United States Department of the Interior
U.S. FISH AND WILDLIFE SERVICE
Fairbanks Fish and Wildlife Field Office
101 12th Avenue, Room 110
Fairbanks, Alaska 99701

September 1, 2009

Memorandum

To: John Goll, Regional Director, MMS Alaska OCS Region

From: Deborah Rocque, Field Supervisor - U.S. Fish and Wildlife Service, Fairbanks Fish and Wildlife Field Office

Subject: Endangered Species Act, Section 7 Amended Biological Opinion for Northstar and Liberty Projects

This document transmits the U.S. Fish and Wildlife Service's (Service) update and revision to the Biological Opinions (BOs) on the Minerals Management Service's (MMS) authorization of BP Exploration (Alaska) Inc.'s (BP Alaska) Liberty and Northstar Development Projects.

This document assesses potential impacts to listed species from these two oil development projects in the Beaufort Sea. Effects to Alaska-breeding Steller's eiders (*Polysticta stelleri*), spectacled eiders (*Somateria fischeri*), and polar bears (*Ursus maritimus*) which are all listed as threatened species, along with impacts to candidate species Kittlitz's murrelets (*Brachyramphus brevirostris*) and yellow-billed loons (*Gravia adamsii*), and the Ledyard Bay Critical Habitat Unit, are assessed in accordance with section 7 of the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. 1531 et seq.).

The Service issued BOs for the Liberty (USWFS 2007) and Northstar projects (USFWS 1999) prior to development activities. These BOs described the effects of these projects on spectacled and Steller's eiders. The Liberty BO also discussed effects to Kittlitz's murrelets and the Ledyard Bay Critical Habitat Unit. These BOs concluded the proposed Actions would not violate section 7(a)(2) of the ESA.

Since these BOs were issued, the polar bear (*Ursus maritimus*) has been listed as a threatened species, and the yellow-billed loon (*Gravia adamsii*) has been designated as a candidate species. MMS requested reinitiation of section 7 consultation for these projects as it has ongoing Federal discretion. This document modifies the previous Northstar and Liberty BOs by assessing impacts to polar bears and yellow-billed loons that may result from these projects. As required when consultation is reinitiated, the Service reviewed the analysis of impacts to listed eiders and critical habitat in the context of the current environmental baseline and status of these species to determine if the conclusions of these earlier BOs remain valid.

Based on our assessment of the impacts of these development projects when added to cumulative effects, the current status of the species, and environmental baseline, the Service has determined that it is unlikely that the action will violate section 7(a)(2) of the ESA. Section 7(a)(2) of the ESA states that Federal agencies must ensure that their activities are not likely to: 1) jeopardize the continued existence of any listed species; or 2) result in the destruction or adverse modification of designated critical habitat. In making our current determination we relied upon the statutory provisions of the ESA to complete the analysis.

Although this is a "no jeopardy" opinion, adverse effects to listed eiders and polar bears are anticipated to result from the action. This BO provides incidental take authorization for activities that may adversely affect listed eiders and includes reasonable and prudent measures and terms and conditions. MMS must implement these terms and conditions to remain in compliance with the Incidental Take Statement.

The Service is not authorizing incidental take for polar bears in this BO because incidental take cannot be issued under the Endangered Species Act (ESA) until specific project activities have been reviewed and authorized under the Marine Mammal Protection Act (MMPA). Incidental take coverage for both these projects is currently provided through Letters of Authorization issued to BP Alaska pursuant to the Beaufort Sea Incidental Take Regulations.

A complete administrative record of this consultation is on file at the Fairbanks Fish and Wildlife Field Office, 101 12th Ave., Room 110, Fairbanks, Alaska 99701. If you have any comments or concerns regarding this BO, please have your staff contact Ted Swem, Endangered Species Biologist, Fairbanks Fish and Wildlife Field Office at (907) 456-0441.

FINAL

AMENDED BIOLOGICAL OPINION

For

BP Exploration (Alaska) Inc.'s Northstar and Liberty Development Projects

Consultation with the

Minerals Management Service – Alaska OCS Region
Anchorage, Alaska

September 1, 2009

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1. INTRODUCTION

This document updates and revises the U.S. Fish and Wildlife Service's (Service) Biological Opinions (BOs) on the Minerals Management Service's (MMS) authorization of BP Exploration (Alaska) Inc.'s (BP Alaska) Liberty and Northstar Development Projects.

The Liberty project is in construction, and drilling of the first well is anticipated to begin in 2010, with first oil production possible in 2011. The Liberty project will extract hydrocarbons from State of Alaska leased areas and two OCS lease blocks in the Beaufort Sea Program Area, and is based on an expansion of the existing Endicott Satellite Drilling Island (Endicott SDI).

Northstar is an artificial 5-acre gravel island located approximately 6 miles from Point Storkersen on the Beaufort Sea coast. The island was constructed in 2000-2001 and supports on-going drilling and oil production and living quarters for personnel. Northstar is removing hydrocarbons from areas leased from the State of Alaska and three OCS lease blocks in the Beaufort Sea Program Area.

The Service developed BOs for the Liberty (USWFS 2007) and Northstar projects (USFWS 1999) prior to development activities. These BOs described the effects of the projects on spectacled (*Somateria fischeri*) and Alaska-breeding Steller's *(Polysticta stelleri*) eiders, which are listed as threatened under the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. 1531 et. seq.). The Liberty BO also discussed effects to the candidate species Kittlitz's murrelet *(Brachyramphus brevirostris*), and the Ledyard Bay Critical Habitat Unit (LBCHU). These BOs concluded the proposed Actions would not violate section 7(a)(2) of the ESA.

Since these BOs were issued, the polar bear (*Ursus maritimus*) has been listed as a threatened species, and the yellow-billed loon (*Gravia adamsii*) has been designated as a candidate species. Both the Liberty and Northstar projects were included, and their impacts to polar bears evaluated, in the Service's Beaufort Sea Incidental Take Regulations (Beaufort Sea ITRs) issued in August 2006 under the Marine Mammal Protection Act (MMPA). The service conducted an intra-Service section 7 consultation on the Beaufort Sea ITRs, issuing a non-jeopardy BO in June 2008 (USWFS 2008).

The Beaufort Sea ITRs, and hence the BO evaluating the impacts of these regulations, expires on August 2, 2011. However, both the Northstar and Liberty projects will likely still be producing oil at that time. Therefore, MMS has requested section 7 consultation be conducted for these projects as it has ongoing Federal discretion for them. This document modifies the previous Northstar and Liberty BOs by assessing impacts to polar bears that may occur as a result of the Northstar and Liberty projects, and evaluating their impacts to the candidate species yellow-billed loon. As required when consultation on a project is reinitiated the Service reviewed the analysis of impacts to listed eiders and the LBCHU in the context of the current environmental baseline and status of these species and the critical habitat unit to determine if the conclusions of these earlier BOs remain valid.

After reviewing project information, the current status of the species, the environmental baseline, and cumulative effects, the Service concludes that the proposed activities may adversely affect listed eiders, polar bears, and candidate species but will not jeopardize any listed species or candidate species. No impacts to the LBCHU are anticipated to result from either of these projects. The Service has determined the Action is unlikely to violate section 7(a)(2) of the ESA.

2. DESCRIPTION OF THE PROPOSED ACTION

2.1 Introduction

This section of the BO describes the action area, and summarizes activities and facilities that have resulted from the Liberty and Northstar development projects. A more complete description of these project facilities can be found in the previous BOs for these projects (USFWS 1999, 2007).

BP Alaska's Liberty project is in construction, and drilling of the first well is anticipated to begin in 2010, with first oil production possible in 2011. The Liberty project will extract hydrocarbons from State of Alaska leased areas and two OCS lease blocks in the Beaufort Sea Program Area. BP Alaska's Northstar development is in operation and is removing hydrocarbons from areas leased from the State of Alaska and three OCS lease blocks in the Beaufort Sea Program Area.

2.2 Action Area

The action area is the geographic region in which direct and indirect effects of the Action may occur. The Liberty project is based on the Endicott Satellite Drilling Island (Endicott SDI), the Endicott Main Production Island (Endicott MPI), and along the causeway that joins these two facilities (Figure 2.1). Northstar is a 5-acre man-made gravel island located approximately 6 miles from Point Storkersen on the Beaufort Sea coast which was constructed in 2000-2001. The Action Area includes these facilities and the central and eastern Beaufort Sea and its coastline, as this area could be impacted by a large marine oil spill from either of these facilities.

2.3 Liberty Project

The Liberty prospect is located approximately 5.5 miles offshore in the Beaufort Sea Program Area. BP Alaska will develop the field using Ultra-Extended Reach Drilling (uERD) technology, with 6 wells currently proposed. The wellheads and infrastructure to support the Liberty wells will be constructed on a 20 acre expansion of the existing Endicott Satellite Drilling Island (Endicott SDI). Gravel for the Endicott SDI expansion was mined from the Duck Island Material site, gravel mining has been completed. The drill rig, piping, and other modules needed for the project are being fabricated offsite and are being trucked to Endicott SDI, although one summer barge lift is also anticipated. Traffic to the Endicott SDI will be significantly higher during the construction phase of the project, and a new bridge over the West Sagavanirktok River will be constructed to support it. Construction and on-going Liberty project activities have been, and continue to be, authorized under the Marine Mammal Protection Act (MMPA) through the issuance of Letters of Authorization (LOAs) under the Beaufort Sea ITRs which include polar bears, and by regulations published by the National Oceanic and Atmospheric Administration (NOAA) for species under their jurisdiction.

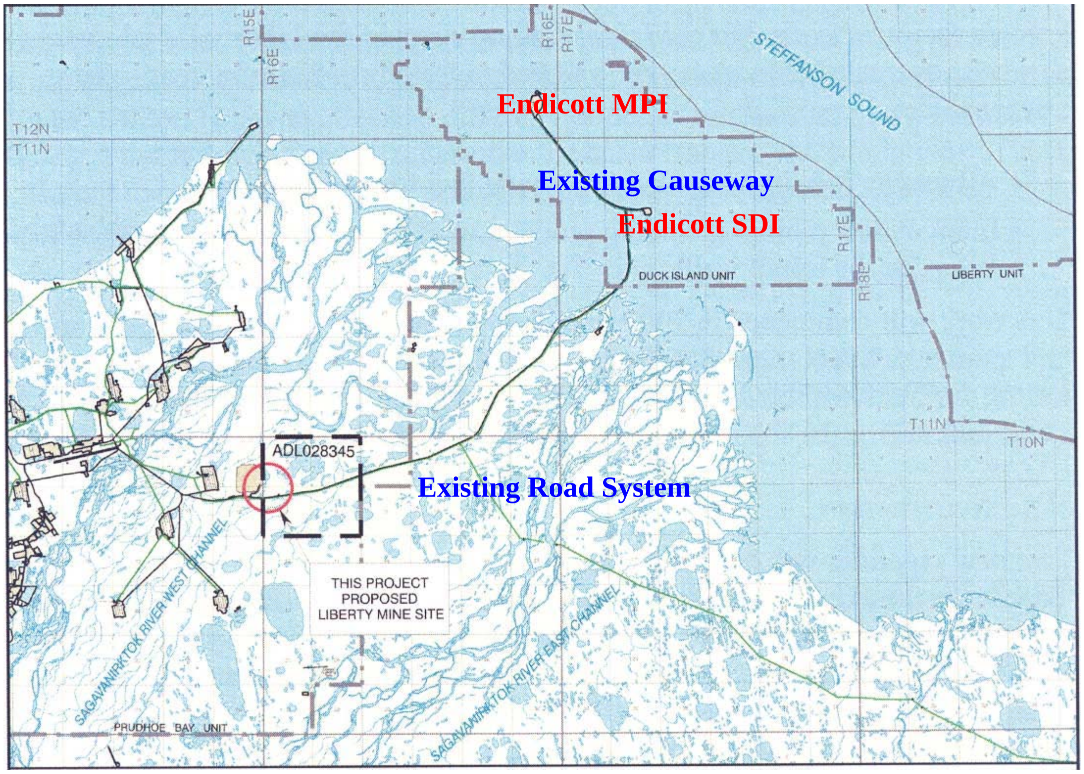


Figure 2.1 – Map of the Liberty Project Area

2.4 Northstar Project

Northstar island was constructed in 2000-2001 and supports on-going drilling and oil production and living quarters for personnel. Sixteen producing, 5 gas injector, and 1 waste disposal wells are planned for the island, although there is space for up to 36 wells. A subsea buried pipeline with a LEOS leak detection system transports crude oil from Northstar to land near Point Storkersen. From there the oil is piped to the Trans Alaska Pipeline System (TAPS). A second, 16.3 mile long subsea pipeline from the Central Compressor Plant in the Prudhoe Bay field imports gas for gas injection and power generation at Northstar. Transportation to the island is via winter ice road to the mainland, helicopters (which must follow prescribed flight corridors and comply with altitude restrictions when safe to do so), hovercraft, and boat (barges and smaller vessels) in open water season. Well drilling continues at Northstar, but only occurs between fall and spring, with the exact dates determined by ice conditions in the Beaufort Sea. In addition to production activities, on-going maintenance includes repairs to the outer walls of the island which suffer from erosion. Construction and on-going activities associated with the Northstar project have been, and continue to be, authorized under the Marine Mammal Protection Act (MMPA) through the issuance of Letters of Authorization (LOAs) under the Beaufort Sea ITRs which include polar bears, and by regulations published by the National Oceanic and Atmospheric Administration (NOAA) for species under their jurisdiction. Unless additional reserves are discovered, estimates suggest oil extraction and processing at Northstar will be finished in 2016.

