/FO will provide the NSB, AEWC, and the State of Alaska a minimum of 30 but no longer than 60 calendar days to review and comment on a proposed monitoring program prior to approval. The monitoring program must be approved each year before exploratory drilling operations can be commenced.

The monitoring program will be designed to assess when bowhead whales are present in the vicinity of lease operations and the extent of behavioral effects on bowhead whales due to these operations. In designing the program, lessees must consider the potential scope and extent of effects that the type of operation could have on bowhead whales. Experiences relayed by subsistence hunters indicate that, depending on the type of operations, some whales demonstrate avoidance behavior at distances of up to 35 miles. The program must also provide for the following:

(1) Recording and reporting information on sighting of other marine mammals and the extent of behavioral effects due to operations;
(2) Inviting an AEWC or NSB representative to participate in the monitoring program as an observer;
(3) Coordinating the monitoring logistics beforehand with the MMS Bowhead Whale Aerial Survey Project (BWASP);
(4) Submitting daily monitoring results to the MMS BWASP;
(5) Submitting a draft report on the results of the monitoring program to the RS/FO within 60 days following the completion of the operation (the RS/FO will distribute this draft report to the AEWC, the NSB, the State of Alaska, and the National Oceanic and Atmospheric Administration-Fisheries [NOAA]); and
(6) Submitting a final report on the results of the monitoring program to the RS/FO (the final report will include a discussion of the results of the peer review of the draft report and the RS/FO will distribute this report to the AEWC, the NSB, the State of Alaska, and the NOAA Fisheries).

Lessees will be required to fund an independent peer review of a proposed monitoring plan and the draft report on the results of the monitoring program. This peer review will consist of independent reviewers who have knowledge and experience in statistics, monitoring marine mammal behavior, the type and extent of the proposed operations, and an awareness of traditional knowledge. The peer reviewers will be selected by the RS/FO from experts recommended by the NSB, the AEWC, industry, NOAA Fisheries, and MMS. The results of these peer reviews will be provided to the RS/FO for consideration in final approval of the monitoring program and the final report, with copies to the NSB, AEWC, and the State of Alaska.

In the event the lessee is seeking a Letter of Authorization (LOA) or Incidental Harassment Authorization (IHA) for incidental take from the NOAA Fisheries, the monitoring program and review process required under the LOA or IHA may satisfy the requirements of this stipulation.

Lessees must advise the RS/FO when it is seeking an LOA or IHA in lieu of meeting the requirements of this stipulation and provide the RS/FO with copies of all pertinent submittals and resulting correspondence. The RS/FO will coordinate with the NOAA Fisheries and advise the lessee if the LOA or IHA will meet these requirements.

This stipulation applies to the following blocks for the time periods listed and will remain in effect until termination or modification by the Department of the Interior, after consultation with the NOAA Fisheries and the NSB.

Spring Migration Area: April 1 through June 15

OPD: NR 05-01, Dease Inlet. Blocks included:

6102-6111	6302-6321	6508-6523	6717-6723
6152-6167	6354-6371	6560-6573	
6202-6220	6404-6423	6610-6623	
6252-6270	6455-6473	6659-6673	

OPD: NR 05-02, Harrison Bay North: Blocks included:

6401-6404	6501-6506	6601-6609	6701-6716
6451-6454	6551-6556	6651-6659	

Central Fall Migration Area: September 1 through October 31

OPD: NR 05-01, Dease Inlet. Blocks included:

6102-6111	6354-6371	6610-6623	6856-6873
6152-6167	6404-6423	6659-6673	6908-6923
6202-6220	6455-6473	6706-6723	6960-6973
6252-6270	6508-6523	6756-6773	7011-7023
6302-6321	6560-6573	6806-6823	7062-7073
			7112-7123

OPD: NR 05-02, Harrison Bay North. Blocks included:

6401-6404	6601-6609	6801-6818	7001-7023
6451-6454	6651-6659	6851-6868	7051-7073
6501-6506	6701-6716	6901-6923	7101-7123
6551-6556	6751-6766	6951-6973	

OPD: NR 05-03, Teshekpuk. Blocks included:

6015-6024	6067-6072

OPD: NR 05-04, Harrison Bay. Blocks included:

6001-6023	6157-6173	6309-6324	6461-6471
6052-6073	6208-6223	6360-6374	6513-6519
6106-6123	6258-6274	6410-6424	6565-6566

OPD: NR 06-01, Beechey Point North. Blocks included:

6901-6911	6951-6962	7001-7012	7051-7062
			7101-7113

OPD: NR 06-03, Beechey Point. Blocks included:

6002-6014	6202-6220	6401-6424	6618-6624
6052-6064	6251-6274	6456-6474	6671-6674
6102-6114	6301-6324	6509-6524	6722-6724
6152-6169	6351-6374	6568-6574	6773

OPD: NR 06-04, Flaxman Island. Blocks included:

6301-6303	6451-6459	6601-6609	6751-6759
6351-6359	6501-6509	6651-6659	6802-6809
6401-6409	6551-6559	6701-6709	6856-6859

Eastern Fall Migration: August 1 through October 31

OPD: NR 06-04, Flaxman Island. Blocks included:

6360-6364	6560-6574	6760-6774	6961-6974
6410-6424	6610-6624	6810-6824	7013-7022
6460-6474	6660-6674	6860-6874	7066-7070
6510-6524	6710-6724	6910-6924	7118-7119

OPD: NR 07-03, Barter Island. Blocks included:

6401-6405	6601-6605	6801-6803	7012-7013
6451-6455	6651-6655	6851-6853	7062-7067
6501-6505	6701-6705	6901-6903	7113-7117
6551-6555	6751-6753	6962-6963	

OPD: NR 07-05, Demarcation Point. Blocks included:

6016-6022	6118-6125	6221-6226	6324-6326
6067-6072	6169-6175	6273-6276	

OPD: NR 07-06, Mackenzie Canyon. Blocks included:

6201	6251	6301	6351

***Stipulation No. 5. Conflict Avoidance Mechanisms to Protect Subsistence Whaling and Other Subsistence-Harvesting Activities*.** Exploration and development and production operations shall be conducted in a manner that prevents unreasonable conflicts between the oil and gas industry and subsistence activities (including, but not limited to, bowhead whale subsistence hunting).

Prior to submitting an exploration plan or development and production plan (including associated oil-spill contingency plans) to MMS for activities proposed during the bowhead whale migration period, the lessee shall consult with the directly affected subsistence communities, Barrow, Kaktovik, or Nuiqsut, the North Slope Borough (NSB), and the Alaska Eskimo Whaling Commission (AEWC) to discuss potential conflicts with the siting, timing, and methods of proposed operations and safeguards or mitigating measures which could be implemented by the operator to prevent unreasonable conflicts. Through this consultation, the lessee shall make every reasonable effort, including such mechanisms as a conflict avoidance agreement, to assure that exploration, development, and production activities are compatible with whaling and other subsistence hunting activities and will not result in unreasonable interference with subsistence harvests.

A discussion of resolutions reached during this consultation process and plans for continued consultation shall be included in the exploration plan or the development and production plan. In particular, the lessee shall show in the plan how its activities, in combination with other activities in the area, will be scheduled and located to prevent unreasonable conflicts with subsistence activities. Lessees shall also include a discussion of multiple or simultaneous operations, such as ice management and seismic activities, that can be expected to occur during operations in order to more accurately assess the potential for any cumulative affects. Communities, individuals, and other entities who were involved in the consultation shall be identified in the plan. The RS/FO shall send a copy of the exploration plan or development and production plan (including associated oil-spill contingency plans) to the directly affected communities and the AEWC at the time they are submitted to the MMS to allow concurrent review and comment as part of the plan approval process.

In the event no agreement is reached between the parties, the lessee, the AEWC, the NSB, the National Oceanic and Atmospheric Administration - Fisheries (NOAA), or any of the subsistence communities that could be affected directly by the proposed activity may request that the RS/FO assemble a group consisting of representatives from the subsistence communities, AEWC, NSB, NOAA Fisheries, and the lessee(s) to specifically address the conflict and attempt to resolve the issues before making a final determination on the adequacy of the measures taken to prevent unreasonable conflicts with subsistence harvests. Upon request, the RS/FO will assemble this group if the RS/FO determines such a meeting is warranted and relevant before making a final determination on the adequacy of the measures taken to prevent unreasonable conflicts with subsistence harvests.

The lessee shall notify the RS/FO of all concerns expressed by subsistence hunters during operations and of steps taken to address such concerns. Lease-related use will be restricted when the RS/FO determines it is necessary to prevent unreasonable conflicts with local subsistence hunting activities.

