BIOLOGICAL OPINION

for

MUSTANG DEVELOPMENT PROJECT: MILUVEACH RIVER POA-2012-236

Consultation with the
U.S. Army Corps of Engineers
Anchorage, Alaska

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Table of Contents

List of Figures

List of Tables

1. INTRODUCTION

This document transmits the U.S. Fish and Wildlife Service's (Service) Biological Opinion (BO) on a proposal by Brooks Range Petroleum Corporation (BRPC) to develop the Mustang Project, which would access a hydrocarbon reservoir near the Miluveach River in the Kuparuk River Unit west of Deadhorse, Alaska. Because the project will impact waters of the United States, BRPC has requested a section 404 permit from the U.S. Army Corps of Engineers (USACE). BRPC submitted two separate Biological Assessments (one regarding listed eiders and the other regarding polar bears) for the Mustang Project (BA) prepared by Oasis Environmental Inc. to the Service on August 21, 2012.

This BO describes the effects of the proposed action on Alaska-breeding Steller's eiders (*Polysticta stelleri*), spectacled eiders (*Somateria fischeri*), and polar bears (*Ursus maritimus*) pursuant to section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.). We used information provided in the project BAs; project-specific communications with the USFWS Alaska Region Marine Mammal Management (USFWS MMM) office; other Service documents; and published and unpublished literature to develop this BO.

Section 7(a)(2) of the ESA states that Federal agencies must ensure that their activities are not likely to:

- Jeopardize the continued existence of any listed species, or
- Result in the destruction or adverse modification of designated critical habitat.

The Service has determined the proposed action may affect but is not likely to adversely affect Steller's eiders but may adversely affect spectacled eiders, and polar bears.

Following review of the status and environmental baseline of spectacled eiders and polar bears, and analysis of the potential effects of the proposed action to these listed entities, the Service has concluded the proposed action is not likely to jeopardize the continued existence of spectacled eiders or polar bears.

If you have comments or concerns regarding this BO, please contact Ted Swem, Endangered Species Branch Chief, Fairbanks Fish and Wildlife Field Office at (907) 456-0441.

2. DESCRIPTION OF THE PROPOSED ACTION

Project Overview

The proposed components of the Mustang Development Project include a production drill site (Mustang Development Pad, MDP) and associated drilling and production structures, 8.16-km (5.07-mi) of interconnecting gravel roads, and 228.6-m (750-ft) of pipelines (Figure 2.1). Pipelines will transport produced crude and water from the MDP to existing Alpine Transportation Company pipelines. The Mustang Development Project would be connected by gravel road to the Kuparuk oilfield infrastructure west of DS-2M. Ice roads would be constructed during the winter of 2013 in support of pipeline and culvert placement. Construction is planned to occur over 2 years (2013–2014), with gravel placement also occurring during winter of 2013. The operational life of the Mustang Development Project is expected to be approximately 15 years with peak oil production estimated at 15,000 barrels per day.

Brooks Range Petroleum Corporation has proposed the following schedule for development of the Mustang project:

- winter/spring 2013: open gravel mine, place production pad and access roads
- spring/summer 2013 – spring 2014: install process facility and utility systems.
- Winter 2014: build pipeline
- Spring 2014: start of field production
- End of field life (~15 years): gravel mine rehabilitation could occur as early as spring 2013.

Action Area

The action area is the area in which direct and indirect effects of the action to listed species and designated critical habitat may occur. The area directly affected by the proposed project includes a gravel pad and roads, pipelines, ice roads, the gravel mine site, and areas potentially affected by terrestrial or marine spills. The area indirectly affected by the proposed project is delineated by a zone of influence[1] surrounding new infrastructure within which listed species may be affected by disturbance resulting from construction activities.

The Mustang Development Project Environmental report (OASIS 2012a) delineates the action area as encompassing a rectangular area approximately 4.5-mi (7.24-km) southwest of DS-2M of the Kuparuk River Unit (Figure 2.2).

[1] This zone of influence is assumed to be 200 m (656 ft) for spectacled eiders and 1.6 km (1 mi) for polar bears.

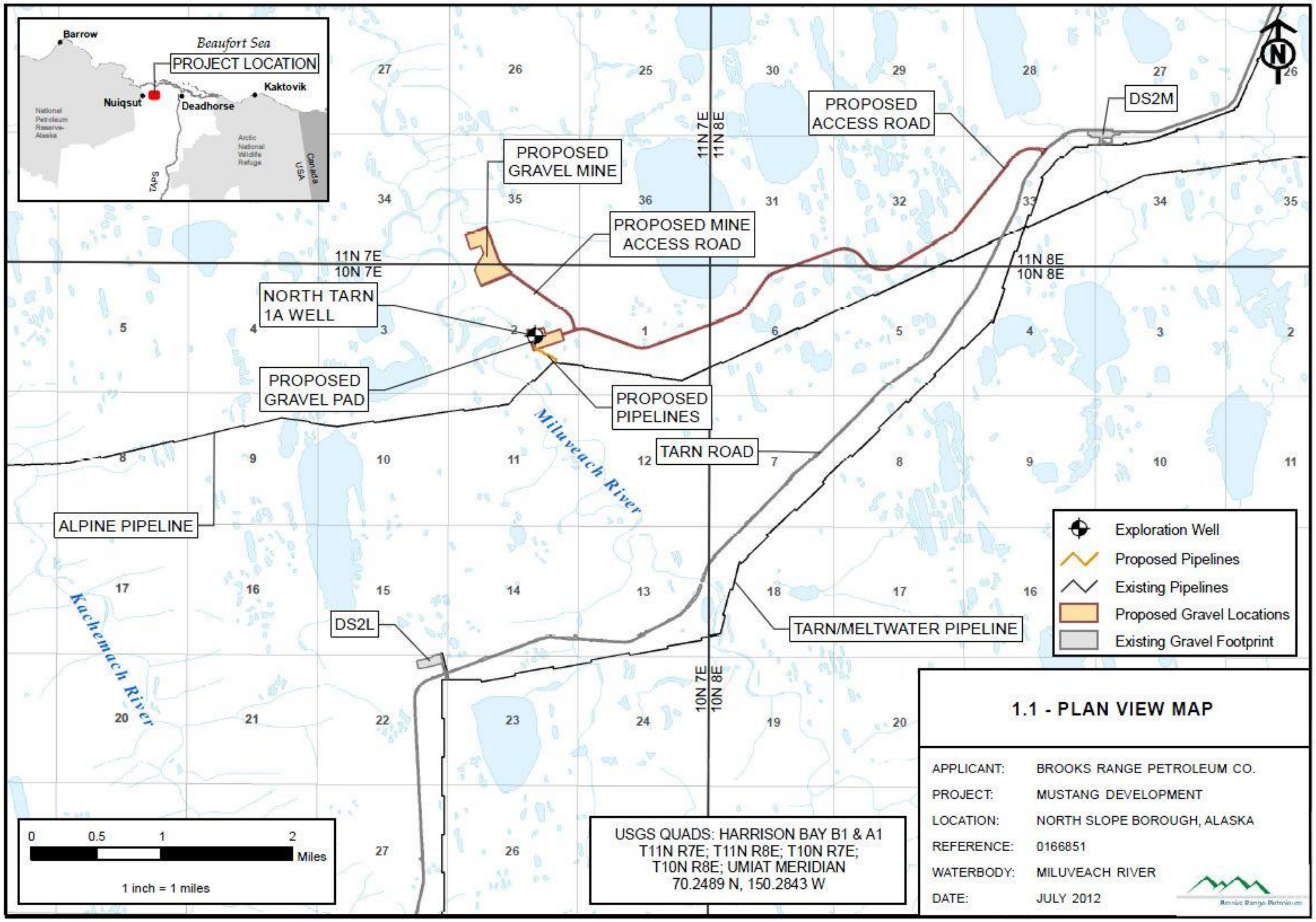


Figure 2.1. The Mustang Development Project area; proposed and existing infrastructure (OASIS 2012b and c).