3. STATUS OF SPECIES

This section presents biological and ecological information relevant to formation of the BO. Appropriate information on the species' life history, habitat and distribution, and other factors necessary for their survival is included for analysis in later sections. After reviewing the best available information, we determined the status of spectacled eiders and Kittlitz's murrelets has not changed significantly since the Liberty BO (USFWS 2007). Therefore, that information is not repeated here.

3.1 Steller's Eider

Physical Appearance

The Steller's eider is the smallest of the four eider species. From early winter until mid-summer males are in breeding plumage - black back, white shoulders and sides, chestnut breast, white head with black eye patches and a greenish tuft (Figure 3.1). During late summer and fall, males molt to dark brown with a white-bordered blue wing speculum; this plumage is replaced during the autumn molt when males re-acquire breeding plumage, which lasts through the next summer. Females are dark mottled brown with a blue wing speculum year round. Juveniles are dark mottled brown until the fall of their second year, when they acquire breeding plumage (Fredrickson 2001).

Figure 3.1 - Male and female Steller's eider in breeding plumage.

Status and Distribution

The Steller's eider is a circumpolar sea duck, and it is the smallest of the four eider species. 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 arctic coastal plain, and the Alaska-breeding population.

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 (Federal Register 62(112):31748-31757). Although population size estimates for the Alaska-breeding population were imprecise, it was clear Steller's eiders had essentially disappeared as a breeding species from the Yukon-Kuskokwim Delta (Y-K Delta), where they had historically occurred in significant numbers, and that their Arctic Coastal Plain (North Slope) 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). The Alaska-breeding population of Steller's eiders now nests primarily on the North Slope, particularly around Barrow and at very low densities from Wainwright to at least as far east as Prudhoe Bay (Figure 3.2). A few pairs may remain on the Y-K Delta; 9 nests have been found in the last 14 years (Service, unpublished data).

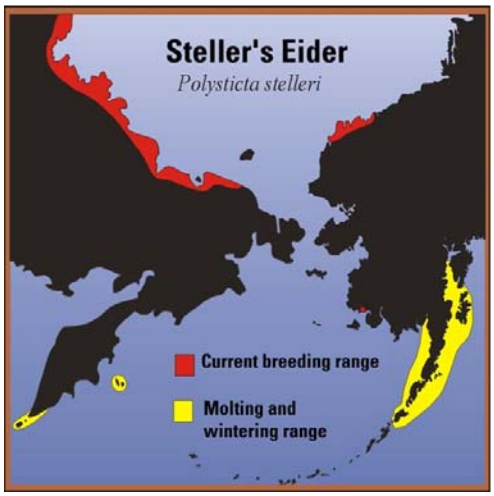


Figure 3.2 - Steller's eider distribution in the Bering, Beaufort, and Chukchi seas (USFWS 2002).

Life History – North Slope (Breeding)

Steller's eiders arrive in pairs on Alaska's North Slope in early June, and are intermittent breeders; since 1991, Steller's eiders near Barrow apparently nested in 10 years but did not nest in 7 years (Rojek 2008). 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 (*Nyctea scandiaca*) that nest nearby (and consume abundant lemmings) may protect eider nests from mammalian predators such as arctic fox (*Alopex lagopus*) (Quakenbush and Suydam 1999, and summarized by Rojek 2006).

When they do breed, Alaska-breeding Steller's eiders nest on 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. 1995), and hatching occurs from July 7 to August 3 (Quakenbush et al. 1998). 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. 1998). Average clutch sizes at Barrow varied from 5.3-6.3, with clutches of up to 8 reported

(Quakenbush et al. 1998, Rojek 2005). Nest success (proportion of nests with at least one egg hatched) at Barrow averaged 17% from 1991-2002 (Service, unpublished data). 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* (Quakenbush et al. 1998, 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 (Quakenbush et al. 1998, Rojek 2006). Fledging occurs from 32-37 days post hatch (Obritschkewitsch et al. 2001, Rojek 2006).

Departure from the breeding grounds differs between sexes and between breeding and non-breeding years. 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). Females whose nests fail may remain near Barrow later in summer; a single failed-breeding 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*). Successfully-breeding females and fledged young depart the breeding grounds in early to mid-September. In a non-breeding year, satellite-transmittered 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. They were tracked at coastal locations from Barrow to Cape Lisburne, and made extensive use of lagoons and bays on the north coast of Chukotka (Martin et al. *in prep*.).

After the breeding season, Steller's eiders move to marine waters where they undergo a complete flightless molt for about 3 weeks. The combined (Russia- and Alaska-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). After molt, many of the Pacific-wintering population of Steller's eiders disperse to winter in the eastern Aleutian Islands, the south side of the Alaskan Peninsula, and as far east as Cook Inlet, although thousands may remain in lagoons used for molt unless or until freezing conditions force them to move (USFWS 2002).

Prior to 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

Alaska-breeding Steller's Eider Abundance and Trends

Stehn and Platte (2009) conducted a review of the distribution, abundance, and trend of the listed population of Steller's eiders on the Arctic Coastal Plain (ACP). Utilizing information from three aerial surveys, (the ACP, the North Slope eider survey (NSE) and the Barrow Triangle survey (ABR)), they assessed the population status and trend of the Steller's eider population nesting on tundra wetlands of northern Alaska. Data reported from these three surveys provide different estimates of average population size and trend. The 1989-2008 ACP survey (Mallek et al. 2007) estimated a total average population size of 866 birds with a declining growth rate of 0.778; the NSE are from 1992-2008 (Larned et al. 2009) averaged 162 birds with increasing growth rate of 1.059. The ABR survey from 1999-2007 (Obrishkewitsch et al. 2008) averaged 100 birds with a growth rate of 0.934. Average population size and trend can be biased by changes in observer, detection rates, and survey timing. Survey timing was considered especially important for species with male departure early in incubation, or other marked shifts in habitat use, movements, or flocking behavior (ground breeding surveys near Barrow indicate the best time for aerial surveys of breeding Steller's is about 12-20 June, after arrival of most breeding individuals but before most males depart. Using a subset of data least confounded by changes in survey timing and observer, the appropriately-timed NSE survey observations from 1993-2008 averaged 173 indicated total Steller's eiders (88-258, 90% confidence interval) with an estimated growth rate of 1.011 (0.857 – 1.193, 90% CI). The authors assumed a detection probability of 30% (based upon reasonable estimates with similar species and habitats), yielding a total average population of Steller's eiders breeding in the ACP of about 576 (292-859, 90% CI) individuals (Stehn and Platte 2009).

Recovery Criteria
The Steller's Eider Recovery Plan (USFWS 2002) 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 to be used in determining 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 life history parameters needed for accurate population modeling are inadequately 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 life history 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.

Steller's Eider Critical Habitat
In 2001, the Service designated 2,830 mi^2 (7,330 km^2) of critical habitat for the Alaska-breeding population of Steller's eiders at breeding areas on the Y-K Delta, a molting and spring-staging

area in the Kuskokwim Shoals, and molting areas in marine waters at the Seal Islands, Nelson Lagoon, and Izembek Lagoon (Federal Register 66(23):8849-8884). None of these critical habitat units are within the Action Area so they are not discussed further.

3.2 Yellow-billed Loon

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 (*Gavia 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 dull, light brown feathers. 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 yellow-billed loon was designated a candidate for protection under the ESA because of its small population size range-wide and concerns about levels of subsistence harvest and other potential impacts to the species (Federal Register 74(56):12932-12968).

Yellow-billed loons nest exclusively on margins of lakes and islands in coastal and inland low-lying tundra from latitude 62° to 74° North. Yellow-billed loons nest from June to September near freshwater lakes in tundra on Alaska's Arctic Coastal Plain (ACP), 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 3.3). Yellow-billed loons are sparsely distributed, and are somewhat clumped at a large scale, perhaps because of non-uniform quality of habitat.

Yellow-billed loons are vulnerable due to a combination of small population size, low reproductive rate, and very specific breeding habitat requirements. It is thought that loons occupy the same breeding territory throughout their reproductive lives. There is no reliable scientific information on lifespan and survivorship, but as large-bodied birds with low clutch size, yellow-billed loons are probably what is known as "K-selected;" that is, they are long-lived and dependent upon high annual adult survival to maintain populations.

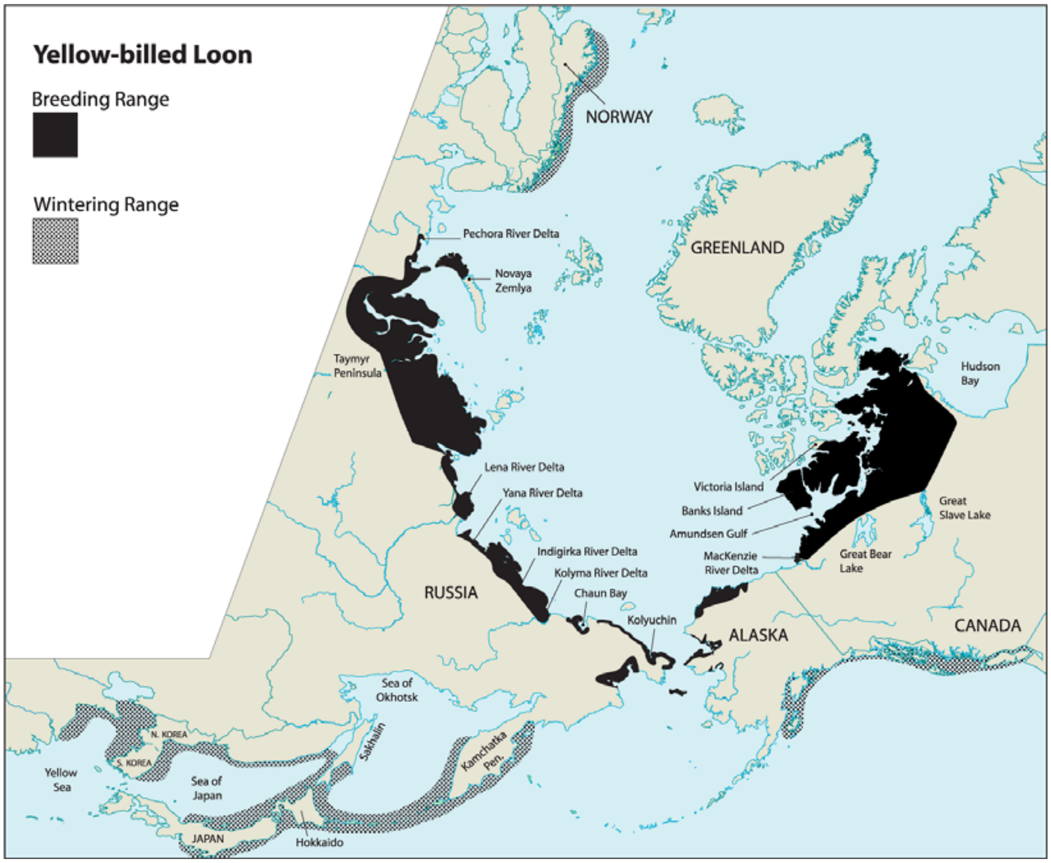
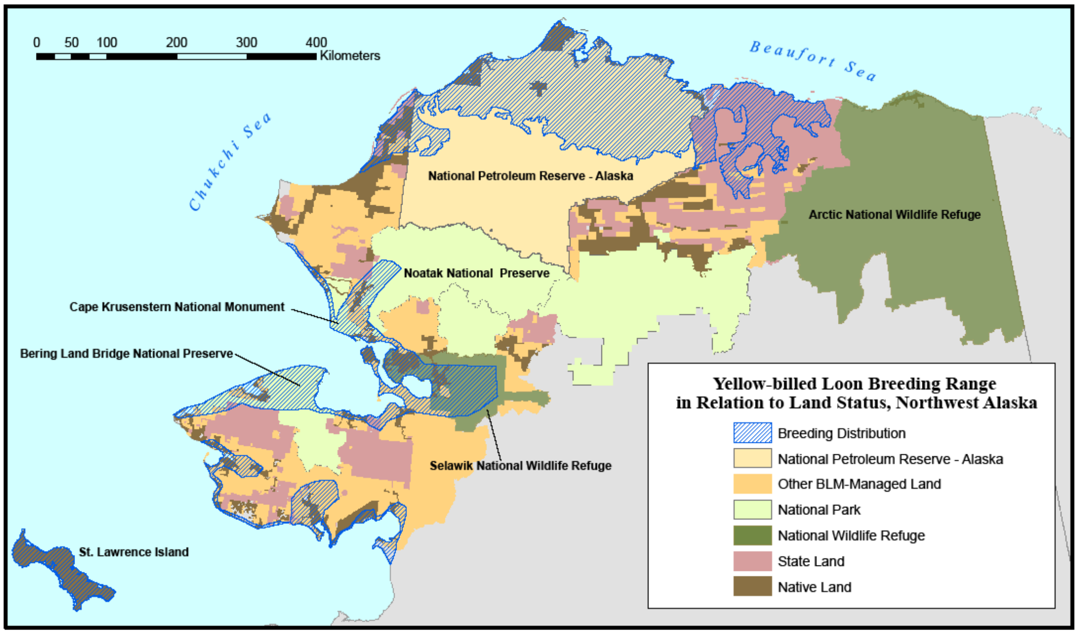