In enforcing this stipulation, the RS/FO will work with other agencies and the public to assure that potential conflicts are identified and efforts are taken to avoid these conflicts.

Subsistence whaling activities occur generally during the following periods:

August to October: Kaktovik whalers use the area circumscribed from Anderson Point in Camden Bay to a point 30 kilometers north of Barter Island to Humphrey Point east of Barter Island. Nuiqsut whalers use an area extending from a line northward of the Nechelik Channel of the Colville River to Flaxman Island, seaward of the Barrier Islands.

September to October: Barrow hunters use the area circumscribed by a western boundary extending approximately 15 kilometers west of Barrow, a northern boundary 50 kilometers north of Barrow, then southeastward to a point about 50 kilometers off Cooper Island, with an eastern boundary on the east side of Dease Inlet. Occasional use may extend eastward as far as Cape Halkett.

Stipulation No. 6 - Pre-Booming Requirements for Fuel Transfers. Fuel transfers (excluding gasoline transfers) of 100 barrels or more occurring 3 weeks prior to or during the bowhead whale migration will require pre-booming of the fuel barge(s). The fuel barge must be surrounded by an oil-spill-containment boom during the entire transfer operation to help reduce any adverse effects from a fuel spill. This stipulation is applicable to the blocks and migration times listed in the stipulation on Industry Site-Specific Bowhead Whale-Monitoring. The lessee's oil-spill-contingency plans must include procedures for the pre-transfer booming of the fuel barge(s).

Stipulation No. 7. Lighting of Lease Structures to Minimize Effects to Spectacled and Steller's Eider. In accordance with the Biological Opinion for the Beaufort Sea Lease Sale 186 issued by the U.S. Fish and Wildlife Service (FWS) on October 22, 2002, and FWS's subsequent amendment of the Incidental Take Statement on September 21, 2004, lessees must adhere to lighting requirements for all exploration or delineation structures so as to minimize the likelihood that migrating spectacled or Steller's eiders will strike these structures.

Lessees are required to implement lighting requirements aimed at minimizing the radiation of light outward from exploration/delineation structures to minimize the likelihood that spectacled or Steller's eiders will strike those structures. These requirements establish a coordinated process for a performance based objective rather than pre-determined prescriptive requirements. The performance based objective is to minimize the radiation of light outward from exploration/delineation structures. Measures to be considered include but need not be limited to the following:

- Shading and/or light fixture placement to direct light inward and downward to living and work structures while minimizing light radiating upward and outward;
- Types of lights;
- Adjustment of the number and intensity of lights as needed during specific activities.
- Dark paint colors for selected surfaces;
- Low reflecting finishes or coverings for selected surfaces; and
- Facility or equipment configuration.

Lessees are encouraged to consider other technical, operational and management approaches to reduce outward light radiation that could be applied to their specific facility and operation.

If further information on bird avoidance measures becomes available that suggests modification to this lighting protocol is warranted under the Endangered Species Act to implement the reasonable and prudent measures of the Biological Opinion, MMS will issue further requirements, based on guidance from the FWS. Lessees will be required to adhere to such modifications of this protocol. The MMS will promptly notify lessees of any changes to lighting required under this stipulation.

These requirements apply to all new and existing Outer Continental Shelf oil and gas leases issued between the 156^0 W longitude and 146^0 W longitude for activities conducted between May 1 and October 31. The MMS encourages operators to consider such measures in areas to the east of $146\ ^0$ W longitude because occasional sightings of eiders that are now listed have been made there and because such measures could reduce the potential for collisions of other, non-ESA listed migratory birds that are protected under the Migratory Bird Treaty Act.

Nothing in this protocol is intended to reduce personnel safety or prevent compliance with other regulatory requirements (e.g. U.S. Coast Guard or Department of Occupational Safety and Health) for marking or lighting of equipment and work areas.

Lessees are required to report spectacled and/or Steller's eiders injured or killed through collisions with lease structures to the Fairbanks Fish and Wildlife Field Office, Endangered Species Branch, Fairbanks, Alaska at (907) 456-0499. We recommend that you call that office for instruction on the handling and disposal of the injured or dead bird.

Lessees must provide MMS with a written statement of measures that will be or that have been taken to meet the objective of this stipulation. Lessees must also include a plan for recording and reporting bird strikes that occur during approved activities to the MMS. This information must be included with an Exploration Plan when the EP is submitted for regulatory review and approval pursuant to 30 CFR 250.203. Lessees are encouraged to discuss their proposed measures in a pre-submittal meeting with the MMS and FWS.

Leasing Activities Information

MMS

U.S. Department of the Interior
Minerals Management Service
Alaska OCS Region

Lease Stipulations

Oil and Gas Lease Sale 202
Beaufort Sea
April 18, 2007

Stipulation No. 1. Protection of Biological Resources
Stipulation No. 2. Orientation Program
Stipulation No. 3. Transportation of Hydrocarbons
Stipulation No. 4. Industry Site-Specific Bowhead Whale-Monitoring Program
Stipulation No. 5. Conflict Avoidance Mechanisms to Protect Subsistence Whaling and Other Subsistence-Harvesting Activities
Stipulation No. 6. Pre-Booming Requirements for Fuel Transfers
Stipulation No. 7. Lighting of Lease Structures to Minimize Effects to Spectacled and Steller's Eider

Stipulation No. 1. Protection of Biological Resources. If biological populations or habitats that may require additional protection are identified in the lease area by the Regional Supervisor, Field Operations (RS/FO), the RS/FO may require the lessee to conduct biological surveys to determine the extent and composition of such biological populations or habitats. The RS/FO shall give written notification to the lessee of the RS/FO's decision to require such surveys.

Based on any surveys that the RS/FO may require of the lessee or on other information available to the RS/FO on special biological resources, the RS/FO may require the lessee to:

(1) Relocate the site of operations;
(2) Establish to the satisfaction of the RS/FO, on the basis of a site-specific survey, either that such operations will not have a significant adverse effect upon the resource identified or that a special biological resource does not exist;
(3) Operate during those periods of time, as established by the RS/FO, that do not adversely affect the biological resources; and/or
(4) Modify operations to ensure that significant biological populations or habitats deserving protection are not adversely affected.

If any area of biological significance should be discovered during the conduct of any operations on the lease, the lessee shall immediately report such findings to the RS/FO and make every reasonable effort to preserve and protect the biological resource from damage until the RS/FO has given the lessee direction with respect to its protection.

The lessee shall submit all data obtained in the course of biological surveys to the RS/FO with the locational information for drilling or other activity. The lessee may take no action that might affect the biological populations or habitats surveyed until the RS/FO provides written directions to the lessee with regard to permissible actions.

Stipulation No. 2. Orientation Program. The lessee shall include in any exploration or development and production plans submitted under 30 CFR 250.201 a proposed orientation program for all personnel involved in exploration or development and production activities (including personnel of the lessee's agents, contractors, and subcontractors) for review and approval by the RS/FO. The program shall be designed in sufficient detail to inform individuals working on the project of specific types of environmental, social, and cultural concerns that relate to the sale and adjacent areas. The program shall address the importance of not disturbing archaeological and biological resources and habitats, including endangered species, fisheries, bird colonies, and marine mammals and provide guidance on how to avoid disturbance. This guidance will include the production and distribution of information cards on endangered and/or threatened species in the sale area. The program shall be designed to increase the sensitivity and understanding of personnel to community values, customs, and lifestyles in areas in which such personnel will be operating. The orientation program shall also include information concerning avoidance of conflicts with subsistence, commercial fishing activities, and pertinent mitigation.

The program shall be attended at least once a year by all personnel involved in onsite exploration or development and production activities (including personnel of the lessee's agents, contractors, and subcontractors) and all supervisory and managerial personnel involved in lease activities of the lessee and its agents, contractors, and subcontractors.

The lessee shall maintain a record of all personnel who attend the program onsite for so long as the site is active, not to exceed 5 years. This record shall include the name and date(s) of attendance of each attendee.

Stipulation No. 3. Transportation of Hydrocarbons. Pipelines will be required: (a) if pipeline rights-of-way can be determined and obtained; (b) if laying such pipelines is technologically feasible and environmentally preferable; and (c) if, in the opinion of the lessor, pipelines can be laid without net social loss, taking into account any incremental costs of pipelines over alternative methods of transportation and any incremental benefits in the form of increased environmental protection or reduced multiple-use conflicts. The lessor specifically reserves the right to require that any pipeline used for transporting production to shore be placed in certain designated management areas. In selecting the means of transportation, consideration will be given to recommendations of any advisory groups and Federal, state, and local governments and industry.