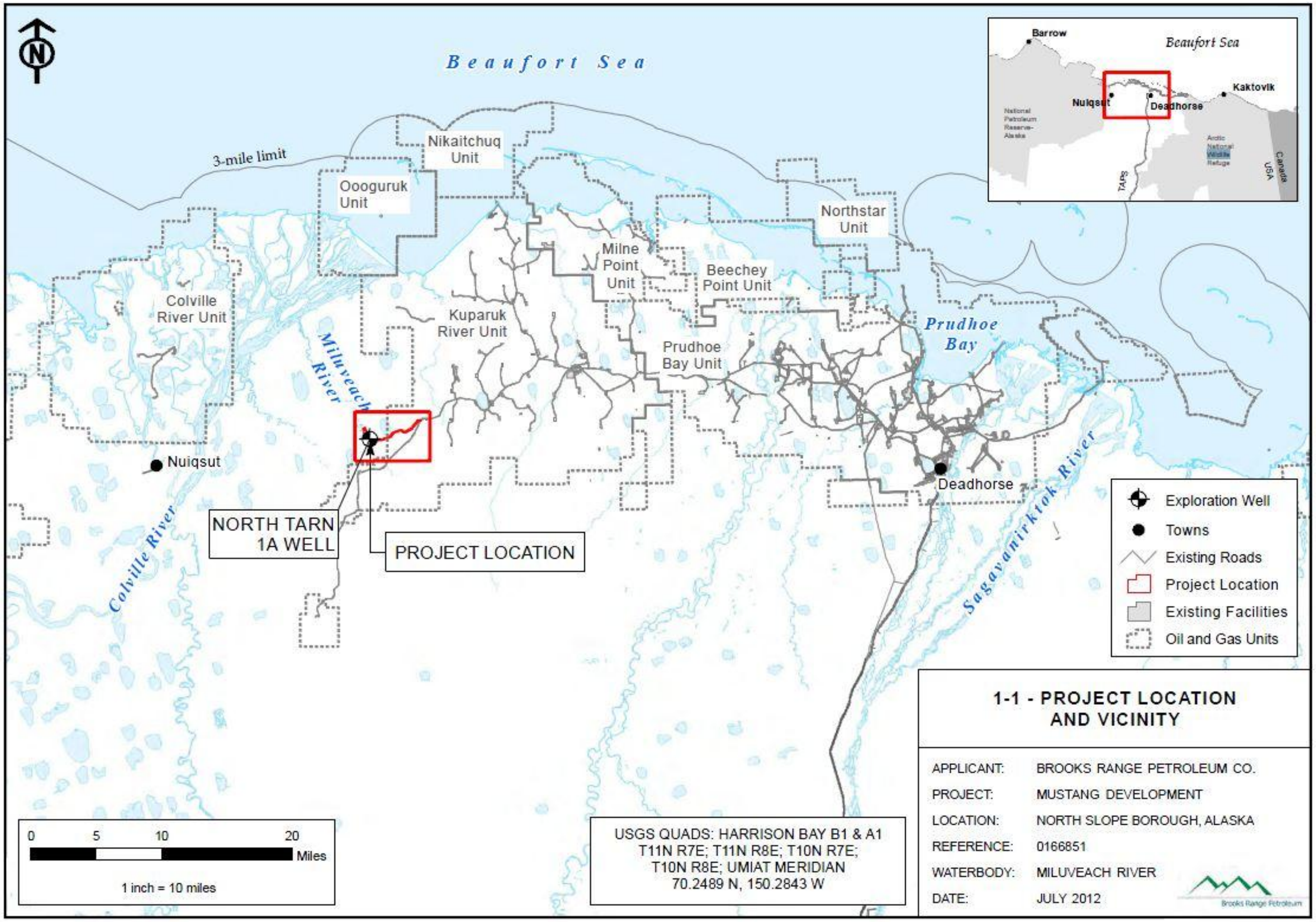


Figure 2.2. The Mustang Development Project action area (OASIS 2012a) in context of the Kuparuk River Unit and Deadhorse.

Proposed Action
Project components and associated construction, operations, and maintenance activities are summarized below. Project infrastructure and implementation are described further in the Mustang Development Project BAs (OASIS 2012b and c).

MDP
The MDP drillsite would be constructed during winter and spring of 2013, and the gravel footprint would be 0.08-km² (19.2 acres). The MDP would support drilling and production operations and is designed to accommodate up to 38 production and injection wells on 4.6-m to 9.1-m (15 to 30-ft) spacing. The MDP drillsite would be protected from damage by seasonal flooding and erosion with gravel bag protection around the pad's perimeter (Figure 2.3).

Facilities at MDP would be installed from summer 2013 through spring 2014. Process and utility systems would include a three-phase central processing facility, tank farm, well tie-ins, pipe rack, headers, well test separation for production allocation, an approximately 120-bed operations camp and 250-bed construction camp, an operations support center, construction support center, communications tower and module, portable generation plants, and heavy equipment. Field production would begin as early as spring 2014.

Access roads
Two 9.8-m (32-ft) wide gravel roads would be constructed to connect the project pads to the Kuparuk infrastructure. The MDP access road would be 7.1-km (4.4-mi) in length and cover approximately 0.07-km² (17.1 acres) of tundra. The gravel mine access road would be 1.1 km in length (0.67-mi) and cover approximately 0.01 km² (2.6 acres). Road construction would occur in winter and spring of 2013.

Pipelines
Two pipelines would be placed on vertical support members (VSMs) at a minimum height of 2.1-m (7-ft) from the tundra surface. A 0.2-m (8-in) diameter pipeline would transport crude from the drillsite to the Alpine Transportation Company pipeline (Figure 2.1). A second parallel 0.02-m diameter pipeline would transport water from the Alpine source water pipeline approximately 228.6-m (750-ft) to the MDP. The VSMs would be spaced approximately 17-m (55-ft) apart, and construction would occur during the winter of 2014. Monitoring of the pipelines would include pipeline inspection gauge (PIG) valves and periodic visual inspection from the adjacent road.

Gravel mine
The primary gravel source would be a new mine site located 1.04-km (3400-ft) north of the MDP (Figure 2.1). This mine site would be developed in the winter of 2013. Gravel would be removed from an area approximately 0.2-km² (46.3-acres), and total