Figure 3.3 - Worldwide range of the yellow-billed loon.

Within Alaska, there are two breeding areas – the ACP north of the Brooks Range and the region surrounding Kotzebue Sound in northwest Alaska, primarily the northern Seward Peninsula (Earnst 2004, North 1993) (Figure 3.4).



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

Figure 3.4 -Yellow-billed loon breeding distribution in Alaska.

Life History - Breeding

Lakes that are able to support breeding loons have abundant fish populations; are < 2 m deep which allows unfrozen water under the ice during winter; are large (at least 13.4 hectares or 33 acres); are often connected to streams that may supply fish; feature highly convoluted, vegetated, and low-lying shorelines; and provide clear water and dependable water levels (Earnst et al. 2006, Stehn et al. 2005, North 1994).

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. 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 1995 - 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). Ninespine sticklebacks (*Pungitius pungitius*) and least cisco (*Coregonus sardinella*) are thought to be the main foods of chicks in Alaska (Earnst 2004). Other freshwater prey available in Alaska that are likely utilized include Alaska blackfish (*Dallia pectoralis*), fourhorn sculpins (*M. quadricornus*), amphipods, and isopods (Earnst 2004), as well as aquatic plant material (Sjölander and Ågren 1976).

Life History – Migration and Wintering
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; 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 2008, Strann and Østnes 2007, Burn and Mather 1974, Gibson and Byrd 2007). 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.

Yellow-billed loon migration routes are thought to be primarily marine. Schmutz (in litt. 2008) found that adult yellow-billed loons marked with satellite transmitters on the breeding grounds in Alaska generally remained between 1 and 20 miles from land during migration and winter. Yellow-billed loons 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 Herter, 1989, Barr 1997, Alexander et al. 1997, Mallory and Fontaine 2004).

Yellow-billed loons breeding in Alaska have been studied to determine migration routes. Nineteen yellow-billed loons captured on the ACP between 2002 and 2008 were outfitted with satellite transmitters (Schmutz *pers. comm*. 2008). All of them migrated to Asia, predominantly south 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. They wintered in the Yellow Sea and Sea of Japan off China, North Korea, Russia, and Japan (near Hokkaido). All 10 yellow-billed loons fitted with transmitters on the Seward Peninsula, Alaska, in 2007 and 2008 also used the Bering Strait region after leaving breeding grounds. Five of these migrated to Asian 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*. 2008). Most of these 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 fall migration in July.

The migration routes of yellow-billed loons breeding in Russia have not been studied. Because of the proximity of the Chukotka Peninsula to the ACP in Alaska, and the fact that ACP breeding yellow-billed loons use the Chukotka Peninsula during migration (Schmutz *pers. comm*. 2008), it is likely that some or all yellow-billed loons from eastern Russia migrate through the Chukchi Sea and Bering Straits to Asian wintering areas.

Although yellow-billed loons are known to forage underwater for fish and aquatic invertebrates, limited information exists on specific prey species consumed by the loons in the marine environment. Marine prey species collected from loons wintering in southeast Alaska and Canada include fish such as sculpins (*Leptocottus armatus*, *Myoxocephalus* sp.), Pacific tomcod (*Microgadus proximus*), and rock cod (*Sebastodes* sp.), and invertebrates such as amphipods (*Orchomonella* sp., *Anonyx nirgax*), isopods (*Idothea* sp.), shrimps (*Pandalus danae*, *Spirontocaris ochotensis*), hermit crabs (*Pagarus* sp.), and marine worms (*Nereis* sp.) (Bailey 1922, Cottam and Knappen 1939, North 1994, Earnst 2004). Prey species taken in other wintering grounds, such as in the Yellow Sea (which supports 276 fish species and 54 crustacean species; UNDP 2002) are unknown.

Yellow-billed Loon Abundance and Trends

The global breeding ground population size for yellow-billed loons is unknown, but probably in the range of 16,000-32,000, with an Alaska population of 3,000-4,000 (Federal Register 74(56):12932-12968). 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.

In Alaska, yellow-billed loon population indices on the ACP are determined by two independent fixed-wing aerial transect surveys for waterfowl conducted each year by the Service's Migratory Bird Management program. The North Slope Eider survey is flown in early June (1992-2008) and the Arctic Coastal Plain survey in late June (1986-2006). Survey timing and coverage differs between the two surveys, and the long-term mean yellow-billed loon population index differs. Overall, an estimated 2,500-3,500 yellow-billed loons breed on the ACP (USFWS unpublished data based on examining results in Earnst et al. 2005, Stehn et al. 2005, Mallek et al. 2007, Larned et al. 2009). Approximately 500 loons breed in the Kotzebue Sound region in western Alaska. 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 Selawik National Wildlife Refuge (June 1996 and 1997) (Platte 1999, Bollinger et al. 2008).

The Service recently examined a subset of the NSE data through 2008 that analyzed the pilot-observer data. The average growth rate using this subset of data is estimated at 0.986 (0.967-1.006, 95% C.I.) (USFWS unpublished data). This suggests that the ACP breeding population is relatively stable or slightly declining. Limited surveys have been conducted only in small parts of the Russian and Canadian ranges, so population sizes for these ranges are gross approximations and no information on trends is available.

3.3 Polar Bear

Physical Appearance

Polar bears are characterized by a large stocky body, with a longer neck and proportionately smaller head than other members of the bear family, and without the distinct shoulder hump common to brown bears (*Ursus arctos*) (Figure 3.5). Polar bear fur color varies between white, yellow, gray, and brown, and is affected by oxidation or exposure to air, light conditions, and staining due to contact with fats from prey items. The nose, lips, and skin of polar bears are black (Amstrup 2003).

Polar bears exhibit sexual dimorphism with female body length, skull size, and body mass considerably less than males (Derocher et al. 2005). Adult males weigh up to 654 kg (1,440 lbs) (Kolenosky et al. 1992), with some individuals not weighed estimated at 800 kg (1,760 lbs) (DeMaster and Stirling 1981). Adult females weigh 181 to 317 kg (400-700 pounds).

Figure 3.5 – Polar Bears
Photo by Steve Hillebrand, USFWS

Distribution and Status

Polar bears are distributed throughout regions of arctic and subarctic waters where the sea is ice covered for large portions of the year. The total number of polar bears worldwide is estimated to be 20,000-25,000 bears (Schliebe et al. 2006). Although movements of individual polar bears overlap extensively, telemetry studies have demonstrated spatial segregation among groups or stocks of polar bear in different regions of their circumpolar range (Schweinsburg and Lee 1982, Amstrup 2000, Garner et al. 1990 and 1994, Messier et al. 1992, Amstrup and Gardner 1994, Ferguson et al. 1999, Carmack and Chapman 2003). Patterns in spatial segregation suggested by telemetry data, along with information from surveys, marking studies, and traditional knowledge, resulted in recognition of 19 partially discrete polar bear groups by the International Union for the Conservation of Nature (IUCN) Polar Bear Specialist Group (PBSG). These 19 groups have been described as management subpopulations (or stocks) in the scientific literature and regulatory actions (IUCN 2006).

Because the principal habitat of polar bears is sea ice, it is considered a marine mammal, and it is therefore included in the species protected under the Marine Mammal Protection Act of 1972 (MMPA). On May 15, 2008, the polar bear was listed as a threatened species range-wide under the ESA (73 FR 28212, May 15, 2008).

Two stocks of polar bears occur in Alaska: the Chukchi Sea (CS) and Southern Beaufort Sea (SBS) stocks. The ranges of these stocks are shown in Figure 3.6.

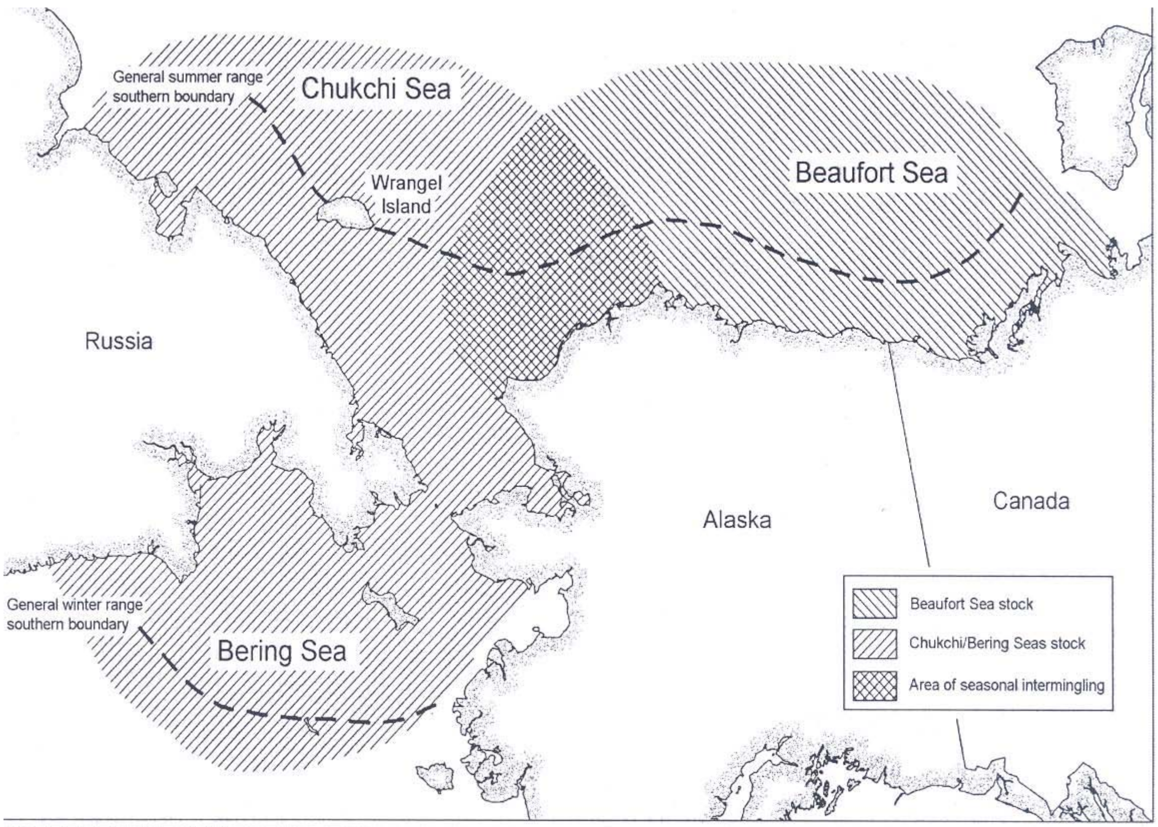


Figure 3.6 – Range Map of Beaufort Sea and Chukchi Sea Polar Bear Stocks

Life History – Beaufort Sea Stock

Telemetry studies indicate polar bear movements are not random, nor do they passively follow ocean currents on the ice as previously thought (Mauritzen et al. 2003) Movement data come almost exclusively from adult female polar bears because male anatomy (their neck is larger than their skull) will not accommodate radio collars. The movements of seven male polar bears surgically implanted with transmitters in 1996 and 1997 were compared to movements of 104 females between 1985 and 1995 (Amstrup et al. 2001). The data indicated males and females had similar activity areas on a monthly basis, but males traveled farther each month (Amstrup et al 2000b). Activity areas have not been determined for many populations, and available information reflects movement data collected prior to recent changes wrought by retreating ice conditions. In the Beaufort Sea, annual activity areas for individually monitored female bears averaged 149,000 km^2 (range 13,000 - 597,000 km^2, Amstrup et al. 2000b). Total annual movements by female bears in the Beaufort Sea averaged 3,415 km and ranged up to 6,200 km, with a movement rate of > 4 km/ hr sometimes sustained for long periods, and movements of > 50 km/day observed (Amstrup et al. 2000b).