Following the development of sufficient pipeline capacity, no crude oil production will be transported by surface vessel from offshore production sites, except in the case of an emergency. Determinations as to emergency conditions and appropriate responses to these conditions will be made by the RS/FO.

Stipulation No. 4. Industry Site-Specific Bowhead Whale-Monitoring Program. Lessees proposing to conduct exploratory drilling operations, including seismic surveys, during the bowhead whale migration will be required to conduct a site-specific monitoring program approved by the RS/FO; unless, based on the size, timing, duration, and scope of the proposed operations, the RS/FO, in consultation with the North Slope Borough (NSB) and the Alaska Eskimo Whaling Commission (AEWC), determine that a monitoring program is not necessary. The RS/FO will provide the NSB, AEWC, and the State of Alaska a minimum of 30 but no longer than 60 calendar days to review and comment on a proposed monitoring program prior to approval. The monitoring program must be approved each year before exploratory drilling operations can be commenced.

The monitoring program will be designed to assess when bowhead whales are present in the vicinity of lease operations and the extent of behavioral effects on bowhead whales due to these operations. In designing the program, lessees must consider the potential scope and extent of effects that the type of operation could have on bowhead whales. Experiences relayed by subsistence hunters indicate that, depending on the type of operations, some whales demonstrate avoidance behavior at distances of up to 35 miles. The program must also provide for the following:

(1) Recording and reporting information on sighting of other marine mammals and the extent of behavioral effects due to operations;
(2) Inviting an AEWC or NSB representative to participate in the monitoring program as an observer;
(3) Coordinating the monitoring logistics beforehand with the MMS Bowhead Whale Aerial Survey Project (BWASP);
(4) Submitting daily monitoring results to the MMS BWASP;
(5) Submitting a draft report on the results of the monitoring program to the RS/FO within 60 days following the completion of the operation (the RS/FO will distribute this draft report to the AEWC, the NSB, the State of Alaska, and the National Oceanic and Atmospheric Administration-Fisheries [NOAA]); and
(6) Submitting a final report on the results of the monitoring program to the RS/FO (the final report will include a discussion of the results of the peer review of the draft report and the RS/FO will distribute this report to the AEWC, the NSB, the State of Alaska, and the NOAA Fisheries).

Lessees will be required to fund an independent peer review of a proposed monitoring plan and the draft report on the results of the monitoring program. This peer review will consist of independent reviewers who have knowledge and experience in statistics, monitoring marine mammal behavior, the type and extent of the proposed operations, and an awareness of traditional knowledge. The peer reviewers will be selected by the RS/FO from experts recommended by the NSB, the AEWC, industry, NOAA Fisheries, and MMS. The results of these peer reviews will be provided to the RS/FO for consideration in final approval of the monitoring program and the final report, with copies to the NSB, AEWC, and the State of Alaska.

In the event the lessee is seeking a Letter of Authorization (LOA) or Incidental Harassment Authorization (IHA) for incidental take from the NOAA Fisheries, the monitoring program and review process required under the LOA or IHA may satisfy the requirements of this stipulation. Lessees must advise the RS/FO when it is seeking an LOA or IHA in lieu of meeting the requirements of this stipulation and provide the RS/FO with copies of all pertinent submittals and resulting correspondence. The RS/FO will coordinate with the NOAA Fisheries and advise the lessee if the LOA or IHA will meet these requirements.

This stipulation applies to the following blocks for the time periods listed and will remain in effect until termination or modification by the Department of the Interior, after consultation with the NOAA Fisheries and the NSB.

Spring Migration Area: April 1 through June 15

OPD: NR 05-01, Dease Inlet. Blocks included:

6102-6111	6302-6321	6508-6523	6717-6723
6152-6167	6354-6371	6560-6573	
6202-6220	6404-6423	6610-6623	
6252-6270	6455-6473	6659-6673	

OPD: NR 05-02, Harrison Bay North: Blocks included:

6401-6404	6501-6506	6601-6609	6701-6716
6451-6454	6551-6556	6651-6659	

Central Fall Migration Area: September 1 through October 31

OPD: NR 05-01, Dease Inlet. Blocks included:

6102-6111	6354-6371	6610-6623	6856-6873
6152-6167	6404-6423	6659-6673	6908-6923
6202-6220	6455-6473	6706-6723	6960-6973
6252-6270	6508-6523	6756-6773	7011-7023
6302-6321	6560-6573	6806-6823	7062-7073
			7112-7123

OPD: NR 05-02, Harrison Bay North. Blocks included:

6401-6404	6601-6609	6801-6818	7001-7023
6451-6454	6651-6659	6851-6868	7051-7073
6501-6506	6701-6716	6901-6923	7101-7123
6551-6556	6751-6766	6951-6973	

OPD: NR 05-03, Teshekpuk. Blocks included:

6015-6024	6067-6072

OPD: NR 05-04, Harrison Bay. Blocks included:

6001-6023	6157-6173	6309-6324	6461-6471
6052-6073	6208-6223	6360-6374	6513-6519
6106-6123	6258-6274	6410-6424	6565-6566

OPD: NR 06-01, Beechey Point North. Blocks included:

6901-6911	6951-6962	7001-7012	7051-7062
			7101-7113

OPD: NR 06-03, Beechey Point. Blocks included:

6002-6014	6202-6220	6401-6424	6618-6624
6052-6064	6251-6274	6456-6474	6671-6674
6102-6114	6301-6324	6509-6524	6722-6724
6152-6169	6351-6374	6568-6574	6773

OPD: NR 06-04, Flaxman Island. Blocks included:

6301-6303	6451-6459	6601-6609	6751-6759
6351-6359	6501-6509	6651-6659	6802-6809
6401-6409	6551-6559	6701-6709	6856-6859

Eastern Fall Migration: August 1 through October 31

OPD: NR 06-04, Flaxman Island. Blocks included:

6360-6364	6560-6574	6760-6774	6961-6974
6410-6424	6610-6624	6810-6824	7013-7022
6460-6474	6660-6674	6860-6874	7066-7070
6510-6524	6710-6724	6910-6924	7118-7119

OPD: NR 07-03, Barter Island. Blocks included:

6401-6405	6601-6605	6801-6803	7012-7013
6451-6455	6651-6655	6851-6853	7062-7067
6501-6505	6701-6705	6901-6903	7113-7117
6551-6555	6751-6753	6962-6963	

OPD: NR 07-05, Demarcation Point. Blocks included:

6016-6022	6118-6125	6221-6226	6324-6326
6067-6072	6169-6175	6273-6276	

OPD: NR 07-06, Mackenzie Canyon. Blocks included:

6201	6251	6301	6351

Stipulation No. 5. Conflict Avoidance Mechanisms to Protect Subsistence Whaling and Other Subsistence-Harvesting Activities. Exploration and development and production operations shall be conducted in a manner that prevents unreasonable conflicts between the oil and gas industry and subsistence activities (including, but not limited to, bowhead whale subsistence hunting).

Prior to submitting an exploration plan or development and production plan (including associated oil-spill contingency plans) to MMS for activities proposed during the bowhead whale migration period, the lessee shall consult with the directly affected subsistence communities, Barrow, Kaktovik, or Nuiqsut, the North Slope Borough (NSB), and the Alaska Eskimo Whaling Commission (AEWC) to discuss potential conflicts with the siting, timing, and methods of proposed operations and safeguards or mitigating measures which could be implemented by the operator to prevent unreasonable conflicts. Through this consultation, the lessee shall make every reasonable effort, including such mechanisms as a conflict avoidance agreement, to assure that exploration, development, and production activities are compatible with whaling and other subsistence hunting activities and will not result in unreasonable interference with subsistence harvests.

A discussion of resolutions reached during this consultation process and plans for continued consultation shall be included in the exploration plan or the development and production plan. In particular, the lessee shall show in the plan how its activities, in combination with other activities in the area, will be scheduled and located to prevent unreasonable conflicts with subsistence activities. Lessees shall also include a discussion of multiple or simultaneous operations, such as ice management and seismic activities, that can be expected to occur during operations in order to more accurately assess the potential for any cumulative affects. Communities, individuals, and other entities who were involved in the consultation shall be identified in the plan. The RS/FO shall send a copy of the exploration plan or development and production plan (including associated oil-spill contingency plans) to the directly affected communities and the AEWC at the time they are submitted to the MMS to allow concurrent review and comment as part of the plan approval process.