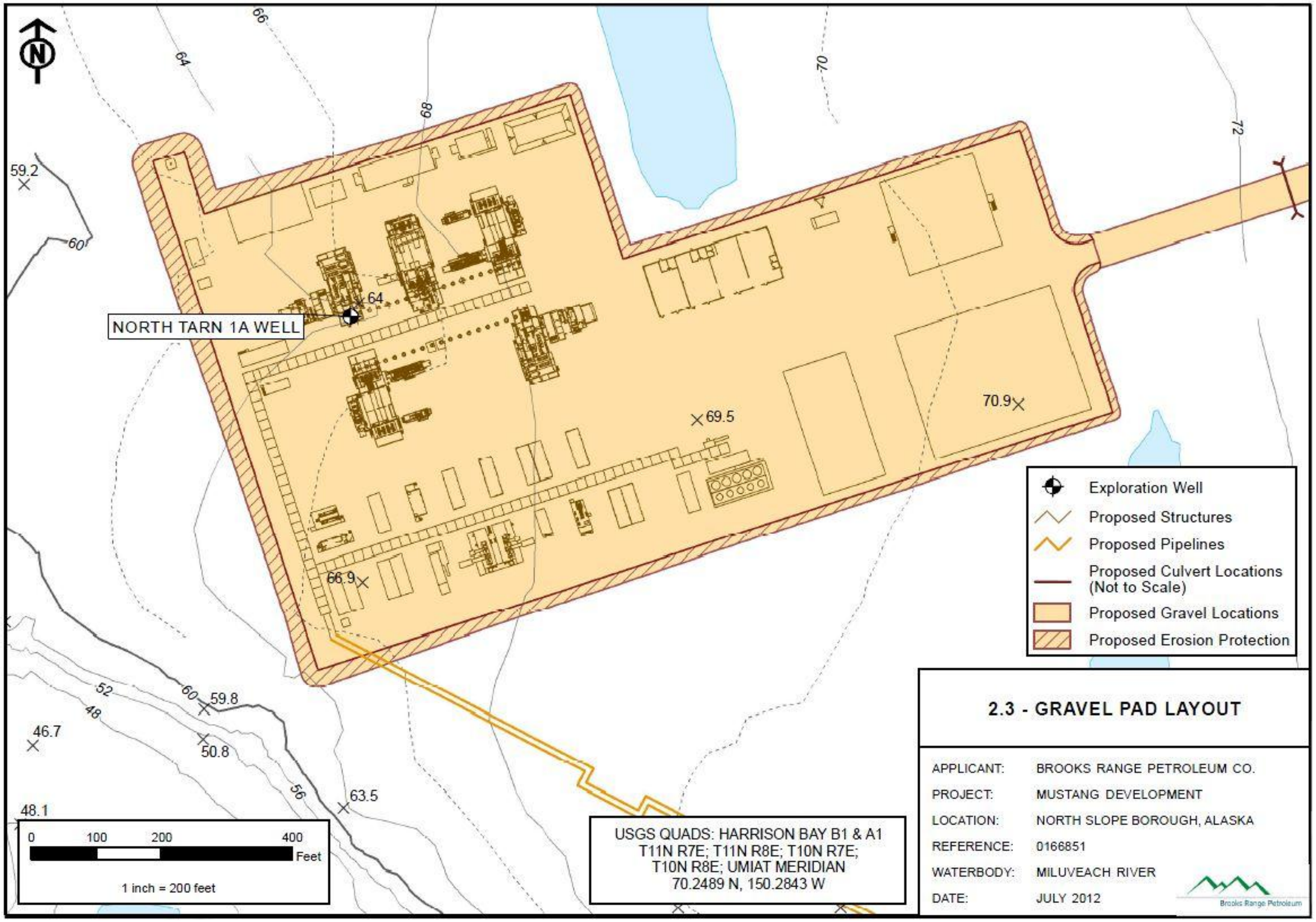


Figure 2.3. The Mustang Development Project production pad (OASIS 2012a, b, and c)

extracted material could be up to 585,649-m^3 (766,000-yd^3). The gravel mine would be converted into wetland and deep-water habitat, and rehabilitation at the mine site would be monitored with performance standards for a minimum of 14 years post gravel extraction.

Ice roads and pad
Ice roads would be constructed in the winter of 2012/2013 to connect project locations to the existing gravel road system near DS-2M (Figure 2.1). Ice roads (8.16-km total length; 0.12-km^2) would parallel the proposed gravel roads and a 3-acre ice pad (0.01 km^2) would be used to support installation of production facilities and other infrastructure over the winter construction season. The ice pad would be located adjacent to the ice road approximately 1-mi (1.6-km) from the gravel mine site. Ice roads would be maintained until April of 2013.

Prior to ice road construction, BRPC plans to survey, in cooperation with the USFWS Marine Mammals Management office (USFWS MMM), the proposed ice road and pipeline routes for potential polar bear dens using forward-looking infrared (FLIR) imaging technology. Conservation measures to avoid adverse effects to dens would be implemented based on recommendations by USFWS MMM and include operations maintaining a distance of 1.6-km (1-mi) from known dens.

Water supply
Local fresh water sources (lakes, ponds, and rivers) are proposed to provide water for the ice road system, potable water for the construction camp, and water for drilling and long term production operations. BRPC would only be permitted to extract specific quantities of freshwater from each source by the Alaska Department of Natural Resources – Division of Mining, Land, and Water. BRPC estimates fresh water use for ice roads during construction would be approximately 23 million liters (6 million gallons). Construction, development drilling, potable water, and dust control would require at least 204 million liters (54 million gallons) over the life of the project.

Communications and electrical power.
A 24.4-m (80-ft) communications tower without guy wires would provide telephone and data communications links to the drillsite. Electrical power would be generated on-site by dual-fueled turbine generators. Power and communication lines would be suspended from the pipeline’s VSMs. No overhead power lines would be constructed.

Spill prevention and response
A spill prevention, control, and countermeasures (SPCC) plan will be developed in accordance with U.S. Environmental Protection Agency regulations, and an Oil Discharge Prevention and Contingency Plan (ODPCP) will be prepared in accordance with Alaska Department of Environmental Conservation regulations to cover drilling, production/operations, and oil transportation for the Mustang Development Project.

Closure
Once the economic life of the field has passed, the drill-site, gravel roads, and mine would be abandoned. The mine site would be rehabilitated as a wetland that could provide nesting and resting islands for birds, littoral zones for aquatic vegetation, and deep water habitat. This site would be allowed to fill with water naturally and achieve its final water level approximately 15-20 years once gravel mining has ceased. Disturbed terrestrial areas along the perimeter of the mine site would be seeded with a mix of native grasses to provide for short-term establishment of grasses that would not persist but allow native tundra species to invade the site over time. The progress of revegetation at the mine site would be monitored for at least 14 years following the initial seeding.

Conservation Measures
Conservations measures that BRPC plans to implement (OASIS 2012b and c) to reduce potential impacts from the Mustang Development Project to listed species and other wildlife are listed below:

- Power lines would be placed on pipeline VSMs to reduce the risk of bird collisions and reduce perching sites for predatory birds. No overhead power lines will be used.

- Dust-control measures would be applied to roads and pads to protect vegetation and terrestrial and aquatic habitats.

- Careful design considerations were given to facility lighting (shielded lighting to reduce outward-radiating light) to reduce the potential for bird strikes.

- A *Polar Bear Interaction Plan* will be developed for the Mustang Project by BRPC, and will be updated annually in accordance with regulations for the issuance of Letters of Authorization (LOAs) for incidental take under Section 101(a)(5)(A) of the Marine Mammal Protection Act (MMPA). The plan provides procedures to protect both polar bears and humans. This plan incorporates the following provisions:
  - Education of all personnel working in polar bear habitat;
  - Procedures for ice road/off-site operations including den detection and avoidance;
  - Procedures for identifying, limiting, and isolating or removing bear attractants;
  - Procedures for early detection of bears, and an effective communication system to warn workers and direct appropriate responses;
  - Procedures for responding safely to bear encounters; and

– Procedures for reporting polar bear sightings and interactions to USFWS MMM.

3. EFFECT DETERMINATION FOR STELLER'S EIDER

In Alaska, Steller's eiders breed almost exclusively on the Arctic Coastal Plain (ACP), migrating to the breeding grounds in late spring and remaining in the region as late as mid-October. However, nesting is concentrated in tundra wetlands near Barrow, Alaska and Steller's eiders occur at very low densities elsewhere on the ACP (Larned et al. 2010). USFWS aerial surveys for breeding eiders conducted annually on the ACP from 1992–2010 reported only 5 observations of Steller's eiders east of the Colville River, with the most recent observation in 1998 (USFWS Alaska Region Migratory Bird Management, unpublished data). Because available data indicate Steller's eiders are unlikely to nest near or migrate through the project area, we conclude that adverse effects will be discountable and that the proposed action is *not likely to adversely affect* Alaska-breeding Steller's eiders.

4. STATUS OF THE 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.

Spectacled Eider

Spectacled eiders (Figure 4.1A) were listed as threatened throughout their range on May 10, 1993 (USFWS 1993) based on indications of steep declines in the two Alaska-breeding populations. There are three primary spectacled eider populations, each corresponding to breeding grounds on Alaska's North Slope, the Yukon–Kuskokwim Delta (YK-delta), and northern Russia. The YK-delta population declined 96% between the early 1970s and 1992 (Stehn et al. 1993). Data from the Prudhoe Bay oil fields (Warnock and Troy 1992) and information from Native elders at Wainwright, Alaska (R. Suydam, pers. comm. in USFWS 1996) suggested concurrent localized declines on the North Slope, although data for the entire North Slope breeding population were not available. Spectacled eiders molt in several discrete areas (Figure 4.1B) during late summer and fall, with birds from the different populations and genders apparently favoring different molting areas (Petersen et al. 1999). All three spectacled eider populations overwinter in openings in pack ice of the central Bering Sea, south and southwest of St. Lawrence Island (Petersen et al. 1999; Figure 4.2), where they remain until March–April (Lovvorn et al. 2003).