Radio-collared females indicate some individuals occupy home ranges (or "multi-annual activity areas") which they seldom leave (Amstrup 2003). The size of a polar bear's home range is determined, in part, by the annual pattern of freeze-up and break-up of sea ice, and therefore by the distance a bear must travel to access prey (Stirling 1988, Durner et al. 2004). A bear with consistent access to ice, leads, and seals may have a relatively small home range, while bears in areas such as the Barents, Greenland, Chukchi, Bering or Baffin seas may have to move many hundreds of kilometers each year to remain in contact with sea ice from which to hunt (Born et al. 1997, Mauritzen et al. 2001, Ferguson et al. 2001, Amstrup 2003, Wiig et al. 2003). Polar bears are dependent upon sea ice for foraging and the most productive areas are near ice edges, leads, or polynyas where ocean depth is minimal (Durner et al. 2004). Polar bears can be present along the Alaskan shoreline as they opportunistically scavenge on marine mammal carcasses.

The SBS population occurs between Icy Cape, Alaska on the western boundary and Pearce Point, NWT (Amstrup et al. 1986, Amstrup and DeMaster 1988, Stirling et al. 1988). It is thought that nearly all bears in the central coastal region of the Beaufort Sea are from the SBS population, and that proportional representation of SBS bears decreases to both the west and east. For example, only 50% of polar bears occurring in Barrow, Alaska and Tuktoyaktuk, NWT are SBS bears, with the remainder being from the CS and Northern Beaufort Sea populations.

Polar bears derive essentially all their sustenance from marine mammal prey and have evolved a strategy that utilizes the high fat content of marine mammals (Best 1985, Amstrup et al. 2007). Over half the caloric content of a seal carcass occurs in the layer of fat between the skin and underlying muscle (Stirling and McEwan 1975) and polar bears quickly remove the fat layer from beneath the skin after they catch a seal. High fat intake from specializing on marine mammal prey allows polar bears to thrive in the harsh Arctic environment (Stirling and Derocher 1990, Amstrup 2003).

Over much of their range, polar bears are dependent on one species of seal, the ringed seal (*Phoca hispida*) (Smith and Stirling 1975, Smith 1980). The relationship between ringed seals and polar bears is so close that the abundance of ringed seals in some areas appears to regulate the density of polar bears, while polar bear predation in turn regulates density and reproductive success of ringed seals (Hammill and Smith 1991, Stirling and Øritsland 1995). Polar bears occasionally catch belugas (*Delphinapterus leucas*), narwhals (*Monodon monoceros*), walrus (*Odobenus rosmarus divirgens*), and harbor seals (*P. vitulina*) (Smith 1985, Calvert and Stirling 1990, Smith and Sjare 1990, Stirling and Øritsland 1995, Derocher et al. 2002). Where common, bearded seals (*Erignathus barbatus*) can be a large part of polar bear diets, and are probably the second most common prey item (Derocher et al. 2002), and walrus can be seasonally important in some parts of the polar bear's range (Parovshchikov 1965, Ovsyanikov 1996).

Polar bears rarely catch seals on land or in open water (Furnell and Oolooyuc 1980); rather they catch seals and other marine mammals at the air-ice-water interface, where aquatic mammals come to breathe (Amstrup et al. 2007). Although there are local exceptions, it appears that polar bears gain little overall benefit from alternate foods (Amstrup et al. 2007). Therefore, maintenance of polar bear populations is dependent upon marine prey, largely ringed seals, and polar bears are tied to the surface of the ice for effective access to that prey (Amstrup et al. 2007).

Polar bears have an intrinsically low reproductive rate characterized by late age of sexual maturity, small litter sizes, and extended maternal investment in raising young. Female polar bears enter a prolonged estrus between March and June, when breeding occurs. Ovulation is thought to be induced by mating (Wimsatt 1963, Ramsay and Dunbrack 1986, Derocher and Stirling 1992). Implantation is delayed until autumn, and gestation is 195-265 days (Uspenski 1977), with active development of the fetus suspended for most of that time. The timing of implantation, and hence birth, is likely dependent upon body condition of the female, which in turn is dependent upon a variety of environmental factors (Schliebe et al. 2006). In the Beaufort Sea many pregnant females did not enter dens until late November or early December (Amstrup and Gardner 1994).

Throughout their range, most pregnant female polar bears excavate dens in snow located on land during September – November after drifts large enough to excavate a snow cave have formed (Harington 1968, Lentfer and Hensel 1980, Ramsay and Stirling 1990, Amstrup and Gardner 1994). In the southern Beaufort Sea a portion of the population dens in snow caves located on pack and shorefast ice. Successful denning by polar bears requires an accumulation of sufficient snow combined with winds to cause snow accumulation leeward of topographic features that create denning habitat (Harington 1968). The common characteristic of all denning habitat is topographic features that catch snow in the autumn and early winter (Durner et al. 2003).

Satellite telemetry studies determined mean dates of den entry in the Beaufort Sea were 11 and 22 November for land (n = 20) and pack-ice (n = 16), respectively (Amstrup and Gardner 1994). Female bears foraged until den entry. Mean date of emergence was 26 March for pack-ice dens (n = 10) and 5 April for land dens (n = 18). Messier et al. (1994) reported mean date of den entry and exit varied among years depending upon sea ice, snow and weather conditions. For bears denning on sea ice or moving from sea ice to land denning habitat, time of sea ice consolidation can alter the onset of denning. Sea-ice dens must be in ice stable enough to stay intact for up to 164 days while possibly moving hundreds of kilometers by currents (Amstrup 2003, Wiig 1998).

Polar bear denning habitat in Alaska includes areas of low relief topography characterized by tundra with riverine banks within approximately 50 km of the coast (Amstrup 1993, Amstrup and Gardner 1994, Durner et al. 2001, 2003), and offshore pack ice pressure ridge habitat. Although the northern Alaskan coast gets minimal snow fall, because the landscape is flat the snow is blown continuously throughout the winter creating drifts in areas of relief.

Data suggests that an increasing number of SBS females are denning on land. Sixty percent of radio-collared females denned on land from 1996 – 2006, compared to forty percent in the previous 15 years (Fishbach et al. 2007). The geographic distribution of land denning also appears to have shifted to the west in recent years (71 FR 148, August 2, 2006).

Fidelity to denning locales was investigated by Amstrup and Garner (1994), who located 27 females at up to four successive maternity dens. Bears that denned once on pack ice were more likely to den on pack ice than on land in subsequent years. Similarly, bears were faithful to general geographic areas – those that denned once in the eastern half of the Alaska coast were more likely to den there than to the west in subsequent years. Annual variations in weather, ice conditions, prey availability, and the long-distance movements of polar bears (Amstrup et al. 1986, Garner et al. 1990) make recurrence of exact denning locations unlikely.

Polar bears give birth in the dens during mid-winter (Harington 1968, Ramsay and Dunbrack 1986). Survival and growth of the cubs depends on the warmth and stable environment within the maternal den (Blix and Lentfer 1979). Family groups emerge from dens in March and April when cubs are about three months old and able to survive outside weather conditions (Blix and Lentfer 1979, Amstrup 1995).

Newborn polar bears are very small, weighing approximately 0.6 kg (Blix and Lentfer 1979), and nurse from their hibernating mothers. Cubs grow quickly and may weigh 10-12 kg by the time they emerge from the den about three months later. Young bears stay with their mothers until weaned, which occurs most commonly in early spring when the cubs are 2.3 years of age. Female polar bears are available to breed again after cubs are weaned. Therefore, in most areas, the minimum successful reproductive interval for polar bears is 3 years (Schliebe et al. 2006).

Age of maturation of mammals is often associated with a threshold body mass (Sadleir 1969), and in polar bear populations it appears to be largely dependent on numbers and productivity of ringed seals. In the Beaufort Sea, ringed seal densities are lower in some areas of the Canadian High Arctic and Hudson Bay. As a possible consequence, female polar bears in the Beaufort Sea usually do not breed for the first time until they are 5 years of age (Lentfer and Hensel 1980), giving birth for the first time at 6 years of age.

Litter size and reproduction rates vary by geographic area and may change in response to hunting pressure, environmental factors, and other population perturbations. Litters of two cubs are common (Schliebe et al. 2006), with litters of three cubs occurring sporadically across the Arctic and most commonly reported in the Hudson Bay region (Stirling et al. 1977, Ramsay and Stirling 1988, Derocher and Stirling 1992). Average litter size across the species' range varied from 1.4 to 1.8 cubs (Schliebe et al. 2006), and several studies have linked reproduction to availability of seal prey, especially in the northern portion of their range. Body weights of mother polar bears and their cubs decreased markedly in the mid-1970s in the Beaufort Sea following a decline in ringed and bearded seal pup production (Stirling et al. 1976, 1977, Kingsley 1979, DeMaster et al. 1980, Stirling et al. 1982, Amstrup et al. 1986). Declines in reproductive parameters varied by region and year with ice conditions and the corresponding reduction in numbers and productivity of seals (Amstrup et al. 1986). In the Beaufort Sea, female polar bears produce a litter of cubs at an annual rate of 0.25 litters per adult female (Amstrup 1995).

Polar bear reproduction lends itself to early termination without extensive energetic investment by the female (Ramsay and Dunbrack 1986, Derocher and Stirling 1992). Female polar bears may defer reproduction in favor of survival when foraging conditions are difficult (Derocher et al. 1992). Repeated deferral of reproduction could cause a decline in populations with an intrinsically low rate of growth (Schliebe et al. 2006).

Polar bears are long-lived animals; the oldest known female polar bear in the wild was 32 years and the oldest known male was 28, although few bears in the wild live beyond 20 years (Stirling 1990). Taylor et al. (unpublished data) described survival rates that generally increased by age class up to approximately 20 years of age (cubs-of-the-year 35-75%; 1-4 year old bears 63-98%; adults 5-20 years 95-99%; and 72-99% for adults > 20 years of age).

Survival of cubs is dependent upon their weight when they exit maternity dens (Derocher and Stirling 1992), and most cub mortality occurred early in the period after emergence from the den (Amstrup and Durner 1995, Derocher and Stirling 1996), with early age mortality generally associated with starvation (Derocher and Stirling 1996). Survival of cubs to weaning stage (generally 27-28 months) is estimated to range from 15% to 56% of births (Schliebe et al. 2006). Subadult survival rates are poorly understood because telemetry collars cannot be used on rapidly growing individuals.

Population age structure data indicate subadults 2-5 years survive at lower rates than adults (Amstrup 1995), probably because their hunting and survival skills are not fully developed (Stirling and Latour 1978). Eberhardt (1985) hypothesized adult survival rates must be in the upper 90% range to sustain polar bear populations. Studies using telemetry monitoring of individual animals (Amstrup and Durner 1995) estimated adult female survival in prime age groups may exceed 96%, and survival estimates are a reflection of the characteristics and qualities of an ecosystem to maintain the health of individual bears (Schliebe et al. 2006). Polar bears that avoid serious injury may become too old and feeble to hunt efficiently.

Abundance and Trends – Alaska Stocks

The size of the SBS population was estimated at 1,800 animals in 1986 (Amstrup et al. 1986). A new population assessment derived from capture-recapture data collected during 2001 to 2006 concluded there were 1,526 (95% CI = 1,211 - 1,841) polar bears in the region in 2006 (Regehr et al. 2006). The most recent stock assessment estimated a population size of 1,526 bears (USFWS 2009).