In the event no agreement is reached between the parties, the lessee, the AEWC, the NSB, the National Oceanic and Atmospheric Administration - Fisheries (NOAA), or any of the subsistence communities that could be affected directly by the proposed activity may request that the RS/FO assemble a group consisting of representatives from the subsistence communities, AEWC, NSB, NOAA Fisheries, and the lessee(s) to specifically address the conflict and attempt to resolve the issues before making a final determination on the adequacy of the measures taken to prevent unreasonable conflicts with subsistence harvests. Upon request, the RS/FO will assemble this group if the RS/FO determines such a meeting is warranted and relevant before making a final determination on the adequacy of the measures taken to prevent unreasonable conflicts with subsistence harvests.

The lessee shall notify the RS/FO of all concerns expressed by subsistence hunters during operations and of steps taken to address such concerns. Lease-related use will be restricted when the RS/FO determines it is necessary to prevent unreasonable conflicts with local subsistence hunting activities.

In enforcing this stipulation, the RS/FO will work with other agencies and the public to assure that potential conflicts are identified and efforts are taken to avoid these conflicts.

Subsistence whaling activities occur generally during the following periods:

<u>August to October</u>: Kaktovik whalers use the area circumscribed from Anderson Point in Camden Bay to a point 30 kilometers north of Barter Island to Humphrey Point east of Barter Island. Nuiqsut whalers use an area extending from a line northward of the Nechelik Channel of the Colville River to Flaxman Island, seaward of the Barrier Islands.

<u>September to October</u>: Barrow hunters use the area circumscribed by a western boundary extending approximately 15 kilometers west of Barrow, a northern boundary 50 kilometers north of Barrow, then southeastward to a point about 50 kilometers off Cooper Island, with an eastern boundary on the east side of Dease Inlet. Occasional use may extend eastward as far as Cape Halkett.

<u>Stipulation No. 6 - Pre-Booming Requirements for Fuel Transfers.</u> Fuel transfers (excluding gasoline transfers) of 100 barrels or more occurring 3 weeks prior to or during the bowhead whale migration will require pre-booming of the fuel barge(s). The fuel barge must be surrounded by an oil-spill-containment boom during the entire transfer operation to help reduce any adverse effects from a fuel spill. This stipulation is applicable to the blocks and migration times listed in the stipulation on Industry Site-Specific Bowhead Whale-Monitoring. The lessee's oil-spill-contingency plans must include procedures for the pre-transfer booming of the fuel barge(s).

<u>Stipulation No. 7. Lighting of Lease Structures to Minimize Effects to Spectacled and Steller's Eider.</u> In accordance with the Biological Opinion for the Beaufort Sea Lease Sale 186 issued by the U.S. Fish and Wildlife Service (FWS) on October 22, 2002, and FWS's subsequent amendment of the Incidental Take Statement on September 21, 2004, lessees must adhere to lighting requirements for all exploration or delineation structures so as to minimize the likelihood that migrating spectacled or Steller's eiders will strike these structures.

Lessees are required to implement lighting requirements aimed at minimizing the radiation of light outward from exploration/delineation structures to minimize the likelihood that spectacled or Steller's eiders will strike those structures. These requirements establish a coordinated process for a performance based objective rather than pre-determined prescriptive requirements. The performance based objective is to minimize the radiation of light outward from exploration/delineation structures. Measures to be considered include but need not be limited to the following:

- Shading and/or light fixture placement to direct light inward and downward to living and work structures while minimizing light radiating upward and outward;
- Types of lights;
- Adjustment of the number and intensity of lights as needed during specific activities.
- Dark paint colors for selected surfaces;

- Low reflecting finishes or coverings for selected surfaces; and
- Facility or equipment configuration.

Lessees are encouraged to consider other technical, operational and management approaches to reduce outward light radiation that could be applied to their specific facility and operation.

If further information on bird avoidance measures becomes available that suggests modification to this lighting protocol is warranted under the Endangered Species Act to implement the reasonable and prudent measures of the Biological Opinion, MMS will issue further requirements, based on guidance from the FWS. Lessees will be required to adhere to such modifications of this protocol. The MMS will promptly notify lessees of any changes to lighting required under this stipulation.

These requirements apply to all new and existing Outer Continental Shelf oil and gas leases issued between the 156^0 W longitude and 146^0 W longitude for activities conducted between May 1 and October 31. The MMS encourages operators to consider such measures in areas to the east of $146^{\,0}$ W longitude because occasional sightings of eiders that are now listed have been made there and because such measures could reduce the potential for collisions of other, non-ESA listed migratory birds that are protected under the Migratory Bird Treaty Act.

Nothing in this protocol is intended to reduce personnel safety or prevent compliance with other regulatory requirements (e.g. U.S. Coast Guard or Occupational Safety and Health Administration) for marking or lighting of equipment and work areas.

Lessees are required to report spectacled and/or Steller's eiders injured or killed through collisions with lease structures to the Fairbanks Fish and Wildlife Field Office, Endangered Species Branch, Fairbanks, Alaska at (907) 456-0499. We recommend that you call that office for instruction on the handling and disposal of the injured or dead bird.

Lessees must provide MMS with a written statement of measures that will be or that have been taken to meet the objective of this stipulation. Lessees must also include a plan for recording and reporting bird strikes that occur during approved activities to the MMS. This information must be included with an Exploration Plan when the EP is submitted for regulatory review and approval pursuant to 30 CFR 250.201. Lessees are encouraged to discuss their proposed measures in a pre-submittal meeting with the MMS and FWS.

Leasing Activities Information

MMS

U.S. Department of the Interior
Minerals Management Service
Alaska OCS Region

Final
Lease Stipulations
Oil and Gas Lease Sale 193
Chukchi Sea
February 6, 2008

Stipulation No. 1. Protection of Biological Resources. If previously unidentified biological populations or habitats that may require additional protection are identified in the lease area by the Regional Supervisor, Field Operations (RS/FO), the RS/FO may require the lessee to conduct biological surveys to determine the extent and composition of such biological populations or habitats. The RS/FO shall give written notification to the lessee of the RS/FO's decision to require such surveys.

Based on any surveys that the RS/FO may require of the lessee or on other information available to the RS/FO on special biological resources, the RS/FO may require the lessee to:

(1) Relocate the site of operations;
(2) Establish to the satisfaction of the RS/FO, on the basis of a site-specific survey, either that such operations will not have a significant adverse effect upon the resource identified or that a special biological resource does not exist;
(3) Operate during those periods of time, as established by the RS/FO, that do not adversely affect the biological resources; and/or

(4) Modify operations to ensure that significant biological populations or habitats deserving protection are not adversely affected.

If any area of biological significance should be discovered during the conduct of any operations on the lease, the lessee shall immediately report such finding to the RS/FO and make every reasonable effort to preserve and protect the biological resource from damage until the RS/FO has given the lessee direction with respect to its protection.

The lessee shall submit all data obtained in the course of biological surveys to the RS/FO with the locational information for drilling or other activity. The lessee may take no action that might affect the biological populations or habitats surveyed until the RS/FO provides written directions to the lessee with regard to permissible actions.

Stipulation No. 2. Orientation Program. The lessee shall include in any exploration plan (EP) or development and production plan (DPP) submitted under 30 CFR 250.211 and 250.241 a proposed orientation program for all personnel involved in exploration or development and production activities (including personnel of the lessee's agents, contractors, and subcontractors) for review and approval by the RS/FO. The program shall be designed in sufficient detail to inform individuals working on the project of specific types of environmental, social, and cultural concerns that relate to the sale and adjacent areas. The program shall address the importance of not disturbing archaeological and biological resources and habitats, including endangered species, fisheries, bird colonies, and marine mammals and provide guidance on how to avoid disturbance. This guidance will include the production and distribution of information cards on endangered and/or threatened species in the sale area. The program shall be designed to increase the sensitivity and understanding of personnel to community values, customs, and lifestyles in areas in which such personnel will be operating. The orientation program shall also include information concerning avoidance of conflicts with subsistence activities and pertinent mitigation.

The program shall be attended at least once a year by all personnel involved in onsite exploration or development and production activities (including personnel of the lessee's agents, contractors, and subcontractors) and all supervisory and managerial personnel involved in lease activities of the lessee and its agents, contractors, and subcontractors.

The lessee shall maintain a record of all personnel who attend the program onsite for so long as the site is active, not to exceed 5 years. This record shall include the name and date(s) of attendance of each attendee.