Life History

Breeding – In Alaska, spectacled eiders breed primarily on the North Slope (ACP) and the YK-delta. On the ACP, spectacled eiders breed north of a line connecting the mouth of the Utukok River to a point on the Shaviovik River about 24-km (15-mi) inland from its mouth. Breeding density varies across the ACP (Figure 4.2). Although spectacled eiders historically occurred throughout the coastal zone of the YK-delta, they currently breed primarily in the central coast zone within about 15-km (9-mi) of the coast from Kigigak Island north to Kokechik Bay (USFWS 1996). However, a number of sightings on the YK-delta have also occurred both north and south of this area during the breeding season (R. Platte, USFWS, pers. comm. 1997).

Spectacled eiders arrive on the ACP breeding grounds in late May to early June. Numbers of breeding pairs peak in mid-June and decline 4–5 days later when males begin to depart from the breeding grounds (Smith et al. 1994, Anderson and Cooper 1994, Anderson et al. 1995, Bart and Earnst 2005). Mean clutch size reported from studies on the Colville River Delta was 4.3 (Bart and Earnst 2005). Spectacled eider clutch size near Barrow has averaged 3.2–4.1, with clutches of up to eight eggs reported (Quakenbush et al. 1995, Safine 2011). Incubation lasts 20–25 days (Kondratev and Zadorina 1992, Harwood and Moran 1993, Moran and Harwood 1994, Moran 1995), and hatching occurs from mid- to late July (Warnock and Troy 1992).

Nest initiation on Kigigak Island on the YK-delta occurs from mid-May to mid-June (Lake 2007). Incubation lasts approximately 24 days (Dau 1974). Mean spectacled eider clutch size is higher on the YK-delta compared to the ACP. Mean annual clutch size ranged from 3.8–5.4 in coastal areas of the YK-delta (1985–2011; Fischer at al. 2011), and 4.0–5.5 on Kigigak Island (1992–2011; Gabrielson and Graff 2011), with clutches of up to eight eggs reported (Lake 2007).

On the breeding grounds, spectacled eiders feed on mollusks, insect larvae (craneflies, caddisflies, and midges), small freshwater crustaceans, and plants and seeds (Kondratev and Zadorina 1992) in shallow freshwater or brackish ponds, or on flooded tundra. Ducklings fledge approximately 50 days after hatch, when females with broods move from freshwater to marine habitat prior to fall migration.

Survivorship – Nest success is highly variable and thought to be influenced by predators, including gulls (*Larus* spp.), jaegers (*Stercorarius* spp.), and red (*Vulpes vulpes*) and arctic (*Alopex lagopus*) foxes. In arctic Russia, apparent nest success was estimated to be <2% in 1994 and 27% in 1995; low nest success was attributed to predation (Pearce et al. 1998). Apparent nest success in 1991 and 1993–1995 in the Kuparuk and Prudhoe Bay oil fields on the ACP was also low, varying from 25–40% (Warnock and Troy 1992, Anderson et al. 1998). On Kigigak Island in the YK-delta, nest survival probability ranged from 0.06–0.92 from 1992–2007 (Lake 2007); nest success tended to be higher in years with low fox numbers or activity (i.e., no denning) or when foxes were eliminated from the island prior to the nesting season. Bowman et al. (2002) also reported high variation in nesting success (20–95%) of spectacled eiders on the YK-delta, depending on year and location.

(A)

(B)

Figure 4.1. (A) Male and female spectacled eiders in breeding plumage. (B) Distribution of spectacled eiders. Molting areas (green) are used July –October. Wintering areas (yellow) are used October –April. The full extent of molting and wintering areas is not yet known and may extend beyond the boundaries shown.

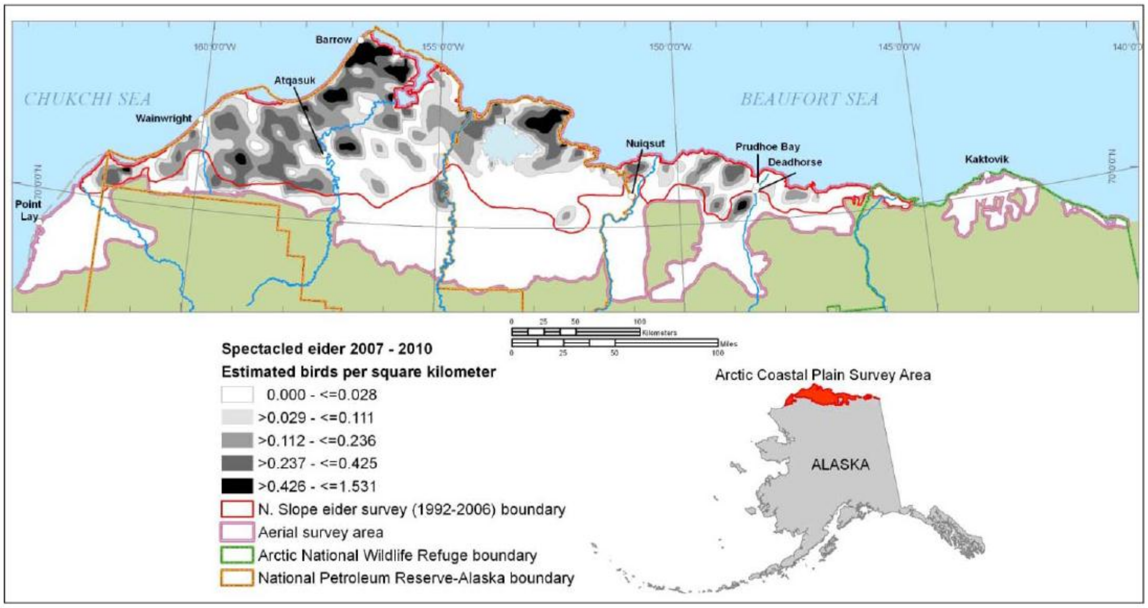


Figure 4.2. Density distribution of spectacled eiders observed on aerial transects sampling 57,336 km^2 of wetland tundra on the North Slope of Alaska during early to mid-June, 2007–2010 (source: Larned et al. 2011).

Available data indicate egg hatchability is high for spectacled eiders nesting on the ACP, in arctic Russia, and at inland sites on the YK-delta, but considerably lower in the coastal region of the YK-delta. Spectacled eider eggs that are addled or that do not hatch are very rare in the Prudhoe Bay area (Declan Troy, TERA, pers. comm. 1997), and Esler et al. (1995) found very few addled eggs on the Indigirka River Delta in Arctic Russia. Additionally, from 1969 to 1973 at an inland site on the Yukon Delta National Wildlife Refuge, only 0.8% of spectacled eider eggs were addled or infertile (Dau 1974). In contrast, 24% of all nests monitored in a coastal region of the YK-delta during the early to mid-1990s contained inviable eggs and ~10% of eggs in successful nests did not hatch due to either embryonic mortality or infertility (Grand and Flint 1997). This relatively high occurrence of inviable eggs near the coast of the YK-delta may have been related to exposure to contaminants (Grand and Flint 1997). It is unknown whether hatchability of eggs in this region has improved with decreased use of lead shot in the region and natural attenuation of existing lead pellets (Flint and Schamber 2010) in coastal YK-delta wetlands.

Recruitment rate (the percentage of young eiders that hatch, fledge, and survive to sexual-maturity) of spectacled eiders is poorly known (USFWS 1999) because there is limited data on juvenile survival. In a coastal region of the YK-delta, duckling survival to 30 days averaged 34%, with 74% of this mortality occurring in the first 10 days, while survival of adult females during the first 30 days post hatch was 93% (Flint and Grand 1997).