The SBS stock experienced little or no growth during the 1990s (Amstrup et al. 2001). Declining survival, recruitment, and body size (Regehr et al. 2006, 2007), low growth rates during years of reduced sea ice during summer and fall (2004 and 2005), and an overall declining growth rate of 3% per year from 2001-2005 (Hunter et al. 2007), indicate the SBS population is declining.

4. ENVIRONMENTAL BASELINE

Regulations implementing the ESA (50 CFR §402.02) define the environmental baseline as 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.

4.1 Spectacled and Steller's Eiders

Status in the Action Area
Spectacled and Steller's eiders may be present in the Action Area from late May through approximately late October. Both species nest on Alaska's North Slope between early June and September, and individuals migrate through the Beaufort Sea from May through the end of October. Based on years of aerial survey data, we estimate < 3% of the North-Slope breeding population of spectacled eiders nest east of Northstar. Few observations of Steller's eiders have been recorded as far east as the Northstar and Liberty project locations during annual aerial surveys conducted by the Service.

Both species have undergone significant, unexplained declines in their Alaska-breeding populations. Factors that have possibly contributed to the current status of spectacled and Steller's eiders in the Action Area are discussed below and include, but may not be limited to, toxic contamination of habitat, increased predator populations, impacts of development, impacts from scientific research, and climate change. Factors that affect adult survival may be most influential on population growth rates. Recovery efforts for both species are underway.

Toxic Contamination of Habitat
Water birds in arctic regions are also exposed to global contamination, including radiation, and industrial and agricultural chemicals that are transported by atmospheric and marine currents. Twenty male spectacled eiders wintering near St. Lawrence Island sampled for contaminants were in good physical condition but had high concentrations of metals and subtle biochemical changes that may be associated with long-term health effects (Trust et al. 2000).

Increased Predator Populations
There is some evidence that 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 2007). Researchers have proposed that reduced fox trapping, anthropogenic food sources in villages and oil fields, and nesting/denning sites on human-built structures 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).

Development

Industrial development in the Beaufort Sea has been limited to the Northstar and Liberty projects, Pioneers' Oooguruk project, and KMG's Nikaitchuq Project. Offshore development is not thought to have played a major role in population declines of spectacled or Steller's eiders. The presence of infrastructure along the migration route presents a collision risk for listed eiders, in addition, there is a risk of large marine oil spills from these developments although none has occurred to date. The Service has conducted formal section 7 consultations for these projects and impacts that may result from them were considered in the final jeopardy analysis of this BO.

Scientific Research

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 likely disturb a small number of listed eiders each year.

Climate Change

High latitude regions, such as Alaska's North Slope and the Beaufort Sea, 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 any specificity 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).

There are a wide variety of changes occurring in the arctic worldwide, including 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).

There are indications regional-scale environmental shifts may be underway in both the Chukchi and the Beaufort seas, which have important hydrologic and biologic connections. An observed increase in Atlantic water in the western Arctic Ocean (Zangh and Hunke 2001) can warm surface water, which in turn thins arctic sea ice (Manabe and Stouffer 1995). An average 1-m reduction in sea ice thickness has been estimated in the Chukchi and Beaufort seas (Rothrock et al 1999). Late summer arctic sea ice area has declined 2-7.7% per decade (Parkinson et al. 1999, Stroeve et al. 2005), and the area of perennial sea ice has declined 9.8% per decade of since 1978 (Comiso 2006). Sea ice and the associated ice-edge productivity is a key factor in the heightened carrying capacity of arctic sea shelves (Grebmeier and Dunton 2000). Grebmeier et al. (2006) suggest that an ecological shift from arctic to subarctic conditions is occurring in the northern Bering Sea; this shift resulting in decreased sea ice may have profound impacts on arctic marine mammals and diving seabird populations through ecosystem linkages that change food supplies. A similar trend may be underway in the Chukchi Sea as recent retrospective studies of benthic communities indicate a changing marine system in both the Bering and Chukchi seas (Iken and Konar 2003, Sirenko and Koltun 1992, Grebmeier and Dunton 2000).

Current understanding of regional-scale shifts in the arctic marine environment is primarily limited to measurements in the physical environment, such a sea ice thickness and water temperatures. Because similar types of changes are recently being linked to ecologic shifts in the Bering Sea (Grebmeier et al. 2006), it may be reasonable to conclude unmeasured ecological shifts may be occurring in the Beaufort Sea, or will occur, if trends continue.

While the impacts of climate change on listed species in the Action Area are unclear, species with small populations are more vulnerable to environmental change (Crick 2004). Some species may increase in abundance or range with climate change, while others will suffer from reduced population size or range. The ultimate effects of climate change that will impact both the terrestrial and marine habitats of listed eiders are undetermined at present. While it is certain that listed eiders will be impacted by the effects of climate change on their terrestrial and marine habitats, it is presently impossible to predict the direction or magnitude of these individual impacts or their combined sum.

4.2 Yellow-billed Loons

Status in the Action Area

Many yellow-billed loons nesting on the ACP and likely significant numbers of yellow-billed loons nesting in Arctic Canada migrate through the Action Area as they move between wintering and breeding areas. Yellow-billed loons are absent from the Action Area in winter. 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 subsistence harvest, offshore oil development, and climate change, and these are discussed below.

Subsistence Harvest
Subsistence harvest surveys have indicated a substantial level of harvest of yellow-billed loons relative to their population size, although exact harvest numbers are uncertain (USFWS 2009b). There is no legal harvest of yellow-billed loons allowed in the United States except in Alaska's North Slope Region where a total of up to 20 yellow-billed loons may be kept if inadvertently caught in subsistence fishing nets and used for subsistence purposes. Harvest reports suggest that take exceeds this number, and they are often taken by shooting (USFWS 2009b).

A population model developed by U.S. Geological Survey (USGS) tested the sensitivity or response of the population to a range of possible harvest levels and found that for all harvest level and population size scenarios considered, harvest would cause an otherwise stable population to decline (Schmutz 2009). Outreach and education efforts by the Service to reduce harvest levels are underway.

Offshore Oil Development
Both non-nesting and breeding yellow-billed loons on Alaska's ACP use marine areas of the Beaufort Sea to forage. They may be at risk from collisions with oil structures in marine waters. Additionally, in spring yellow-billed loons gather in polynyas, ice leads, and opens 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 development in the Beaufort Sea.

Climate Change
As described above for listed eiders, the effects of climate change to yellow-billed loon habitat in both the terrestrial arctic and marine systems is complex, with highly variable predictions of effects. Perhaps the greatest concern is potential effects of climate change on morphology and characteristics of breeding lakes and their prey-fish communities (USFWS 2009b). Potential climate change effects that may affect yellow-billed loons are likely similar to those described above for listed eiders.

4.3 Kittlitz's Murrelet

Kittlitz's murrelets are closely associated with marine tidewater glaciers, and their decline may be related to the retreat of glaciers and decreased foraging habitat. At this time, the ultimate cause for the population decline of Kittlitz's murrelet is unknown, but major threats appear to be habitat based, caused by one or a combination of mechanisms including: change to forage fish quality and availability due to rapid atmospheric and/or decadal oceanic climate change, and by contamination of the marine environment. Additive to this underlying stress to the population may be adult mortality from incidental bycatch in commercial fisheries, disturbance by tour boats, and predation (USFWS 2009c). The primary distribution and breeding range of Kittlitz's murrelets occurs in southeast Alaska, outside of the Action Area. Activities in the Action Area are not thought to be impacting the decline, or recovery, of this species.

4.4 Polar Bears

Status in the Action Area

Polar bears spend the majority of their time on ice in near-shore, shallow waters over the productive continental shelf. Polar bears are generally widely and sparsely distributed across the Alaskan portion of the Beaufort Sea. Unlike polar bears in eastern Canada, the Beaufort Sea population does not currently spend extended periods of time on land (Garner et al. 1990). However, polar bears have been observed congregating on barrier islands in the fall and winter feeding on bowhead whale (*Balaena mysticetus*) carcasses, notably at Cross and Barter islands (USFWS 2006).

Only pregnant female polar bears den; other members of the population (males, solitary females, and females with older cubs) remain active throughout winter. Some females from the approximately 1,500 animal Southern Beaufort Sea stocks may den close to the Action Area. Durner et al. (2006) found approximately 50% of pregnant females in the Beaufort Sea came ashore to construct maternity dens, Fishbach et al. described 60% of females in this area denned on land, while Amstrup and Gardner (1994) found 42% of females observed in the Alaskan Chukchi and Beaufort seas and Canadian Beaufort Sea from 1983-1991 denned on land. The remaining females denned on shore-fast ice or drifting pack ice.

Females come ashore to den in late October/early November depending upon ice movements and timing of freeze up (Lentfer and Hensel 1980). In Alaska, dens are sparsely distributed along a narrow coastal strip with sightings reported up to 48 km inland (Lentfer and Hensel 1980) and 61 km inland (Amstrup and Gardner 1994). Denning habitat includes areas such as coastal and river banks and bluffs where snow accumulates early.

Whereas loss of sea ice habitat is considered the principle threat to polar bears, other threats occurring in the Action Area include hunting, development, environmental contaminants, disease, and predation of young.

Hunting

Prior to the 1950s, most hunting was by indigenous people for subsistence purposes. Increased sport hunting in the 1950s and 1960s resulted in population declines (Prestrud and Stirling 1994). International concern about the status of polar bears resulted in biologists from the five polar bear range nations forming the Polar Bear Specialist Group (PBSG) within the IUCN SSC (Servheen et al. 1999). The PBSG was largely responsible for the development and ratification of the 1973 International Agreement on the Conservation of Polar Bears (1973 Polar Bear Agreement), which called for international management of polar bear populations based on sound conservation practices. It prohibits polar bear hunting except by local people using traditional methods, calls for protection of females and denning bears, and bans use of aircraft and large motorized vessels to hunt polar bears. The PBSG meets every 3-5 years to review all aspects of polar bears science and management, including harvest management.

Additionally, since passage of the Marine Mammal Protection Act in 1972 (MMPA), the sport hunting of polar bears in the United States has ceased. However, the MMPA provides a special exemption to Coastal dwelling Alaska Natives who may continue to take polar bears for subsistence or handicraft purposes. Currently, under the MMPA, there are no restrictions on the number, season, or age of polar bears that can be harvested by Alaska Natives. However, there is a more restrictive Native-to-Native agreement between Inũpiat from Alaska and Inuvialuit in Canada that was developed in 1988. This agreement, the Inuvialuit-Inũpiat Polar Bear Management Agreement, established quotas and recommendations concerning protection of denning females, family groups, and methods of take. Presently it is thought that the current harvest levels, which have averaged 36 bears per years since 1980, will not impact the rate of recovery of the species (USFWS 2006d).

Development

Documented impacts on polar bears by the oil and gas industry in Alaska during the past 30 years are minimal. Polar bears have been encountered at or near most coastal and offshore production facilities, or along roads and causeways that link these facilities to the mainland including the Northstar and Liberty project areas. However, interactions have been minimized by implementation of Incidental Take Regulations (ITRs) for the Beaufort Sea (USFWS 2006) and the associated Letters of Authorization (LOAs) issued under the MMPA. No lethal take associated with the oil and gas industry has occurred during the period covered by ITRs (1991 until present) in Beaufort Sea; prior to issuance of these regulations, lethal takes of adult polar bears by industry were rare (two in Alaska since 1968).

Formal section 7 consultation has been conducted for the Beaufort Sea ITRs, which authorizes the incidental taking of a small number of polar bears in this sea and the adjacent Arctic Coastal Plain during oil and gas activities. This consultation and its conclusions were considered in the jeopardy analysis of this BO.

Environmental Contaminants

Three main types of contaminants in the Arctic are thought to present the greatest potential threat to polar bears and other marine mammals: petroleum hydrocarbons, persistent organic pollutants (POPs), and heavy metals.

Potential exposure of polar bears to petroleum hydrocarbons comes from direct contact and ingestion of crude oil and refined products from acute and chronic oil spills. Polar bear range overlaps with many active oil and gas operations (Schliebe et al. 2006). To date, no major oil spills have occurred in the Alaska marine environment within the range of polar bears.