Stipulation No. 3. Transportation of Hydrocarbons. Pipelines will be required: (a) if pipeline rights-of-way can be determined and obtained; (b) if laying such pipelines is technologically feasible and environmentally preferable; and (c) if, in the opinion of the lessor, pipelines can be laid without net social loss, taking into account any incremental costs of pipelines over alternative methods of transportation and any incremental benefits in the form of increased environmental protection or reduced multiple-use conflicts. The lessor specifically reserves the right to require that any pipeline used for transporting production to shore be placed in certain designated management areas. In selecting the means of transportation, consideration will be given to recommendations of any Federal, State, and local governments and industry.

Following the development of sufficient pipeline capacity, no crude oil production will be transported by surface vessel from offshore production sites, except in the case of an emergency. Determinations as to emergency conditions and appropriate responses to these conditions will be made by the RS/FO.

Stipulation No. 4. Industry Site-Specific Monitoring Program for Marine Mammal Subsistence Resources. A lessee proposing to conduct exploration operations, including ancillary seismic surveys, on a lease within the blocks identified below during periods of subsistence use related to bowhead whales, beluga whales, ice seals, walruses, and polar bears will be required to conduct a site-specific monitoring program approved by the RS/FO, unless, based on the size, timing, duration, and scope of the proposed operations, the RS/FO, in consultation with appropriate agencies and co-management organizations, determines that a monitoring program is not necessary. Organizations currently recognized by the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (FWS) for the co-management of the marine mammals resources are the Alaska Eskimo Whaling Commission, the Alaska Beluga Whale Committee, the Alaska Eskimo Walrus Commission, the Ice Seal Commission, and the Nanuk Commission. The RS/FO will provide the appropriate agencies and co-management organizations a minimum of 30 calendar days, but no longer than 60 calendar days, to review and comment on a proposed monitoring program prior to Minerals Management Service (MMS) approval. The monitoring program must be approved each year before exploratory drilling operations can be commenced.

The monitoring program will be designed to assess when bowhead and beluga whales, ice seals, walruses, and polar bears are present in the vicinity of lease operations and the extent of behavioral effects on these marine mammals due to these operations. In designing the program, the lessee must consider the potential scope and extent of effects that the type of operation could have on these marine mammals. Experiences relayed by subsistence hunters indicate that, depending on the type of operations, some whales demonstrate avoidance behavior at distances of up to 35 miles. The program must also provide for the following:

(1) Recording and reporting information on sighting of the marine mammals of concern and the extent of behavioral effects due to operations;
(2) Coordinating the monitoring logistics beforehand with the MMS Bowhead Whale Aerial Survey Project and other mandated aerial monitoring programs;
(3) Inviting a local representative, to be determined by consensus of the appropriate co-management organizations, to participate as an observer in the monitoring program;
(4) Submitting daily monitoring results to the RS/FO;
(5) Submitting a draft report on the results of the monitoring program to the RS/FO within 90 days following the completion of the operation. The RS/FO will distribute this draft report to the appropriate agencies and co-management organizations;
(6) Allowing 30 days for independent peer review of the draft monitoring report; and
(7) Submitting a final report on the results of the monitoring program to the RS/FO within 30 days after the completion of the independent peer review. The final report will include a discussion of the results of the peer review of the draft report. The RS/FO will distribute this report to the appropriate agencies and co-management organizations.

The RS/FO may extend the report review and submittal timelines if the RS/FO determines such an extension is warranted to accommodate extenuating circumstances.

The lessee will be required to fund an independent peer review of a proposed monitoring plan and the draft report on the results of the monitoring program for bowhead whales. The lessee may be required to fund an independent peer review of a proposed monitoring plan and the draft report on the results of the monitoring program for other co-managed marine mammal resources. This peer review will consist of independent reviewers who have knowledge and experience in statistics, monitoring marine mammal behavior, the type and extent of the proposed operations, and an awareness of traditional knowledge. The peer reviewers will be selected by the RS/FO from experts recommended by the appropriate agencies and co-management resource organizations. The results of these peer reviews will be provided to the RS/FO for consideration in final MMS approval of the monitoring program and the final report, with copies to the appropriate agencies and co-management organizations.

In the event the lessee is seeking a Letter of Authorization (LOA) or Incidental Harassment Authorization (IHA) for incidental take from NMFS and/or FWS, the monitoring program and review process required under the LOA or IHA may satisfy the requirements of this stipulation. The lessee must advise the RS/FO when it is seeking an LOA or IHA in lieu of meeting the requirements of this stipulation and must provide the RS/FO with copies of all pertinent submittals and resulting correspondence. The RS/FO will coordinate with the NMFS and/or FWS and will advise the lessee if the LOA or IHA will meet these requirements.

The MMS, NMFS, and FWS will establish procedures to coordinate results from site-specific surveys required by this stipulation and the LOA's or IHA's to determine if further modification to lease operations are necessary.

This stipulation applies to the following blocks:

NR02-06, Chukchi Sea:
6624, 6625, 6674, 6675, 6723-6725, 6773-6775, 6822, 6823, 6872

NR03-02, Posey:
6872, 6873, 6918-6923, 6967-6973, 7016-7023, 7063-7073, 7112-7123

NR03-03, Colbert
6674, 6723, 6724, 6771-6774, 6820-6824, 6869-6874, 6918-6924, 6966-6974, 7015-7024, 7064-7074, 7113-7124

NR03-04, Solivik Island
6011-6023, 6060-6073, 6109-6122, 6157-6171, 6206-6219, 6255-6268, 6305-6317, 6354-6365, 6403-6414, 6453-6462, 6502-6511, 6552-6560, 6601-6609, 6651-6658, 6701-6707, 6751-6756, 6801-6805, 6851-6854, 6901-6903, 6951, 6952, 7001

NR03-05, Point Lay West
6014-6024, 6062-6073, 6111-6122, 6160-6171, 6209-6221, 6258-6269, 6307-6317, 6356-6365, 6406-6414, 6455-6462, 6503-6510, 6552-6558, 6602-6606, 6652-6655, 6702, 6703

NR04-01, Hanna Shoal
6223, 6267-6273, 6315-6323, 6363-6373, 6411-6423, 6459-6473, 6507-6523, 6556-6573, 6605-6623, 6654-6671, 6703-6721, 6752-6771, 6801-6819, 6851-6868, 6901-6916, 6951-6964, 7001-7010, 7051-7059, 7101-7107

NR04-02, Barrow
6003-6022, 6052-6068, 6102-6118, 6151-6164, 6201-6214, 6251-6262, 6301-6312, 6351-6359, 6401-6409, 6451-6456, 6501-6506, 6551, 6552, 6601, 6602

NR04-03, Wainwright
6002-6006, 6052, 6053

NS04-08, (Unnamed)
6816-6822, 6861-6872, 6910-6922, 6958-6972, 7007-7022, 7055-7072, 7104-7122

This stipulation applies during the time periods for subsistence-harvesting described below for each community.

Subsistence Whaling and Marine Mammal Hunting Activities by Community

Barrow: Spring bowhead whaling occurs from April to June; Barrow hunters hunt from ice leads from Point Barrow southwestward along the Chukchi Sea coast to the Skull Cliff area. Fall whaling occurs from August to October in an area extending from approximately 10 miles west of Barrow to the east side of Dease Inlet. Beluga whaling occurs from April to June in the spring leads between Point Barrow and Skull Cliff; later in the season, belugas are hunted in open water around the barrier islands off Elson Lagoon. Walrus are harvested from June to September from west of Barrow southwestward to Peard Bay. Polar bear are hunted from October to June generally in the same vicinity used to hunt walrus. Seal hunting occurs mostly in winter, but some open-water sealing is done from the Chukchi coastline east as far as Dease Inlet and Admiralty Bay in the Beaufort Sea.

Wainwright: Bowhead whaling occurs from April to June in the spring leads offshore of Wainwright, with whaling camps sometimes as far as 10 to 15 miles from shore. Wainwright hunters hunt beluga whales in the spring lead system from April to June but only if no bowheads are in the area. Later in the summer, from July to August, belugas can be hunted along the coastal lagoon systems. Walrus hunting occurs from July to August at the southern edge of the retreating pack ice. From August to September, walrus can be hunted at local haulouts with the focal area from Milliktagvik north to Point Franklin. Polar bear hunting occurs primarily in the fall and winter around Icy Cape, at the headland from Point Belcher to Point Franklin, and at Seahorse Island.

Point Lay: Because Point Lay's location renders it unsuitable for bowhead whaling, beluga whaling is the primary whaling pursuit. Beluga whales are harvested from the middle of June to the middle of July. The hunt is concentrated in Naokak and Kukpowruk Passes south of Point Lay where hunters use boats to herd the whales into the shallow waters of Kasegaluk Lagoon where they are hunted. If the July hunt is unsuccessful, hunters can travel as far north as Utukok Pass and as far south as Cape Beaufort in search of whales. When ice conditions are favorable, Point Lay residents hunt walrus from June to August along the entire length of Kasegaluk Lagoon, south of Icy Cape, and as far as 20 miles offshore. Polar bear are hunted from September to April along the coast, rarely more than 2 miles offshore.