Fall migration and molting – As with many other sea ducks, spectacled eiders spend the 8–10 month non-breeding season at sea, but until recently much about the species' life in the marine environment was unknown. Satellite telemetry and aerial surveys led to the discovery of spectacled eider migrating, molting, and wintering areas. These studies are summarized in Petersen et al. (1995), Larned et al. (1995), and Petersen at al. (1999). Results of recent satellite telemetry research (2008–2011) are consistent with earlier studies (Matt Sexson, USGS, pers. comm.). Phenology, spring migration and breeding, including arrival, nest initiation, hatch, and fledging, is 3–4 weeks earlier in western Alaska (YK-delta) than northern Alaska (ACP); however, phenology of fall migration is similar between areas. Individuals depart breeding areas July–September, depending on their breeding status, and molt in September–October. (Matt Sexson, USGS, pers. comm.).

Males generally depart breeding areas on the North Slope (ACP) when the females begin incubation in late June (Anderson and Cooper 1994, Bart and Earnst 2005). Use of the Beaufort Sea by departing males is variable. Some appear to move directly to the Chukchi Sea over land, while the majority move rapidly (average travel of 1.75 days), over near shore waters from breeding grounds to the Chukchi Sea (TERA 2002). Of 14 males implanted with satellite transmitters, only four spent an extended period of time (11–30 days), in the Beaufort Sea (TERA 2002). Preferred areas for males appeared to be near large river deltas such as the Colville River where open water is more prevalent in early summer when much of the Beaufort Sea is still frozen. Most adult males marked with satellite transmitters in northern and western Alaska in a recent satellite telemetry study migrated to northern Russia to molt (USGS, unpublished data). Results from this study also suggest that male eiders likely follow coast lines but also migrate straight across the northern Bering and Chukchi seas en route to northern Russia (Matt Sexson, USGS, pers. comm.).

Females generally depart the breeding grounds later, when much more of the Beaufort Sea is ice-free, allowing more extensive use of the area. Females spent an average of two weeks in the Beaufort Sea (range 6-30 days) with the western Beaufort Sea the most heavily used (TERA 2002). Females also appeared to migrate through the Beaufort Sea an average of 10 km further offshore than males (Petersen et al. 1999). The greater use of the Beaufort Sea and offshore areas by females was attributed to the greater availability of open water when females depart the area (Petersen et al. 1999, TERA 2002). Recent telemetry data indicates that molt migration of failed/non-breeding females from the Colville River Delta through the Beaufort Sea is relatively rapid, 2–weeks, compared to 2–3 months spent in the Chukchi Sea (Matt Sexson, USGS, pers. comm.).

Spectacled eiders use specific molting areas from July to late October/early November. Larned et al. (1995) and Petersen et al. (1999) discussed spectacled eiders' apparently strong preference for specific molting locations, and concluded that all spectacled eiders molt in four discrete areas (Table 4.1). Females generally used molting areas nearest their breeding grounds. All marked females from the YK-delta molted in nearby Norton Sound, while females from the North Slope molted in Ledyard Bay, along the Russian coast, and near St. Lawrence Island. Males did not show strong molting site fidelity; males from all three breeding areas molted in Ledyard Bay, Mechigmenskiy Bay, and the Indigirka/Kolyma River Delta. Males reached molting areas first, beginning in late June, and remained through mid-October. Non-breeding females, and those that nested but failed, arrived at molting areas in late July, while successfully-breeding females and young of the year reached molting areas in late August through late September and remained through October. Fledged juveniles marked on the Colville River Delta usually staged in the Beaufort Sea near the delta for 2–3 weeks before migrating to the Chukchi Sea.

Table 4.1 Important staging and molting areas for female and male spectacled eiders from each breeding population.

Population and Sex	Known Major Staging/Molting Areas
Arctic Russia Males	Northwest of Medvezhni (Bear) Island group
	Mechigmenskiy Bay
	Ledyard Bay
Arctic Russia Females	unknown
North Slope Males	Ledyard Bay
	Northwest of Medvezhni (Bear) Island group
	Mechigmenskiy Bay
North Slope Females	Ledyard Bay
	Mechigmenskiy Bay
	West of St. Lawrence Island
YK-delta Males	Mechigmenskiy Bay Northeastern Norton Sound
YK-delta Females	Northeastern Norton Sound

Avian molt is energetically demanding, especially for species such as spectacled eiders that complete molt in a few weeks. Molting birds must have ample food resources, and the rich benthic community of Ledyard Bay (Feder et al. 1989, 1994a, 1994b) likely provides these for spectacled eiders. Large concentrations of spectacled eiders molt in Ledyard Bay to use this food resource; aerial surveys on 4 days in different years counted 200 to 33,192 molting spectacled eiders in Ledyard Bay (Petersen et al. 1999; Larned et al. 1995).

Wintering – Spectacled eiders generally depart all molting sites in late October/early November (Matt Sexson, USGS, pers. comm.), migrating offshore in the Chukchi and Bering Seas to a single wintering area in openings in pack ice of the central Bering Sea south/southwest of St. Lawrence Island (Figure 4.1). In this relatively shallow area, > 300,000 spectacled eiders (Petersen et al. 1999) rest and feed, diving up to 230 ft (70 m) to eat bivalves, other mollusks, and crustaceans (Cottam 1939, Petersen et al. 1998, Lovvorn et al. 2003, Petersen and Douglas 2004).

Spring migration – Recent information indicates spectacled eiders likely make extensive use of the eastern Chukchi spring lead system between departure from the wintering area in March and April and arrival on the North Slope in mid-May or early June. Limited spring aerial observations in the eastern Chukchi Sea have documented dozens to several hundred common eiders (*Somateria mollissima)* and spectacled eiders in spring leads and several miles offshore in relatively small openings in rotting sea ice (W. Larned, USFWS; J. Lovvorn, University of Wyoming, pers. comm.). Woodby and Divoky (1982) documented large numbers of king (*Somateria spectabilis*) and common eiders using the eastern Chukchi lead system, advancing in pulses during days of favorable following winds, and concluded that an open lead is probably requisite for spring eider passage in this region. Preliminary results from an ongoing satellite telemetry study conducted by the USGS Alaska Science Center (Figure 4.3; USGS, unpublished data) suggest that spectacled eiders also use the lead system during spring migration.

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

Abundance and trends

The most recent rangewide estimate of abundance of spectacled eiders was 369,122 (364,190–374,054 90% CI), obtained by aerial surveys of the known wintering area in the Bering Sea in late winter 2010 (Larned et al. 2012). Comparison of point estimates between 1997 and 2010 indicate an average of 353,051 spectacled eiders (344,147-361956 90% CI) in the global population over that 14-year period (Larned et al. 2012).