Polar bears could come in contact with oil spilled in the marine or land environment, or by ingesting contaminated prey (Neff 1990). Polar bears groom themselves regularly as a means to maintain the insulating properties of their fur, so oil ingestion would also be likely during grooming behavior by a fouled bear (Neff 1990). Polar bears are curious and are likely to investigate oil spills and oil contaminated wildlife. Although it is not known whether healthy polar bears in their natural environment would avoid oil spills and contaminated seals, bears that are hungry are likely to scavenge contaminated seals, as they have shown no aversion to eating and ingesting oil (St. Aubin 1990, Derocher and Stirling 1991).

Due to the seasonal distribution of polar bears, the times of greatest impact from an oil spill are summer and autumn (Amstrup et al. 2000a). This is important because distributions of polar bears are not uniform through time. In fact, near-shore densities of polar bears are two to five times greater in autumn than in summer (Durner et al. 2000), and polar bear use of coastal areas during the fall open water period has increased in recent years in the Beaufort Sea. A large number of bears might be affected by a large oil spill in this area, particularly during the broken ice period. The number of polar bears affected by an oil spill could be substantially higher if the spill spread to areas of seasonal polar bear concentrations, such as the area near Kaktovik, in the fall where polar bears congregate at bowhead whale carcasses. Industrial development in polar bear habitat may also expose individuals to other hazardous substances through improper storage or spills. For example, one polar bear died in Alaska from consuming ethylene glycol in 1988 (Amstrup et al. 1989).

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). The Arctic ecosystem is 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. The persistence and lipophilic nature of organochlorines increase the potential for bioaccumulation and biomagnification at higher trophic levels (Fisk et al. 2001). The highest concentrations of OCs have been found in species at the top of marine food chains such as glaucous gulls which scavenge on marine mammals and polar bears which feed primarily on seals (Braune et al. 2005). Consistent patterns between OC and mercury contamination and trophic status have been documented in Arctic marine food webs (Braune et al. 2005). Southern Beaufort Sea polar bears may have concentrations of mercury close to the toxicity threshold levels of 60 micrograms wet weight reported for marine mammals (AMAP 2005) above this threshold an animal may exhibit adverse effects.

Disease

Except for the presence of *Trichinella* larvae, the occurrence of diseases and parasites in polar bears is relatively rare compared to other bears. Polar bears feed primarily on fat which is relatively free of parasites, except for *Trichinella* (Rogers and Rogers 1976, Forbes 2000). It is unknown whether polar bears are more susceptible to new pathogens due to their lack of previous exposure to diseases and parasites. Many different pathogens and viruses have been found in seal species that are polar bear prey (Duignan et al. 1997, Measures and Olson 1999, Dubey et al. 2003, Hughes-Hanks et al. 2005), so the potential exists for transmission of these diseases to polar bears. As polar bears become more stressed they may eat more of the intestines and internal organs than they do presently, thus increasing their potential exposure to parasites and viruses (Derocher et al. 2004).

Predation of Young

Polar bears have no predators but man and other polar bears (see *Hunting*, above). Intraspecific killing has been reported among all North American bear species. Reasons for intraspecific predation in bears is poorly understood but thought to include nutrition, and enhanced breeding opportunities in the case of predation of cubs. Although infanticide by male polar bears has been documented (Hannsson and Thomassen 1983, Larsen 1985, Taylor et al. 1985, Derocher and

Wiig 1999), it is thought that this does not account for large percentage of the cub mortality. A potential reason for infanticide relates to density-dependent mechanisms of population control as this behavior seems to occur more frequently with increasing population size (Derocher and Wiig 1999).

Cannibalism has been recently documented in polar bears (Derocher and Wiig 1999, Amstrup et al. 2006). Amstrup et al. (2006) observed three non-related instances of intraspecific predation and cannibalism in the southern Beaufort Sea during the spring of 2004. One incident was the first documented predation of an adult female in a den, the second was of a female and newly emerged cub from a den, and the third involved a yearling male. In a combined 58 years of research by the senior investigators similar observations had not taken place. Active stalking or hunting preceded the attacks and the killed bears were partially consumed. Adult males were believed to be the predator in the attacks. Amstrup et al. (2006) indicated that in general a greater portion of polar bears in the area where the predation occurred were in poor physical condition compared to other years. The authors hypothesized that adult males may be the first to show the effects of nutritional stress caused by significant ice retreat in this area (Skinner et al. 1998, Comiso and Parkinson 2004, Stroeve et al. 2005) because they feed less during the spring mating season and enter the summer in poorer condition than other sex/age classes. Derocher and Wiig (1999) documented a similar intraspecific killing and consumption of another polar bear in Svalbard, Norway, which was attributed to relatively high population densities and food shortages. Taylor et al. (1985) documented that a malnourished female killed and consumed her own cubs, and Lunn and Stenhouse (1985) found an emaciated male consuming an adult female polar bear. The potential importance of cannibalism and infanticide for population regulation is unknown. Given our current knowledge of disease and predation, we do not believe that these factors currently are having population-level effects. However, increased cannibalism in polar bears was postulated and thought to be a result of nutritional stress brought on by climate change (Derocher et al. 2004).

Climate Change

Effects of sea ice loss on polar bear populations range wide have been considered by the Service based upon recent information. In 2007, a USGS science team released 9 reports to the Service that included (1) new observational data on polar bears, including updated information on the current status of 3 of the world's 19 subpopulations of polar bears, and (2) projections of the future distribution and abundance of polar bears in the rest of the 21st century, given changes expected in future sea ice conditions. The reports are available at: http://www.usgs.gov/newsroom/special/polar_bears/.

The overall conclusion of the USGS research effort was that if projected changes in future sea ice conditions are realized, approximately two-thirds of the world's current polar bear population will be lost by the mid-21st century. Because the observed trajectory of Arctic sea ice decline appears to be underestimated by currently available models, this assessment of future polar bear status may be conservative (Amstrup et al. 2007).

While climate change will have the largest impact on polar bears in the marine environment, it may also lead to changes in occurrence and vulnerability of polar bears in the terrestrial environment.

An estimated 60% of female polar bears from the SBS stock den on land, while the remaining females den on drifting pack ice (Fischbach et al. 2007). Durner et al. (2006) noted that ice must be stable for ice-denning females to reproduce successfully. As climate change continues, the quality of sea ice may decrease, forcing more females to den on land (Durner et al. 2006). However, if large areas of open water persist until late winter due to a decrease in pack ice, females may be unable to access land to den (Stirling and Andriashek 1992).

Climate change may affect the availability and quality of denning habitat on land. Durner et al. (2006) found that 65% of terrestrial dens found in Alaska between 1981 and 2005 were on coastal or island bluffs. These habitats are suffering rapid erosion and slope failure as permafrost melts and wave action increases in duration and magnitude. In all areas, dens are constructed in autumn snowdrifts (Durner et al. 2003). Changes in autumn and winter precipitation or wind patterns (Hinzman et al. 2005) could significantly alter the availability and quality of denning habitat.

Polar bears' use of coastal habitats in the fall during open-water and freeze-up conditions has increased since 1992 (USFWS 2006). This may increase the number of human – polar bear interactions if bears occur close to human settlements or development. Amstrup (2000) observed that direct interactions between people and bears in Alaska have increased markedly in recent years. The number of bears taken for safety reasons, based on three-year running averages, increased steadily from about three per year in 1993, to about 12 in 1998, and has averaged about 10 in recent years. There are several plausible explanations for this increase. It could be an artifact of increased reporting, or of increased polar bear abundance and corresponding probability of interactions with humans. Alternatively, or in combination, polar bears from the SBS populations typically move from the pack ice to the near shore environment in the fall to take advantage of the higher productivity of ice seals over the continental shelf. In the 1980s and early 1990s, the near shore environment froze by early or mid October, allowing polar bears to effectively access seals in the area. Since the late 1990s, ice formation in the fall has occurred later in November or early December, extending the period the area was not accessible to polar bears. Consequently, bears spent a greater amount of time on land and not feeding. The later formation of near-shore ice increases the probability of bear-human interactions occurring in coastal villages (Schliebe et al. 2006). Some experts predict the number of polar bear – human interactions will increase as climate change continues (Derocher et al. 2004).

5. EFFECTS OF THE ACTION ON LISTED AND CANDIDATE SPECIES

5.1 Introduction

This section of the BO analyzes direct and indirect effects and interrelated and interdependent effects of the Action on listed and candidate species. Impacts are first described for listed eiders, yellow-billed loons, and Kittlitz's murrelets, and then for polar bears.

5.2 Listed Eiders

As described in Section 1 – *Introduction*, both these projects were reviewed under the ESA and formal consultations evaluating their impacts to listed eiders were completed (USFWS 1999; USFWS 2007).

In summary, we estimated Liberty may result in death by collision of one spectacled eider, and a loss of production of 2 spectacled eider eggs/chicks and < 1 Steller's eider egg/chick over the 30-year project life. We estimated and an incidental take of ≤ 2 spectacled eiders and ≤ 1 Steller's eider killed by collision each year at Northstar. However, since 2000 when construction began, regular monitoring at Northstar has not detected any Steller's or spectacled eider collision mortality.

Small spills of crude and refined oil products are anticipated to occur from these projects. Although small spills are likely, spectacled eiders are at very low risk from small marine spills from these projects because the birds occur at very low densities in the project areas (so few individuals are at risk), and these types of spills are relatively easily contained and cleaned up. The risk for Steller's eiders is even lower as they rarely occur as far east as the project areas. Therefore, the Service does not anticipate listed eiders will be taken as a result of small spills from these projects.

In contrast to small spills, large spills to marine waters have a relatively low probability of occurring (estimated at 13% probability of occurring for the Northstar project, and 8% probability for the Liberty project). However, they may cause significant impacts if they do occur. The effect of a large spill to the Beaufort Sea on avian species from the Liberty field was evaluated by Stehn and Platte (2000). This analysis compared bird distribution observed during aerial surveys with oil spill trajectory models developed by MMS. Oil did not contact spectacled eiders in 451 of 500 simulated large marine spills. The maximum number of spectacled eiders contacted by oil in these spill simulations was 52; mean number contacted was 1.7 birds. Therefore, even if a large spill occurs (which is an unlikely event), the number of likely spectacled eiders fatalities is estimated to range from 0-52. Steller's eiders distribution on the ACP is well to the west of Liberty. Therefore, the Service considers it highly unlikely a spill from Liberty would contact and kill a significant portion, or indeed any, Steller's eiders.

While a similar analysis was not conducted for the Northstar field, it is reasonable to conclude a large spill from Northstar would result in a similar levels of spectacled and Steller's eider mortality as the facilities are geographically close (Northstar at approximately 148^{o}41'W and Liberty (Endicott SDI) at 147^{o}52'W). Longitude is important in determining potential effects because the numbers of listed eiders nesting on the North Slope, and hence migrating through the area, decreases as you move east. Only 6.62% of spectacled eider observations made during the Service annual aerial surveys were east of 149^{o}W and very few Steller's eiders are observed in this area or further east (Service data). While a large oil spill may spread and eventually cover a large area, large numbers of listed eiders do not appear to use the area of the Beaufort Sea proximal to these development projects and we do not anticipate significant mortality levels in the unlikely event a large spill to marine waters occurs.

5.3 Yellow-billed loons

The construction of offshore gravel islands for the Northstar and Liberty projects resulted in the loss of some marine habitat. However, the Service does not consider this type of habitat to be limiting for yellow-billed loons in the Beaufort Sea, and no evidence was found suggesting the area is heavily used by this species. Therefore, this small loss of habitat is not likely to adversely affect yellow-billed loons.

Disturbance from human activities could adversely affect yellow-billed loons by displacing them from feeding areas and altering their behavior. Activities at Northstar Island and the Liberty facilities may displace yellow-billed loons from an area around the facilities. The impacted area is small in relation to the size of available marine habitat in the Beaufort Sea. Further, disturbance from these facilities is relatively constant in intensity and space, possibly allowing birds to habituate to it, and is not anticipated to result in measurable adverse effects.

As described above, small spills of crude and refined oil products are anticipated to result from these projects. Based on radio-telemetry data, yellow-billed loons breeding on the North Slope of Alaska could be present in the project area from May through October, during migrations and breeding (Schmutz 2008 *pers. comm.*). Additionally, loons breeding in Canada may stop in the area during migration along the Beaufort Sea coast. Yellow-billed loons have been observed in nearshore waters and along barrier islands in the vicinity of the projects, but at low density (Dau and Larned 2007). Although small spills are likely, the risk to yellow-billed loons is low because the birds occur at very low densities in the project areas (so few individuals are at risk). If a large marine spill (an unlikely event) were to occur between May and October, oil could contact and kill low numbers of yellow-billed loons.