Point Hope: Bowhead whales are hunted from March to June from whaling camps along the ice edge south and southeast of the point. The pack-ice lead is rarely more than 6 to 7 miles offshore. Beluga whales are harvested from March to June in the same area used for the bowhead whale hunt. Beluga whales can also be hunted in the open water later in the summer from July to August near the southern shore of Point Hope close to the beaches, as well as areas north of the point as far as Cape Dyer. Walruses are harvested from May to July along the southern shore of the point from Point Hope to Akoviknak Lagoon. Point Hope residents hunt polar bears primarily from January to April and occasionally from October to January in the area south of the point and as far out as 10 miles from shore.

This stipulation will remain in effect until termination or modification by the Department of the Interior after consultation with appropriate agencies.

Stipulation No. 5. Conflict Avoidance Mechanisms to Protect Subsistence Whaling and Other Marine Mammal Subsistence-Harvesting Activities. Exploration and development and production operations shall be conducted in a manner that prevents unreasonable conflicts between the oil and gas industry and subsistence activities. This stipulation applies to exploration, development, and production operations on a lease within the blocks identified below during periods of subsistence use related to bowhead whales, beluga whales, ice seals, walruses, and polar bears. The stipulation also applies to support activities, such as vessel and aircraft traffic, that traverse the blocks listed below or Federal waters landward of the sale during periods of subsistence use regardless of lease location. Transit for human safety emergency situations shall not require adherence to this stipulation.

This stipulation applies to the following blocks:

NR02-06, Chukchi Sea:
6624, 6625, 6674, 6675, 6723-6725, 6773-6775, 6822, 6823, 6872

NR03-02, Posey:
6872, 6873, 6918-6923, 6967-6973, 7016-7023, 7063-7073, 7112-7123

NR03-03, Colbert
6674, 6723, 6724, 6771-6774, 6820-6824, 6869-6874, 6918-6924, 6966-6974, 7015-7024, 7064-7074, 7113-7124

NR03-04, Solivik Island
6011-6023, 6060-6073, 6109-6122, 6157-6171, 6206-6219, 6255-6268, 6305-6317, 6354-6365, 6403-6414, 6453-6462, 6502-6511, 6552-6560, 6601-6609, 6651-6658, 6701-6707, 6751-6756, 6801-6805, 6851-6854, 6901-6903, 6951, 6952, 7001

NR03-05, Point Lay West
6014-6024, 6062-6073, 6111-6122, 6160-6171, 6209-6221, 6258-6269, 6307-6317, 6356-6365, 6406-6414, 6455-6462, 6503-6510, 6552-6558, 6602-6606, 6652-6655, 6702, 6703

NR04-01, Hanna Shoal
6223, 6267-6273, 6315-6323, 6363-6373, 6411-6423, 6459-6473, 6507-6523, 6556-6573, 6605-6623, 6654-6671, 6703-6721, 6752-6771, 6801-6819, 6851-6868, 6901-6916, 6951-6964, 7001-7010, 7051-7059, 7101-7107

NR04-02, Barrow
6003-6022, 6052-6068, 6102-6118, 6151-6164, 6201-6214, 6251-6262, 6301-6312, 6351-6359, 6401-6409, 6451-6456, 6501-6506, 6551, 6552, 6601, 6602

NR04-03, Wainwright
6002-6006, 6052, 6053

NS04-08, (Unnamed)
6816-6822, 6861-6872, 6910-6922, 6958-6972, 7007-7022, 7055-7072, 7104-7122

Prior to submitting an exploration plan or development and production plan (including associated oil-spill response plans) to the MMS for activities proposed during subsistence-use critical times and locations described below for bowhead whale and other marine mammals, the lessee shall consult with the North Slope Borough, and with directly affected subsistence communities (Barrow, Point Lay, Point Hope, or Wainwright) and co-management organizations to discuss potential conflicts with the siting, timing, and methods of proposed operations and safeguards or mitigating measures that could be implemented by the operator to prevent unreasonable conflicts. Organizations currently recognized by the NMFS and the FWS for the co-management of the marine mammals resources are the Alaska Eskimo Whaling Commission, the Alaska Beluga Whale Committee, the Alaska Eskimo Walrus Commission, the Ice Seal Commission, and the Nanuk Commission. Through this consultation, the lessee shall make every reasonable effort, including such mechanisms as a conflict avoidance agreement, to assure that exploration, development, and production activities are compatible with whaling and other marine mammal subsistence hunting activities and will not result in unreasonable interference with subsistence harvests.

A discussion of resolutions reached during this consultation process and plans for continued consultation shall be included in the exploration plan or the development and production plan. In particular, the lessee shall show in the plan how its activities, in combination with other activities in the area, will be scheduled and located to prevent unreasonable conflicts with subsistence activities. The lessee shall also include a discussion of multiple or simultaneous operations, such as ice management and seismic activities, that can be expected to occur during operations in order to more accurately assess the potential for any cumulative affects. Communities, individuals, and other entities who were involved in the consultation shall be identified in the plan. The RS/FO shall send a copy of the exploration plan or development and production plan (including associated oil-spill response plans) to the directly affected communities and the appropriate co-management organizations at the time the plans are submitted to the MMS to allow concurrent review and comment as part of the plan approval process.

In the event no agreement is reached between the parties, the lessee, NMFS, FWS, the appropriate co-management organizations, and any communities that could be directly affected by the proposed activity may request that the RS/FO assemble a group consisting of representatives from the parties to specifically address the conflict and attempt to resolve the issues. The RS/FO will invite appropriate parties to a meeting if the RS/FO determines such a meeting is warranted and relevant before making a final determination on the adequacy of the measures taken to prevent unreasonable conflicts with subsistence harvests.

The lessee shall notify the RS/FO of all concerns expressed by subsistence hunters during operations and of steps taken to address such concerns. Activities on a lease may be restricted if the RS/FO determines it is necessary to prevent unreasonable conflicts with local subsistence hunting activities.

In enforcing this stipulation, the RS/FO will work with other agencies and the public to assure that potential conflicts are identified and efforts are taken to avoid these conflicts.

Subsistence-harvesting activities occur generally in the areas and time periods listed below.

Subsistence Whaling and Marine Mammal Hunting Activities by Community

Barrow: Spring bowhead whaling occurs from April to June; Barrow hunters hunt from ice leads from Point Barrow southwestward along the Chukchi Sea coast to the Skull Cliff area; fall whaling occurs from August to October in an area extending from approximately 10 miles west of Barrow to the east side of Dease Inlet. Beluga whaling occurs from April to June in the spring leads between Point Barrow and Skull Cliff; later in the season, belugas are hunted in open water around the barrier islands off Elson Lagoon. Walrus are harvested from June to September from west of Barrow southwestward to Peard Bay. Polar bear are hunted from October to June generally in the same vicinity used to hunt walruses. Seal hunting occurs mostly in winter, but some open-water sealing is done from the Chukchi coastline east as far as Dease Inlet and Admiralty Bay in the Beaufort Sea.

Wainwright: Bowhead whaling occurs from April to June in the spring leads offshore of Wainwright, with whaling camps sometimes as far as 10 to 15 miles from shore. Wainwright hunters hunt beluga whales in the spring lead system from April to June but only if no bowheads are in the area. Later in the summer, from July to August, belugas can be hunted along the coastal lagoon systems. Walrus hunting occurs from July to August at the southern edge of the retreating pack ice. From August to September, walruses can be hunted at local haulouts with the focal area from Milliktagvik north to Point Franklin. Polar bear hunting occurs primarily in the fall and winter around Icy Cape, at the headland from Point Belcher to Point Franklin, and at Seahorse Island.

Point Lay: Because Point Lay's location renders it unsuitable for bowhead whaling, beluga whaling is the primary whaling pursuit. Beluga whales are harvested from the middle of June to the middle of July. The hunt is concentrated in Naokak and Kukpowruk Passes south of Point Lay where hunters use boats to herd the whales into the shallow waters of Kasegaluk Lagoon where they are hunted. If the July hunt is unsuccessful, hunters can travel as far north as Utukok Pass and as far south as Cape Beaufort in search of whales. When ice conditions are favorable, Point Lay residents hunt walruses from June to August along the entire length of Kasegaluk Lagoon, south of Icy Cape, and as far as 20 miles offshore. Polar bears are hunted from September to April along the coast, rarely more than 2 miles offshore.