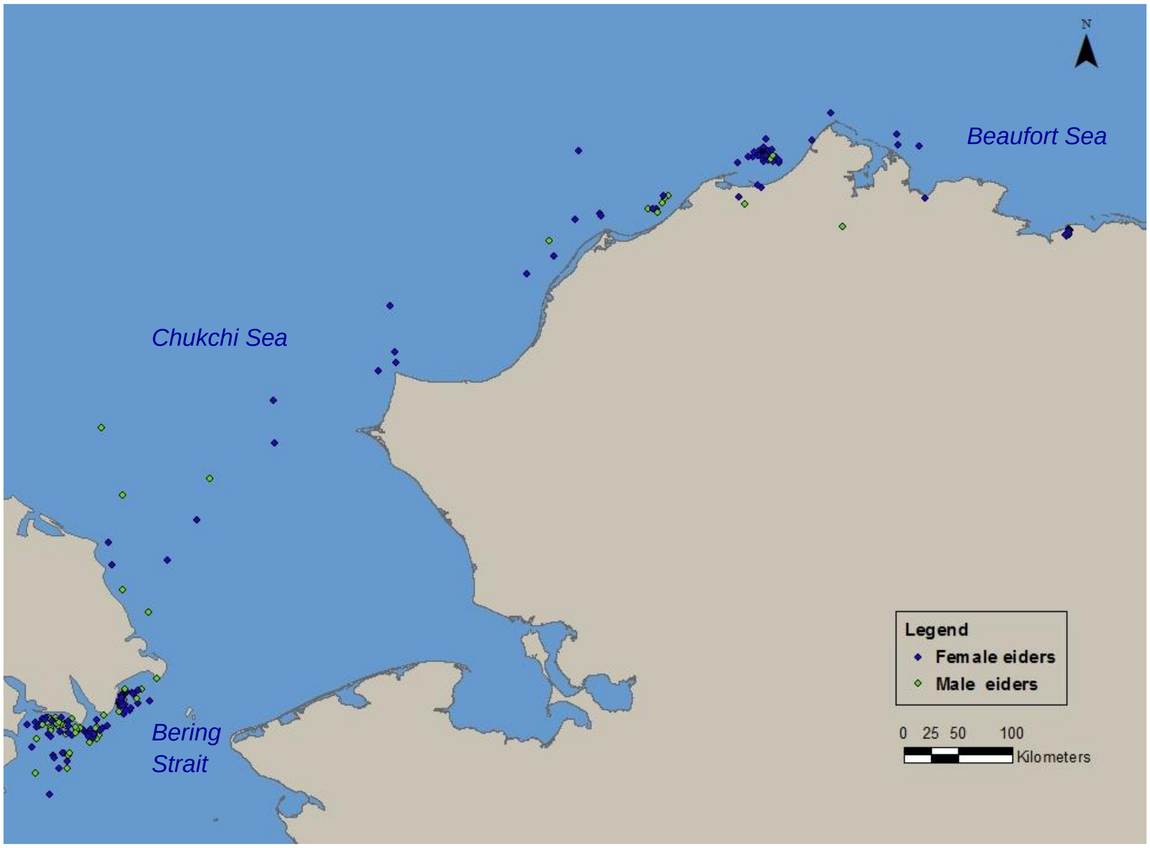


Figure 4.3. Spectacled eider satellite telemetry locations for 12 female and 7 male spectacled eiders in the eastern Chukchi Sea from 1 April – 15 June 2010 and 1 April – 15 June 2011. Additional locations from the northern coast of Russia are not shown. Eiders were tagged on the North Slope during the 2009 and 2010 breeding seasons. Data provided by Matt Sexson, USGS Alaska Science Center (USGS, unpublished).

Population indices for North Slope-breeding spectacled eiders are unavailable prior to 1992. However, Warnock and Troy (1992) documented an 80% decline in spectacled eider abundance from 1981 to 1991 in the Prudhoe Bay area. Since 1992, the Service has conducted annual aerial surveys for breeding spectacled eiders on the ACP. The 2010 population index based on these aerial surveys was 6,286 birds (95% CI, 4,877–7,695; unadjusted for detection probability), which is 4% lower than the 18-year mean (Larned et al 2011). In 2010, the index growth rate was significantly negative for both the long-term (0.987; 95% CI, 0.974–0.999) and most recent 10 years (0.974; 95% CI, 0.950–0.999; Larned et al. 2011). Stehn et al. (2006) developed a North Slope-breeding population estimate of 12,916 (95% CI, 10,942–14,890) based on the 2002–2006 ACP aerial index for spectacled eiders and relationships between ground and aerial surveys on the YK-delta. If the same methods are applied to the 2007–2010 ACP aerial index reported in Larned et al (2011), the resulting adjusted population estimate for North Slope-breeding spectacled eiders is 11,254 (8,338–14,167, 95% CI).

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

Fischer et al. (2011) used combined annual ground-based and aerial survey data to estimate the number of nests and eggs of spectacled eiders on the coastal area of the YK-delta in 2011 and evaluate long-term trends in the YK-delta breeding population from 1985 to 2011. The estimated total number of nests measures the minimum number of breeding pairs in the population in a given year and does not include potential breeders that did not establish nests that year or nests that were destroyed or abandoned at an early stage (Fischer et al. 2011). The total number of nests in 2011 was estimated at 3,608 (SE 448) spectacled eiders nests on the YK-delta, the second lowest estimate over the past 10 years. The average population growth rate based on these surveys was 1.049 (90% CI = 0.994–1.105) in 2002–2011 and 1.003 (90% CI = 0.991–1.015) in 1985–2011 (Fischer et al. 2011). Log-linear regression based solely on the long-term YK-delta aerial survey data indicate positive population growth rates of 1.073 (90% CI = 1.046–1.100) in 2001–2010 and 1.070 (90% CI = 1.058–1.081) in 1988–2010 (Platte and Stehn 2011).

Spectacled eider recovery criteria

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

Polar Bear

The Service listed the polar bear (*Ursus maritimus*) as threatened throughout its range on May 15, 2008 (USFWS 2008a). Polar bears are widely distributed throughout the Arctic where the sea is ice-covered for large portions of the year. Sea ice provides a platform for hunting and feeding, for seeking mates and breeding, for denning, for resting, and for long-distance movement. Polar bears primarily hunt ringed seals, which also depend on sea ice for their survival, but they also consume other marine mammals (USFWS 2008a). Because the principal habitat of polar bears is sea ice, it is considered a marine mammal, and is therefore protected under the Marine Mammal Protection Act of 1972 (MMPA).

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).

Two stocks of polar bears occur in Alaska: the Chukchi/Bering seas (CBS) and Southern Beaufort Sea (SBS) stocks (Figure 4.4). Unlike polar bears in eastern Canada, the Alaskan stocks do not currently spend extended periods of time on land (Garner et al. 1990), with the exception of females that choose to den on land rather than pack ice.

Movement patterns

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. 2000). 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. 2000). 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. 2000). Mean activity area in the Chukchi Sea, which is characterized by highly dynamic ice conditions, was 244,463 km^2 (Garner et al. 1990). Average annual distance moved by CBS female bears was 5,542 km.

Radio-collared females indicate some individuals occupy home ranges (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).

The CBS population is widely distributed on the pack ice of the northern Bering, Chukchi, and eastern portions of the Eastern Siberian seas (Garner et al. 1990, Garner et al. 1994, Garner et al. 1995). Polar bears are seasonably abundant in the Chukchi Sea and their distribution is influenced by the movement of seasonal pack ice. Polar bears in the Chukchi and Bering seas move south with advancing ice during fall and winter, and move north in advance of receding ice in late spring and early summer (Garner et al. 1990). 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 CBS and Northern Beaufort Sea populations.

Feeding

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 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).

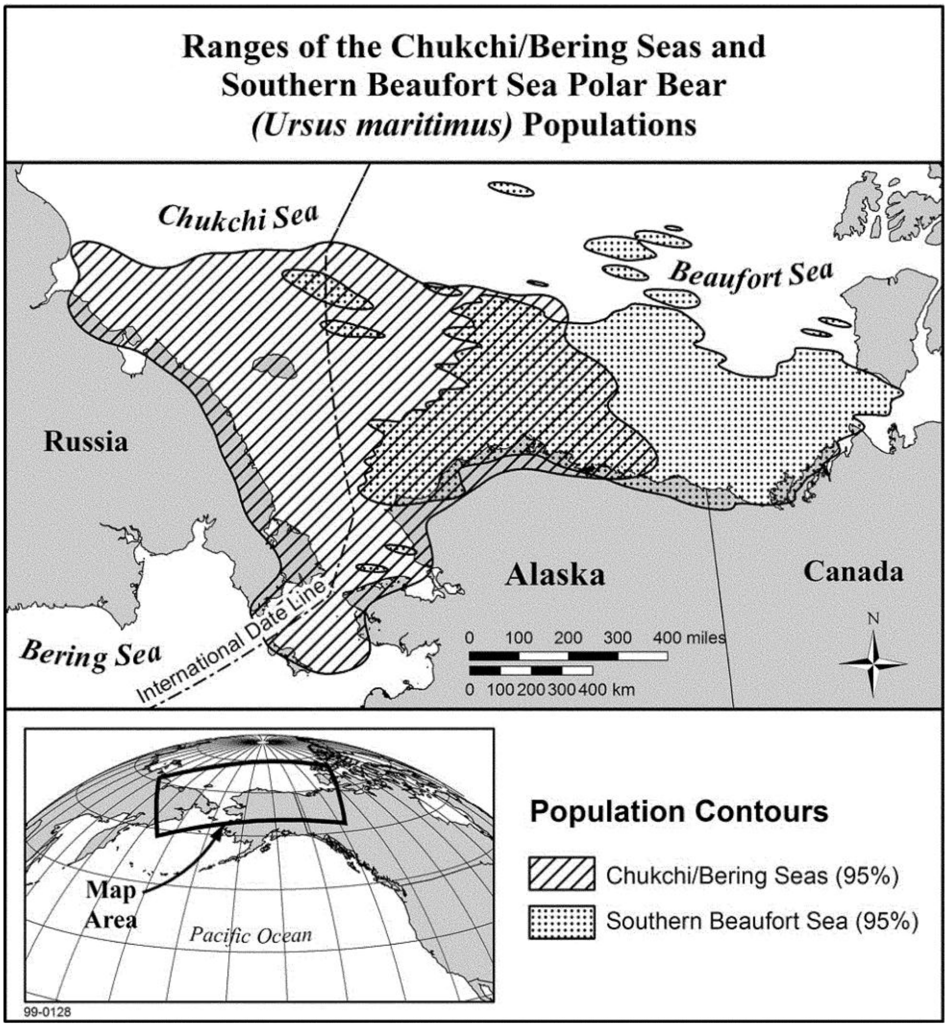


Figure 4.4. Ranges of polar bear stocks in Alaska (USFWS 2010a)

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 (*Phoca 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 (Ovsyanikov 1996).