It is also possible that yellow-billed loons could collide with Northstar and Liberty project structures as they move through the area during migrations and while foraging in nearshore waters during the breeding season. Many avian species are at risk of collision with objects in their path, particularly when visibility is impaired during darkness or inclement weather (Weir 1976). The Service is not aware of information on the propensity of yellow-billed loons to collide with structures. Avian collision monitoring has been carried out at Northstar Island since 2000 and no yellow-billed loon fatalities have been recorded.

5.4 Kittlitz's murrelets

As described in Section 3 – *Status of Species*, Kittlitz's murrelets are closely associated with marine tidewater glaciers. The primary distribution and breeding range of Kittlitz's murrelets occurs in southeast Alaska, with some individuals occurring in the Chukchi Sea. However, there is no evidence to suggest that Kittlitz's murrelets occur in significant numbers in the Beaufort Sea, particularly not as far east as the Northstar and Liberty facilities. Therefore, adverse effects to this species from the Northstar and Liberty projects are not likely.

5.5 Polar Bears

In addition to protection under the ESA, the polar bear is also protected under the Marine Mammal Protection Act of 1972 (MMPA). Under the MMPA, the Service has promulgated the Beaufort Sea Incidental Take Regulations (Beaufort ITRs) for Alaska's oil and gas industry operating in, and adjacent to, the Beaufort Sea. Both the Liberty and Northstar projects were included in these regulations. The Beaufort ITRs include: 1) measures to ensure the least practicable adverse impact on the species by Industry activities; 2) require monitoring and reporting of impacts to the species, and 3) permissible methods of non-lethal, incidental take of small numbers of polar bears under MMPA.

Because the Northstar and Liberty projects have been operating under the Beaufort Sea ITRs, their impacts to polar bears to date have been monitored and reported to the Service. This data was used in the development of the BO.

Project activities could impact polar bears in various ways during both open-water and ice-covered seasons. Potential direct and indirect effects of the activities from physical obstructions; noise disturbance; human encounters; effects on prey species, and oil and fuel spills are described below.

Barriers to Polar Bear Movements
Northstar Island and the Liberty facilities could act as physical barriers to movements of polar bears. Northstar may be approached by polar bears, but due to the continuous sheet pile walls around its perimeter bears may not gain access to the facility itself. This situation may present a small-scale, local obstruction to the bears' movement, but also minimizes the likelihood of human-bear encounters. Causeways and facilities at Endicott, including those associated with the Liberty project, may act as barriers to movements of polar bears because they extend continuously from the coastline to the offshore facility. However, because polar bears appear to have little or no fear of man-made structures they have frequently been observed crossing existing roads and causeways in the Prudhoe Bay oilfields. Given the size of these structures and polar bears' lack of fear and ability to move over and around them, adverse effects from obstruction are not anticipated to result from these projects.

Disturbance and Displacement
During the ice-covered season, mobile non-denning bears and denning females could be disturbed by activities at Northstar and Liberty. The best available scientific information indicates that female polar bears entering dens, or females in dens with cubs, are more sensitive than other age and sex groups to noises.

Disturbance can originate from either stationary (e.g., Northstar Island or the Liberty portion of the Endicott SDI) or mobile sources. Possible stationary sources include maintenance, repair, and remediation activities; operations; flaring excess gas; and drilling at these facilities. Mobile sources include vessel and aircraft traffic, ice road construction and associated vehicle traffic, including tracked vehicles and snowmobiles.

Stationary Sources
Typically, most polar bears occur in the active ice zone, far offshore. However, some bears also spend a limited amount of time on land, coming ashore to feed, den, or move to other areas. If fall storms and ocean currents deposit ice-bound bears on land, they may remain along the coast or on barrier islands for several weeks until the ice returns.

Disturbance from stationary activities could elicit several different responses in polar bears. Noise may act as a deterrent to bears entering the area, or conversely, it could attract bears. Attracting bears to these facilities may result in human–bear encounters, leading to unintentional harassment, or intentional hazing of the bear (see *Human-Bear Interactions* below).

However, there is evidence that disturbance from stationary sources results in minor changes in behavior of polar bears. For example, in 2007 at the Intrepid exploration site located on the Chukchi Sea coast south of Barrow, a female bear and her cub were observed approximately 100 meters from a pad. The bear did not appear concerned about the activity and ultimately changed her direction of movement and left the area. Similar encounters between polar bears and oil activities on the Beaufort Sea coast have been documented.

During the ice-covered season, noise from stationary activities may deter females from denning in the surrounding area. However, polar bears have been known to den near industrial activities without any observed impact. For example, in 1991 two maternity dens were located on the south shore of a barrier island within 2.8 km (1.7 mi) of a production facility. During the ice-covered seasons of 2000-2001 and 2001-2002, active dens were located within approximately 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. As noise and activity at Northstar and Liberty is ongoing, we would not anticipate adverse effects to denning polar bears from stationary disturbance sources, because bears would presumably be habituated to the disturbance, or select a den site away from the facilities.

Mobile Sources

Polar bears are known to run from sources of noise and the sight of vessels or icebreakers and aircraft, especially helicopters.

During the open-water season, most polar bears remain offshore on the pack ice and are not typically present in the area of vessel traffic. Barges and vessels transporting materials for the Northstar and Liberty projects would travel in open-water and avoid large ice floes. If there is an encounter between a vessel and a bear, it would most likely result in short-term behavioral disturbance only.

Extensive or repeated overflights by helicopters travelling to and from Northstar could disturb polar bears. Behavioral reactions of non-denning polar bears should be limited to short-term changes in behavior and would have no long-term impact on individuals and no impacts on the polar bear population. While it is possible overflights may cause denning bears to abandon or depart their dens early in response to repeated noise, this is unlikely as helicopters travelling to and from Northstar are required to use a standard flight path and conform to altitude restrictions, when it is safe to do so. Therefore, we assume any bears denning along this route are habituated to this source of disturbance.

A winter ice road is often constructed to Northstar Island and is used to transport personnel and equipment to and from the facility. However, after visiting the area the Service's MMM office concluded there is no denning habitat along the routes used so impacts to denning polar bears from the construction and operation of this ice road are not anticipated (Craig Perham, MMM Office, *pers. Comm.*).

The Liberty facilities on Endicott SDI have road access to them. Non-denning polar bears may be temporarily displaced, or their behavior modified (e.g., by changing direction or speed of travel), by traffic using this road but impacts are not anticipated to be significant. As disturbance form traffic on the road is continous, we assume denning females will avoid the area or become habituated to this source of disturbance and not suffer adverse effects from road disturbance during denning.

Human-Bear Interactions

Human encounters can be dangerous for both the polar bear and the human. Whenever humans work in the habitat of the animal, there is a chance of an encounter, although historically encounters have been uncommon in association with oil and gas activities.

Although bears may be found along the coast during open-water periods, most of the polar bears in the Action Area inhabit the multi-year pack ice during this time of year. Encounters are more likely to occur during fall and winter when greater numbers of polar bears are found in the coastal environment searching for food and possibly den sites. BP Alaska takes steps to actively prevent bears from accessing facilities, such as using safety gates and fences, however, some human-polar bear interactions do occur.

Documented impacts on polar bears by the oil and gas industry in the Beaufort Sea during the past 30 years are minimal. Annual monitoring reports from the North Slope oil industry indicates polar bears are increasing time on land, perhaps in response to changing ice conditions. Fall storms, which are happening with increased frequency and severity, may be forcing bears to concentrate along the coastline where they remain until ice returns. For this reason, polar bears have been observed with increased frequency near coastal and offshore production facilities, or along roads and causeways that link these facilities to the mainland. During those periods, the likelihood of interactions between polar bears and Industry activities increases.

The majority of impacts to polar bears in the Beaufort Sea have resulted from direct human–bear encounters. As discussed above, polar bears may be attracted to Northstar and Liberty facilities, particularly if they are forced onto shore by autumn storms, etc. The number of polar bears observed at these facilities, and the type of interaction / impacts to the bears is recorded, as required by the LOAs issued to BP Alaska (the facility operator). Table 5.1 shows the number of bears observed at the facilities, and the number that involved Level B harassment, as defined under the MMPA, where bears were deterred from the area without injury. No bears have been injured, and no lethal take of polar bears has occurred at either of these facilities.

Table 5.1 – Polar bear sightings at Liberty and Northstar facilities from 2000 – 2008

Data from D. Sanzone, BP Exploration (Alaska) Inc.

Year	Liberty^	Northstar
2000	-	19
2001	-	22
2002	-	15
2003	-	6
2004	-	24
2005	-	14
2006	-	5 (3)
2007	-	19 (4)
2008	15 (6)	7 (2)

Numbers in parentheses indicate the number of sightings that involved some type of hazing.
^ The Liberty was not active before fall 2007.

BP Alaska has obtained LOAs for Liberty and Northstar. These LOAs have required BP Alaska to implement mitigation measures, including development and implementation of a polar bear interaction plan. These plans include a range of measures such as: (1) use of detection systems, such as bear monitors, motion and infrared detection systems; (2) use of safety gates and fences; (3) implementation of appropriate garbage disposal and snow management procedures; and (4) identifying the chain of command for responding to a polar bear sighting.

Employee training programs are also in place and aim to educate field personnel about the dangers of bear encounters and to implement safety procedures in the event of a bear sighting. The result of these polar bear interaction plans and training allows personnel on site to detect bears and respond safely and appropriately. Often, personnel are instructed to leave the area when bears are seen. Many times polar bears are monitored until they leave the area. Sometimes, this response involves deterring the bear from the site. If it is not possible to leave, in most cases bears can be displaced by using pyrotechnics (e.g., cracker shells) or other forms of deterrents (e.g., a vehicle horn, vehicle siren, vehicle lights, spot lights, etc.). The purpose of these plans and training is to eliminate the potential for injury to personnel or lethal take of bears in defense of human life.

Since the Beaufort Sea ITRs went into effect in 1993, there has been no known instance of an adult bear being killed or industry personnel being injured by a bear as a result of oil and gas industry activities. The mitigation measures associated with these regulations have been proven to minimize human-bear interactions and will continue to be requirements of future LOAs, as appropriate. Based upon the demonstrated effectiveness of the mitigation measures, the Service anticipates that activities at Northstar and Liberty will continue to result in only non-lethal human-polar bear interactions.

Effect on Prey Species
Ringed seals are the primary prey of polar bears and inhabit the nearshore waters that surround Northstar and abut the Liberty facilities. Seals may be adversely affected through contamination (oil spills) and noise disturbance from industrial activities. Contamination impacts are described in the following section. Studies have shown that seals can be displaced from certain areas, such as pupping lairs or haulouts, and abandon breathing holes near oil and gas industry activity, although significant effects to these species from oil development activities in the Beaufort Sea have not been documented. Unless a large oil spill reaches marine waters the Service does not anticipate the Northstar or Liberty projects to significantly affect prey species in a manner that would result in measurable adverse effects to polar bears.

Crude Oil and Refined Oil Spills
Potential impacts from oil spills from Northstar or Liberty are a major concern to the Service. Polar bears could encounter oil spills during open-water or ice-covered seasons in offshore or onshore habitat. Although the majority of polar bears spend a large amount of their time offshore on the pack ice, some bears may encounter oil from a spill regardless of the season.

Polar bears could be exposed to petroleum hydrocarbons through direct contact with spills in the marine or land environment, or by ingesting contaminated prey (Neff 1990). Polar bears groom themselves regularly as a means of maintaining the insulating properties of their fur, so oil ingestion would also be likely during grooming by a fouled bear (Neff 1990). Some direct information on oiled polar bears comes from an experimental study (St. Aubin 1990) in which two polar bears were involuntarily forced into a pool of oil for 15 minutes and then observed. The animals immediately attempted to clean the oil from their paws and forelegs by licking, and continued grooming trying to clean their fur for five days. After 26 days one bear died of liver and kidney failure and the other bear was euthanized at day 29. Gastrointestinal fungus-containing ulcers, degenerated kidney tubules, low-grade liver lesions, and depressed lymphoid activity were found during necropsy (St. Aubin 1990). Other effects included loss of hair (Derocher and Stirling 1991), anemia, anorexia, and stress (St. Aubin 1990).

Additionally, polar bears are curious and may investigate oil spills or oil-contaminated wildlife. Although it is not known whether healthy polar bears in their natural environment would avoid oil spills and contaminated seals, bears that are hungry are likely to scavenge contaminated seals, as they have shown no aversion to eating and ingesting oil (St. Aubin 1990, Derocher and Stirling 1991).