Point Hope: Bowhead whales are hunted from March to June from whaling camps along the ice edge south and southeast of the point. The pack-ice lead is rarely more than 6 to 7 miles offshore. Beluga whales are harvested from March to June in the same area used for the bowhead whale hunt. Beluga whales can also be hunted in the open water later in the summer from July to August near the southern shore of Point Hope close to the beaches, as well as areas north of the point as far as Cape Dyer. Walruses are harvested from May to July along the southern shore of the point from Point Hope to Akoviknak Lagoon. Point Hope residents hunt polar bears primarily from January to April and occasionally from October to January in the area south of the point and as far out as 10 miles from shore.

Stipulation No. 6. Pre-Booming Requirements for Fuel Transfers. Fuel transfers (excluding gasoline transfers) of 100 barrels or more will require pre-booming of the fuel barge(s). The fuel barge must be surrounded by an oil-spill-containment boom during the entire transfer operation to help reduce any adverse effects from a fuel spill. The lessee's oil spill response plans must include procedures for the pre-transfer booming of the fuel barge(s)**.**

Stipulation No. 7. Measures to Minimize Effects to Spectacled and Steller's Eiders During Exploration Activities. This stipulation will minimize the likelihood that spectacled and Steller's eiders will strike drilling structures or vessels. The stipulation also provides additional protection to eiders within the blocks listed below and Federal waters landward of the sale area, including the Ledyard Bay Critical Habitat Area, during times when eiders are present.

(A) General conditions: The following conditions apply to all exploration activities.

(1) An EP must include a plan for recording and reporting bird strikes. All bird collisions (with vessels, aircraft, or drilling structures) shall be documented and reported within 3 days to MMS. Minimum information will include species, date/time, location, weather, identification of the vessel, and aircraft or drilling structure involved and its operational status when the strike occurred. Bird photographs are not required, but would be helpful in verifying species. Lessees are advised that the FWS does not recommend recovery or transport of dead or injured birds due to avian influenza concerns.

(2) The following conditions apply to operations conducted in support of exploratory and delineation drilling.

(a) Surface vessels (e.g., boats, barges) associated with exploration and delineation drilling operations should avoid operating within or traversing the listed blocks or Federal waters between the listed blocks and the coastline between April 15 and June 10, to the maximum extent practicable. If surface vessels must traverse this area during this period, the surface vessel operator will have ready access to wildlife hazing equipment (including at least three *Breco* buoys or similar devices) and personnel trained in its use; hazing equipment may located onboard the vessel or on a nearby oil spill response vessel, or in Point Lay or Wainwright. Lessees are required to provide information regarding their operations within the area upon request of MMS. The MMS may request information regarding number of vessels and their dates of operation within the area.

(b) Except for emergencies or human/navigation safety, surface vessels associated with exploration and delineation drilling operations will avoid travel within the Ledyard Bay Critical Habitat Area between July 1 and November 15. Vessel travel within the Ledyard Bay Critical Habitat Area for emergencies or human/navigation safety shall be reported within 24 hours to MMS.

(c) Aircraft supporting drilling operations will avoid operating below 1,500 feet above sea level over the listed blocks or Federal waters between the listed blocks and the coastline between April 15 and June 10, or the Ledyard Bay Critical Habitat Area between July 1 and November 15, to the maximum extent practicable. If weather prevents attaining this altitude, aircraft will use pre-designated flight routes. Pre-designated flight routes will be established by the lessee and MMS, in collaboration with the FWS, during review of the EP. Route or altitude deviations for emergencies or human safety shall be reported within 24 hours to MMS.

(B) Lighting Protocols. The following lighting requirements apply to activities conducted between April 15 and November 15 of each year.

(1) Drilling Structures: Lessees must adhere to lighting requirements for all exploration or delineation drilling structures so as to minimize the likelihood that migrating marine and coastal birds will strike these structures. Lessees are required to implement lighting requirements aimed at minimizing the radiation of light outward from exploration or delineation drilling structures to minimize the likelihood that birds will strike those structures. These requirements establish a coordinated process for a performance-based objective rather than pre-determined prescriptive requirements. The performance-based objective is to minimize the radiation of light outward from exploration/delineation structures while operating on a lease or if staged within nearshore Federal waters pending lease deployment.

Measures to be considered include but need not be limited to the following:

- Shading and/or light fixture placement to direct light inward and downward to living and work structures while minimizing light radiating upward and outward;
- Types of lights;
- Adjustment of the number and intensity of lights as needed during specific activities;
- Dark paint colors for selected surfaces;
- Low-reflecting finishes or coverings for selected surfaces; and
- Facility or equipment configuration.

Lessees are encouraged to consider other technical, operational, and management approaches that could be applied to their specific facilities and operations to reduce outward light radiation. Lessees must provide MMS with a written statement of measures that will be or have been taken to meet the lighting objective, and must submit this information with an EP when it is submitted for regulatory review and approval pursuant to 30 CFR 250.203.

(2) Support Vessels: Surface support vessels will minimize the use of high-intensity work lights, especially when traversing the listed blocks and federal waters between the listed blocks and the coastline. Exterior lights will be used only as necessary to illuminate active, on-deck work areas during periods of darkness or inclement weather (such as rain or fog), otherwise they will be turned off. Interior lights and lights used during navigation could remain on for safety.

For the purpose of this stipulation, the listed blocks are as follows:

NR02-06, Chukchi Sea:
6624, 6625, 6674, 6675, 6723-6725, 6773-6775, 6822, 6823, 6872

NR03-02, Posey:
6872, 6873, 6918-6923, 6967-6973, 7016-7023, 7063-7073, 7112-7123

NR03-03, Colbert
6674, 6723, 6724, 6771-6774, 6820-6824, 6869-6874, 6918-6924, 6966-6974, 7015-7024, 7064-7074, 7113-7124

NR03-04, Solivik Island
6011-6023, 6060-6073, 6109-6122, 6157-6171, 6206-6219, 6255-6268, 6305-6317, 6354-6365, 6403-6414, 6453-6462, 6502-6511, 6552-6560, 6601-6609, 6651-6658, 6701-6707, 6751-6756, 6801-6805, 6851-6854, 6901-6903, 6951, 6952, 7001

NR03-05, Point Lay West
6014-6024, 6062-6073, 6111-6122, 6160-6171, 6209-6221, 6258-6269, 6307-6317, 6356-6365, 6406-6414, 6455-6462, 6503-6510, 6552-6558, 6602-6606, 6652-6655, 6702, 6703

NR04-01, Hanna Shoal
6223, 6267-6273, 6315-6323, 6363-6373, 6411-6423, 6459-6473, 6507-6523, 6556-6573, 6605-6623, 6654-6671, 6703-6721, 6752-6771, 6801-6819, 6851-6868, 6901-6916, 6951-6964, 7001-7010, 7051-7059, 7101-7107

NR04-02, Barrow
6003-6022, 6052-6068, 6102-6118, 6151-6164, 6201-6214, 6251-6262, 6301-6312, 6351-6359, 6401-6409, 6451-6456, 6501-6506, 6551, 6552, 6601, 6602

NR04-03, Wainwright
6002-6006, 6052, 6053

NS04-08, (Unnamed)
6816-6822, 6861-6872, 6910-6922, 6958-6972, 7007-7022, 7055-7072, 7104-7122

Nothing in this stipulation is intended to reduce personnel safety or prevent compliance with other regulatory requirements (e.g., U.S. Coast Guard or Occupational Safety and Health Administration) for marking or lighting of equipment and work areas.

Existing Geological and Geophysical Permit Stipulations for Oil and Gas Activities in Alaska OCS Waters

Programmatic Environmental Assessment (2006)
Arctic Ocean Outer Continental Shelf Seismic Surveys
Appendix A

Minerals Management Service
Alaska OCS Region
OCS/EIS/EA MMS 2006-038

Revised 4/92

STIPULATIONS

From http://www.mms.gov/alaska/re/permits/stips1-5/htm

In the performance of any operations under the Permit and Agreement for Outer Continental Shelf Exploration, the Permittee shall comply with the following Stipulations:

1. As part of the requirements of 30 CFR 251.7-3, the Permittee shall submit to the Regional Supervisor, Resource Evaluation (hereinafter referred to as the Supervisor) within 30 days after the completion of the survey authorized under this Permit and Agreement a map at the same scale as that used ordinarily for such maps and showing the coordinates of latitude and longitude. In addition, each Permittee shall submit one (1) one-half inch, nine-track, final edited navigation tape of all locations in latitude and longitude degrees. The tape is to be in an ASCII or EBCDIC 1600 BPI format with fixed record length and fixed block size. Record length, block size, density and whether the tape is ASCII or EBCDIC must be on a label affixed to the tape. The label must also specify the geodetic reference system (NAD27 or NAD83) used. A printed tape listing and format statement are to be included with the tape.