Polar bears rarely catch seals on land or in open water (Furnell and Oolooyuk 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 (e.g., Bentzen et al. 2007, Schliebe et al. 2008), 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 seals, and polar bears are tied to the surface of the ice for effective access to that prey (Amstrup et al. 2007).

Reproduction

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).

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). 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.

Fidelity to denning habitat was investigated by Amstrup and Gardner (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.

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; however, many pregnant females did not enter dens until late November or early December (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 with currents (Amstrup 2003, Wiig 1998).

Data suggests that an increasing proportion 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 terrestrial dens also appears to have shifted to the west (USFWS 2006).

Insufficient data exist to accurately quantify polar bear denning locations along the Alaskan Chukchi Sea coast; however, dens in the area are less concentrated than for other areas in the Arctic. The majority of denning of Chukchi Sea polar bears occurs on Wrangel Island, Herald Island, and other locations on the northern Chukotka coast of Russia.

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 liters 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).

Life span and survivorship

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 and colleagues (unpublished data) described survival rates that generally increased by age class up to approximately 20 years of age (cubs-of-the-year, 35–75%; subadults 1–4 years, 63–98%; adults 5–20 years, 95–99%; and adults > 20 years 72–99%).

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 immediately following emergence from the den (Amstrup and Durner 1995, Derocher and Stirling 1996), with early mortality generally associated with starvation (Derocher and Stirling 1996). Survival of cubs to the 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 indicates 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. Given low reproductive rates, low survival rates of cubs, and the high predicted survival rates necessary to maintain a viable population, polar bear populations may be subject to decline from low recruitment and loss of adult bears.

Abundance and Trends – Alaska Stocks

A reliable abundance estimate for the CBS stock currently does not exist (USFWS 2010b); however, the best available information at this time suggests a minimum population estimate of 2,000 (USFWS 2010b), based on extrapolation from multiple years of denning data for Wrangel Island in Russia and an assumed population denning rate (IUCN 2006 in USFWS 2010b). Reliable estimates of population size based upon mark and recapture studies are not available for this region. The combined Alaska–Chukotka polar bear harvest is currently believed to exceed sustainable levels, and the status of the CBS polar bear population is considered uncertain or declining (Schliebe et al. 2006).

Estimates of the population size of the SBS were 1,778 from 1972 to 1983 (Amstrup et al. 1986), 1,480 in 1992 (Amstrup 1995), and 2,272 in 2001 (Amstrup, USGS unpublished data). Most recently, Regehr et al. (2006) estimated the SBS population to be 1,526 (95% CI = 1,211–1,841), the most current and valid estimate for the SBS (USFWS 2010c). Declining survival, recruitment, and body size (Regehr et al. 2006, 2007), low growth rates during years of reduced summer and fall sea ice (2004 and 2005), and an overall declining growth rate of 3% per year from 2001–2005 (Hunter et al. 2007), indicate the SBS stock population is declining (USFWS 2010c).

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

5. ENVIRONMENTAL BASELINE

This section provides an analysis of the effects of past and ongoing human and natural factors leading to the current status of the species or critical habitat within the action area.

Spectacled eider

Status of spectacled eiders within the action area

Spectacled eiders are present in the action area from late May through late October. In summer, spectacled eiders are widely distributed near lakes or coastal margins throughout this area with a trend toward higher abundance towards the coast and within the Colville River Delta. On the Colville River Delta near the Mustang project area, surveys have indicated pre-nesting spectacled eiders significantly prefer brackish water, salt marsh, salt-killed tundra, deep open water with islands or polygonized margins, shallow open water with islands or polygonized margins, deep polygon complex, and grass (*Arctophyla fulva*) marsh habitats (Johnson et al. 2011). East of the project area, in the Kuparuk oilfield, spectacled eiders nested primarily in non-patterned wet meadows within wetland complexes containing emergent grasses and sedges (Anderson and Cooper 1994, Anderson et al. 2009). After hatching, spectacled eider hens and broods occupy deep *Arctophila* and shallow *Carex* habitat (Safine 2011).

Factors which may have contributed to the current status of spectacled eiders in the action area include environmental contaminants, increased predation, collisions with structures, long-term habitat loss through development and disturbance, and climate change. These impacts are occurring throughout much of the species' range, including within the action area.

For example, existing oil and gas industry developments in the nearby Kuparuk River Unit have resulted in long-term loss of spectacled eider breeding habitat in the action area directly through gravel fill and indirectly through disturbance from oilfield activities. Given the extent of development, it is likely that eiders in the action area have experienced some loss of reproductive potential resulting from direct and indirect habitat loss. However, the degree to which spectacled eiders can reproduce in disturbed areas or move to other less disturbed areas to reproduce, and the potential population level consequences of existing development near the action area, are unknown.

Regional activities requiring formal section 7 consultation

Activities on the eastern ACP that required formal section 7 consultations, and the estimated associated incidental take of listed eiders, is presented in Table 5.1. The table illustrates the number and diversity of actions that have required consultation in the region. We believe these estimates have overestimated, possibly significantly, actual take. Actual take is likely reduced by the implementation of terms and conditions in each biological opinion, is spread over the life-span of a project (often 50 years), and is dominated by the potential loss of eggs/ducklings, which we expect to have substantially lower population-level effects compared to adult mortality for this species (see further discussion in the conclusion).

Table 5.1 - Activities on the eastern Arctic Coastal Plain that required formal section 7 consultations and the amount of incidental take authorized. Listed activities include those where effects to listed eiders may occur in the Colville River Delta east to the Sagavanirktok River.