During the ice-covered season, mobile, non-denning bears would have a higher probability of encountering oil than non-mobile denning females. In winter polar bears are relatively sparsely distributed in the project areas such that even a large spill would be unlikely to contact more than a few individual polar bears. However, near-shore densities of polar bears are two to five times greater in autumn than in summer (Durner et al. 2000), and polar bear use of coastal areas during the fall open water period has increased in recent years in the Beaufort Sea. Therefore, the largest potential impacts were a spill to occur would be in summer and autumn (Amstrup et al. 2000a).

Oil may also affect food sources of polar bears. A local reduction in ringed seal numbers as a result of direct or indirect effects of oil could temporarily affect the local distribution of polar bears. The loss of a food source could reduce recruitment or survival.

In assessing the effects of the activities covered by the Beaufort Sea ITRs, the Service conducted an oil spill risk assessment analysis that considered the oil spill probability for Northstar and the Liberty field if it were to be developed from an offshore facility (the current Endicott SDI expansion has a much lower spill risk than the modeled development). The oil spill risk assessment considered oil spill trajectory models linked to a polar bear distribution model based on location of satellite-collared females during September and October. A detailed description of the assessment, including methodology, can be found in the final rule promulgating the current Beaufort Sea ITRs (71 FR 43938-43941).

The analysis concluded the probability of a large oil spill from Northstar causing the mortality of 5 or more bears ranged from 1.0% - 3.4%; 10 or more bears was 0.7% - 2.3%; and 20 or more bears was 0.2% - 0.8%. For Liberty, the probability of a spill causing the mortality of 5 or more bears ranged from 0.3% - 7.4%; 10 or more bears was 0.1% - 0.4%; and 20 or more bears was 0.1% - 0.2%. This analysis suggests even if a large spill were to occur from either of these facilities, the number of polar bears that would be impacted is low. In the event of an oil spill, it is also likely that polar bears would be intentionally hazed to keep them away from the area, further reducing the likelihood large numbers of individuals would be impacted.

Toxic Contamination
Industrial development of any kind in polar bear habitat may also expose individuals to other hazardous substances through improper storage or spills. For example, one polar bear died in Alaska from consuming ethylene glycol in 1988 (Amstrup et al. 1989). Although it is possible that polar bears may be adversely affected by toxic contamination from the Northstar and Liberty projects the Service considers this unlikely, and such an incident would not impact more than a very small number of individuals.

6. 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 considered in this BO. Future Federal actions are not considered in this section because they will require separate consultation under the ESA. 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, be they in Federal or State waters would require Federal permits (such as section 404 of the Clean Water Act authorization from the U.S. Army Corps of Engineers, and National Pollution Discharge Elimination System permits from the Environmental Protection Agency) and, therefore, are not considered cumulative impacts under the ESA.

Gas Line
MMS now considers the development and export of North Slope natural gas via pipeline to be reasonably foreseeable. This line may result in gas being developed from the Liberty and Northstar facilities. However, a project of this magnitude would require Federal permits and section 7 consultation. It is therefore, not a cumulative effect under the ESA.

Commercial fishing
Reduction in the extent and duration of sea ice may increase the potential for commercial fishing in the region, but the likelihood and magnitude of these activities are unknown at this time. Future commercial fisheries in the Action Area would likely be managed by the National Marine Fisheries Service, and the issuance of regulations would require section 7 consultations, and are therefore 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 coastguard activities. The United States Coastguard conducted a number of major exercises in Arctic waters during 2008 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 number of vessels that may operate in these waters in the future and the magnitude of potential risk they pose. As more information becomes available we will amend the environmental baseline and consider these impacts.

7. CONCLUSIONS

Listed Eiders

As discussed earlier, the effects of the Northstar and Liberty projects to listed spectacled and Steller's eiders were evaluated in previous BOs (USFWS 1999, USFWS 2007). The Service concluded these projects did not violate section 7(a)(2) of the ESA and incidental take for listed eiders was provided. Adverse effects to listed eiders were anticipated through habitat loss, collisions, an increase in predators, and through crude and refined oil spills if they occur. We have reviewed these BOs in the context of the current environmental baseline and the status of species. While Steller's eider numbers are of concern, very few Steller's eiders nest as far east as Liberty and Northstar, and hence are not at significant risk from these projects. Monitoring at Northstar since 2000 has not detected any collision or other mortality of listed eiders from this project. Therefore, the Service has determined our previous conclusion that these projects will not violate section 7(a)(2) of the ESA remains valid.

Polar Bears

After reviewing the current status of polar bears, the environmental baseline, effects of the proposed activities, and cumulative effects, it is the Service's biological opinion that activities associated with the Northstar and Liberty projects are not likely to jeopardize the continued existence of this species.

However, these projects may adversely affect polar bears by through disturbance, human-polar bear interactions, and through crude and refined oil spills if they occur. With the exception of oil spills, adverse effects are likely limited to minor changes in bear behavior and are not anticipated to result in polar bear mortality. A large marine oil spill has a low probability of occurring, however, if one does occur it could result in the death of low numbers (likely < 20) polar bears from the Beaufort Sea population. Although cause for concern, even if this level of take were to occur, it would not jeopardize the continued existence of polar bears as this species is listed range-wide, with the global population currently estimated at 20,000-25,000 bears (Schliebe et al. 2006).

Candidate Species

Although the ESA does not require consultation for candidate species, by mutual agreement with the MMS, we have evaluated potential impacts to Kittlitz's murrelets and yellow-billed loons in anticipation of possible future listing. Although limited information currently exists regarding the specific distribution of the species, Kittlitz's murrelets do not appear to regularly occur in Action Area, and hence we conclude the Northstar and Liberty projects are not likely to impact this species. Small numbers of yellow-billed loons may be adversely affected by these projects through collisions with structures, and mortality in the event of a large marine oil spill. However, we believe population level effects of collisions or oil spills are very unlikely to occur, and conclude that potential impacts do not reach the jeopardy threshold for this species. We appreciate the willingness of MMS to proactively consider the conservation needs of candidate species.

8. 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, the 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 MMS so they become binding conditions of any permit or authorization issued to BP Alaska for the exemption in section 7(o)(2) to apply. MMS has a continuing duty to regulate activities covered by this incidental take statement. If the MMS (1) fails to assume and implement the terms and conditions, or (2) fails to require any applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse.

8.1 Listed Eiders

As described earlier, the effects of the Northstar and Liberty projects on listed eiders were evaluated in previous BOs (USFWS 1999, USFWS 2007). The Service reviewed the incidental take estimates for Steller's and spectacled eiders provided in these previous BOs and believes they remain valid.

In summary, we estimate the Liberty project may result in death by collision of one spectacled eider over the 30-year project life, and a loss of production of 2 spectacled eider eggs/chicks and < 1 Steller's eider egg/chick. The Northstar project provided an incidental take of ≤ 2 spectacled eiders and ≤ 1 Steller's eider killed by collision each year. However, since 2000 when construction began, regular monitoring at Northstar has not detected any Steller's or spectacled eider collision mortality.

While incidental take authorization is not provided for oil spills (as they are not an otherwise legal activity), the potential impacts of oil spills were analyzed to provide information upon which a jeopardy determination can be made. A summary of this analysis is provided in Section 5 – *Effects of the Action*.

8.2 Polar Bears

Protections under the Marine Mammal Protection Act
All activities that may take[1] polar bears are subject to prohibitions of the MMPA. However, there are several mechanisms through which the incidental take of small numbers of marine mammals, including polar bears, can be authorized under the MMPA. The most commonly used is through the issuance of incidental take regulations (ITRs). Before the Service can provide incidental take authorization for polar bears under the ESA, take of marine mammals must first be authorized under the MMPA.

On August 2, 2006 ITRs were issued for the Beaufort Sea (71 FR 43925). These ITRs assessed seismic, exploratory drilling, development, and production activities on North Slope and Beaufort Sea, including the Northstar and Liberty projects. Letters of Authorization (LOAs) issued under these regulations authorize the nonlethal, incidental, unintentional take of small numbers of polar bears and Pacific walrus during year-round oil and gas industry exploration, development, and production operations in the Beaufort Sea and adjacent northern coast of Alaska until August 2, 2011. BP Alaska, the operator of Northstar and Liberty, has applied for and received LOAs for operations at Northstar and Liberty.

The Service has conducted intra-service programmatic section 7 consultations on the Beaufort Sea ITRs. This programmatic consultation provided incidental take authorization under the ESA when an LOA is issued.

In addition to LOAs, BP Alaska may also apply for intentional take permits. These permits, issued under sections 101(a)(4)(A), 109(h), and 112(c) of the MMPA allow the non-lethal harassment of polar bears to deter them from facilities to reduce the likelihood of death or injury of polar bears. These types of activity (considered Level B harassment) will only occur for:

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[1] As defined by the MMPA, take means "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal" (§3(13)). The definition is expanded in 50 CFR 18.3: "… including, without limitation, any of the following: The collection of dead animals or parts thereof; the restraint or detention of a marine mammal, no matter how temporary; tagging a marine mammal; or the negligent or intentional operation of an aircraft or vessel, or the doing of any other negligent or intentional act which results in the disturbing or molesting of a marine mammal." *Harassment* means "any act of pursuit, torment, or annoyance which – (i) has the potential to injure a marine mammal or marine mammal stock in the wild; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering" (§3(18)(A)). The MMPA refers to (i) as "*Level A harassment*" (§3(18)(C)) and (ii) as "*Level B harassment*" (§3(18)(D)).

1. The protection or welfare of the animal;
2. The protection of the public health and welfare; or
3. The non-lethal removal of nuisance animals.

Incidental Take Estimates
Although incidental take under the ESA is not provided in this BO, we have assessed potential impacts to polar bears to ensure activities that may result from the Northstar and Liberty projects do not jeopardize the continued existence of the species as required under section 7(a)(2) of the ESA. As described in Section 5 – *Effects of the Action*, activities that may result from the Action could adversely affect polar bears through disturbance, human-polar bear interactions, and spills of oil and toxic substances that may result in hazing the bear to change its behavior.

As part of their LOAs, BP Alaska, the operator of the Northstar and Liberty facilities, is required to report the number of polar bears observed at the facilities, and if these bears were hazed away from the area (Table 5.1). As future activities at these facilities are anticipated to be similar to past activities, these figures can provided us an estimate of incidental take.

We assume that each facility (Northstar and Liberty) may alter polar bear behavior to a minor extent 15 times each year, which is the average number of polar bears observed at these facilities each year since their construction. The number of human-polar bear interactions that result in the hazing of a polar bear is harder to quantify as there is less data available, and the number of hazing incidents appears to have increased in recent years. Therefore, we based our estimate of incidental take as a result of hazing on data reported from the last three years. We estimate that 6 hazing incidents may occur at Liberty and 3 at Northstar each year. No lethal take of polar bears is anticipated or authorized at either facility.

The most significant impacts to polar bears from these projects would occur in the event of a large marine oil spill. As described in Section 5 – *Effects of the Action*, this is considered to be an unlikely event. However, was such a spill to occur, it is possible that small numbers of polar bears (likely < 20) could be killed. No incidental take for oil spills has been, or will be, provided.

9. REASONABLE AND PRUDENT MEASURES

In addition to providing incidental take for listed eiders, the previous BOs for the Northstar and Liberty projects also required MMS, and their agent BP Alaska to undertake a number of RPMs and their implementing terms and conditions. These RPMs and terms and conditions are still in effect and should be continued.

Incidental take for polar bears under the ESA for these projects will be issued at the time take is authorized under the MMPA. Reasonable and Prudent Measures and their implementing terms and conditions will also be provided at this time.

10. TERMS AND CONDITIONS

To be exempt from the prohibitions of Section 9 of the ESA, MMS and their agent, BP Alaska, must comply with the terms and conditions described in the Northstar and Liberty BOs (USFWS 1999, USFWS 2007), and in LOAs issued for the Northstar and Liberty projects. These terms and conditions are non-discretionary.

11. 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. We recommend the following action be implemented:

MMS and BP Alaska are encouraged to:

- Continue to support research to improve our understanding of Steller's and spectacled eiders, the reasons for their decline, and assist in focusing and conducting recovery efforts.

In order for the Service to be kept informed of actions affecting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

12. REINITIATION NOTICE

This concludes formal consultation on the effects of the Northstar and Liberty projects on polar bears, and a reevaluation of the effects of these projects on listed eiders and candidate species. 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 if:

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

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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