2. As part of the requirements of 30 CFR 251.3-5, if any operation under this Permit and Agreement is to be conducted in a leased area, the Permittee shall take all necessary precautions to avoid interference with operations on the lease and damage to existing structures and facilities. The lessee (or operator) of the leased area will be notified by letter before the Permittee enters the leased area or commences operations, and a copy of the letter will be sent to the Supervisor executing this Permit and Agreement.

3. (a) Solid or liquid explosives shall not be used except pursuant to written authorization from the Supervisor. Requests for the use of such explosives must be made in writing, giving the size of charges to be used, the depth at which they are to be suspended or buried, and the specific precautionary methods proposed for the protection of fish, oysters, shrimp, and other aquatic life, wildlife, or other natural resources.

(b) The following provisions are made applicable when geophysical exploration on the Outer Continental Shelf using explosives is approved:

(i) Each explosive charge will be permanently identified by markings so that unexploded charges may be positively traced to the Permittee and to the specific field party of the Permittee responsible for the explosive charge.

(ii) The placing of explosive charges on the seafloor is prohibited. No explosive charges shall be detonated nearer to the seafloor than five (5) feet.

(iii) No explosives shall be discharged within one thousand (1000) feet of any boat not involved in the survey.

4. Any serious accident, personal injury, or loss of property shall be immediately reported to the Supervisor.

5. All pipes, buoys, and other markers used in connection with work shall be properly flagged and lighted according to the navigation rules of the U.S. Corps of Engineers and the U.S. Coast Guard.

6. If the Permittee discovers any archaeological resource during geological and geophysical activities, the Permittee shall report the discovery immediately to the Supervisor. The Permittee shall make every reasonable effort to preserve the archaeological resource until the Supervisor has told the Permittee how to protect it.

7. In addition to the general provisions above, the following special provisions shall apply:

(a) This permit is applicable only to that portion of the program involving Federal OCS lands seaward of the submerged lands of the State of Alaska.

(b) The Permittee shall, on request of the Supervisor, furnish quarters and transportation for a Federal representative(s) or other designated observer to inspect operations.

(c) Operations shall be conducted in a manner to assure that they will not cause pollution, cause undue harm to aquatic life, create hazardous or unsafe conditions or unreasonably interfere with other uses of the area. Any difficulty encountered with other users of the area or any conditions which cause undue harm to aquatic life, pollution, or could create a hazardous or unsafe condition as a result of the operations under this permit shall be reported to the Supervisor. Serious or emergency conditions shall be reported without delay.

(d) A final summary report (one copy) shall be submitted to this office within 30 days of completion or cessation of operations.

This report shall include:

(i) Program commencement date.

(ii) Program completion date.

(iii) Field effort in crew weeks (actual work time based on 168-hour weeks).

(iv) Line miles of surveys completed.

(v) Summary of incidents or accidents from paragraph 4.

(vi) Date or reasonable estimation of date when data will be available for inspection or selection.

(e) The Permittee shall notify the Commander, U.S. Coast Guard and the Commander, 3rd Fleet as to the approximate time and place the work is to be conducted and to keep them informed:

Commander, U.S. Coast Guard
17th Coast Guard District
Aids to Navigation Branch
P.O. Box 25517
Juneau, AK 99801
(907)586-7365

COMTHIRD
Pearl Harbor, HI
96860
(808)472-8242

8. Information to the Permittee

(a) Operations authorized under permit are subject to the Marine Mammal Protection Act of 1972 as amended (16 U.S.C. 1361 et seq), the Endangered Species Act as amended (16 U.S.C. 1531 et seq), regulations found in 50 CFR Part 18 (U.S. Fish and Wildlife Service), and 50 CFR Part 228 (National Marine Fisheries Service). Special attention should be given to the prohibition of the "taking" of marine mammals. "Taking" means to harass, hunt, capture, collect, or kill or attempt to harass, hunt, capture, collect, or kill any marine mammal. National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (F&WS) regulations allow, under certain conditions, the incidental taking by harassment of specific marine mammals. Such a taking of marine mammals is controlled through Letters of Authorization issued by NMFS or F&WS. Permittees are advised to consult the appropriate agencies regarding these laws and regulations. Further information may be obtained from

Regional Director
U.S. Fish and Wildlife Service
Alaska Region
1011 East Tudor Road
Anchorage, Alaska 99503
telephone (907) 786-3542

National Marine Fisheries Service
222 West 7th Avenue, Box 43
Anchorage, Alaska 99513
telephone (907) 271-5006

(b) It is recommended that you contact the appropriate Regional Supervisor, Commercial Fish Division, Alaska Fish and Game Department, or the National Marine Fisheries Service for information on the fisheries and fishing activities in the proposed area of operations in order to minimize potential conflict between your activities and fishing activities. We are attaching a list of the Fish and Game offices with addresses and telephone numbers and a map showing the boundaries of the fishing districts for your convenience.

In addition to the standard stipulations above, the following stipulation has been included in G&G permits for seismic surveys in the Alaska OCS Region since the 1980's:

- Operators must maintain a minimum spacing of 15 miles between the seismic source vessels for separate surveys. The MMS must be notified by means of the weekly report whenever shut down of operations occurs to maintain this minimum spacing.

THE FOLLOWING DOCUMENT PROVIDES INFORMATION TO THE PERMITTEE ON THE ENDANGERED SPECIES ACT OF 1973, AS IT MIGHT APPLY WHEN CONDUCTING FIELD OPERATIONS.

The Endangered Species Act prohibits harassment of endangered and threatened species whether the harassment occurs through an intentional or negligent act or omission. Harassment refers to conduct of activities that disrupt an animal's normal behavior or cause a significant change in the activity of the affected animal. In many cases the effect of harassment is readily detectible: a whale may rapidly dive or flee from an intruder to avoid the source of disturbance. Other instances of harassment may be less noticeable to an observer but will still have a significant effect on endangered whales.

The Permittee must be prepared to take all reasonable and necessary measures to avoid harassing or unnecessarily disturbing endangered whales. In this regard, the Permittee should be particularly alert to the effects of boat and airplane or helicopter traffic on whales.

In order to ensure that the Permittee may derive maximum benefits from their operations at a minimum cost to the health and well being of endangered whales, the following guidelines are offered to help avoid potential harassment of endangered whales:

(1) (a) Vessels and aircraft should avoid concentrations or groups of whales. Operators should, at all times, conduct their activities at a maximum distance from such concentrations of whales. Under no circumstances, other than an emergency, should aircraft be operated at an altitude lower than 1,000 feet when within 500 lateral yards of groups of whales. Helicopters may not hover or circle above such areas or within 500 lateral yards of such areas.

(b) When weather conditions do not allow a 1,000-foot flying altitude, such as during severe storms or when cloud cover is low, aircraft may be operated below the 1,000-foot altitude stipulated above. However, when aircraft are operated at altitudes below 1,000 feet because of weather conditions, the operator must avoid known whale concentration areas and should take precautions to avoid flying directly over or within 500 yards of groups of whales.

(2) When a vessel is operated near a concentration of whales, the operator must take every precaution to avoid harassment of these animals. Therefore, vessels should reduce speed when within 300 yards of whales and those vessels capable of steering around such groups should do so. Vessels may not be operated in such a way as to separate members of a group of whales from other members of the group.

(3) Vessel operators should avoid multiple changes in direction and speed when within 300 yards of whales. In addition, operators should check the waters immediately adjacent to a vessel to ensure that no whales will be injured when the vessel's propellers (or screws) are engaged.

(4) Small boats should not be operated at such a speed as to make collisions with whales likely. When weather conditions require, such as when visibility drops, vessels should adjust speed accordingly to avoid the likelihood of injury to whales.

When any Permittee becomes aware of the potentially harassing effects of operations on endangered whales, or when any Permittee is unsure of the best course of action to avoid harassment of endangered whales, every measure to avoid further harassment should be taken until the National Marine Fisheries Service is consulted for instructions or directions. However, human safety will take precedence at all times over the guidelines and distances recommended herein for the avoidance of disturbance and harassment of endangered whales.

Permittees are advised that harassment of endangered whales may be reported to the National Marine Fisheries Service. For further information contact the National Marine Fisheries Service, Federal Building, Room C-554, Anchorage, Alaska, 99513, telephone (907) 271-5006.

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