Project Name	Impact Type	Estimated Incidental Take
Intra-Service, Issuance of Section 10 permits for spectacled eider (2000)	Disturbance Collection	10 spectacled eiders 10 spectacled eider eggs 25 spectacled eiders
Alpine Development Project (2004)	Habitat loss Collisions	4 spectacled eider eggs/ducklings 3 adult spectacled eiders
ABR Avian Research/USFWS Intra-Service Consultation (2005)	Disturbance	5 spectacled eider eggs/ducklings
Pioneer's Oooguruk Project (2006)	Habitat loss Collisions	3 spectacled eider eggs/ducklings 3 adult spectacled eiders
Intra-Service Consultation on MBM Avian Influenza Sampling in NPR-A (2006)	Disturbance	7 spectacled eider eggs/ducklings
KMG Nikaitchuq Project (2006)	Habitat loss Collisions	2 spectacled eiders/year 7 adult spectacled eiders
BP 69kV powerline between Z-Pad and GC 2 (2006)	Collisions	10 adult spectacled eiders
BP Liberty Project (2007)	Habitat loss Collisions	2 spectacled eider eggs/ducklings 1 adult spectacled eider
Intra-service on Subsistence Hunting Regulations (2007)	No estimate of incidental take provided	
BLM Programmatic on Summer Activities in NPR-A (2007)	Disturbance	21 spectacled eider eggs/ducklings
Intra-Service Consultation on MBM Avian Influenza Sampling in NPR-A (2007)	Disturbance	6 spectacled eider eggs/ducklings
Intra-service on Subsistence Hunting Regulations (2008)	No estimate of incidental take provided	
BLM Programmatic on Summer Activities in NPR-A (2008)	Disturbance	56 spectacled eider eggs/ducklings
BLM Northern Planning Areas of NPR-A (2008)	Disturbance Collision	87 spectacled eider eggs/ducklings/year 12 Steller's eider eggs/ducklings/year < 7 adult spectacled eiders < 1 adult Steller's eider
MBM/USFWS Intra-Service, Shorebird studies and white-fronted goose banding in NPR-A (2008)	Disturbance	21 spectacled eider eggs/ducklings
BP Alaska's Northstar Project (2009)	Collisions	≤ 2 adult spectacled eiders/year ≤ 1 adult Steller's eider/year
Intra-Service, Section 10 permit for USGS telemetry research on spectacled eider use of the Bering, Chukchi, and Beaufort Seas (2009; North Slope field sites)	Loss of Production Capture/surgery	130 spectacled eider eggs/ducklings 4 adult spectacled eiders
Intra-service on Subsistence Hunting Regulations (2009)	No estimate of incidental take provided	
BLM Programmatic on Summer Activities in NPR-A (2009)	Disturbance	49 spectacled eider eggs/ducklings

Minerals Management Service Beaufort and Chukchi Sea Program Area Lease Sales (2009)	Collision	12 adult spectacled eiders <1 adult Steller's eider
Intra-Service, Migratory Bird Subsistence Hunting Regulations (2010)	No estimate of incidental take provided	
Intra-Service, Section 10 permit for USGS telemetry research on spectacled eider use of the Bering, Chukchi, and Beaufort Seas (2010; North Slope field sites)	Loss of Production Capture/handling/ surgery	130 spectacled eider eggs/ducklings 7 adult/juvenile spectacled eiders (lethal take) 108 adult/juvenile spectacled eiders (non-lethal take)
BLM Programmatic on Summer Activities in NPR-A (2010)	Disturbance	32 Spectacled eider eggs
Intra-Service, USFWS Migratory Bird Management goose banding on the North Slope of Alaska (2010)	Disturbance	4 spectacled eider eggs/ducklings
Intra-Service, Section 10 permit for ABR Inc.'s eider survey work on the North Slope and at Cook Inlet (2010)	Disturbance	35 spectacled eider eggs/ducklings
Intra-Service, Migratory Bird Subsistence Hunting Regulations (2011)	Shooting	400 adult spectacled eiders (lethal take) 4 adult Steller's eiders (lethal take)
Intra-Service, Section 10 permit for ABR Inc.'s eider survey work on the North Slope and at Cook Inlet (2011)	Disturbance	20 spectacled eider eggs/ducklings
Intra-Service, Section 10 permit for USGS telemetry research on spectacled eider use of the Bering, Chukchi, and Beaufort Seas (2011; Colville River Delta field site)	Capture/handling/ surgery	65 juvenile + 13 adult spectacled eiders (non-lethal take) 7 adult/juvenile spectacled eiders (lethal take)
ConocoPhillips Alaska, Inc's CD-5 Project (Alpine reinitiation; 2011)	Habitat loss	59 spectacled eider eggs/ducklings
Intra-Service, Migratory Bird Subsistence Hunting Regulations (2012)	Shooting	400 adult spectacled eiders (lethal take) 4 adult Steller's eiders (lethal take)

Polar bear

Status of polar bears in the action area

Polar bears are generally sparsely distributed across the Beaufort Sea (Regehr et al. 2006, Regehr et al. 2010, Rode et al. 2010), and bears of the SBS are distributed across the northern coasts of Alaska, and the Yukon and Northwest territories of Canada. Declining survival, recruitment, and body size (Regehr et al. 2006, Regehr et al. 2010, Rode et al. 2010), and low population growth rates during years of reduced sea ice (2004 and 2005), and an overall declining population growth rate of 3% per year from 2001 to 2005 (Hunter et al. 2007) suggest that the SBS is now declining. The status of this stock is listed as reduced by the IUCN (Obbard et al. 2010) and depleted under the MMPA.

Previously, Alaskan stocks did not generally spend extended periods of time on land (Garner et al. 1990), with the exception of land-denning females. However, receding sea ice due to climate change is modifying polar bear behavior such that during the open-water months of August to October, bears can be found along the coast awaiting freezeup. Only land-denning females of the SBS are likely to spend extended time on land (Garner et al. 1990) in the action area, and non-denning bears in the action area are likely transients of this stock (males, solitary females, and females with older cubs).

Maternal dens have been observed in the action area [Figure 5.1(A)], and because potential denning habitat exists [Figure 5.1 (B)] denning female polar bears probably occupy habitat in the area at low densities. We also expect non-denning bears to occasionally travel through the action area.

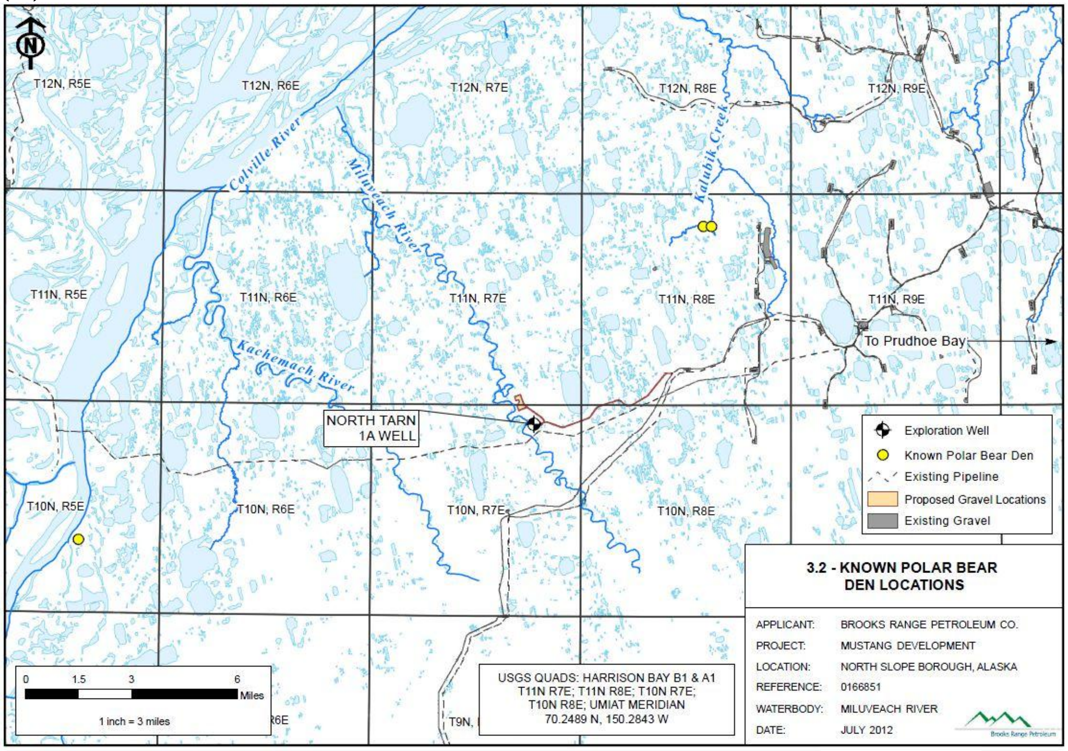
Oil and gas development, hunting, environmental contaminants, and climate change are the primary factors that have contributed to the environmental baseline for polar bears in the action area. These factors are discussed further below.

Oil and gas development
Extensive oil and gas development on Alaska's North Slope over the past several decades has likely altered polar bear use of these areas, including existing developments within the Kuparuk River Unit and related infrastructure which occur in the action area. Assessing the magnitude of these effects is difficult. It is reasonable to assume that some bears have been excluded from habitat that they may have otherwise used for movements along the coast and denning. However, documented impacts on polar bears by the oil and gas industry in Alaska during the past 30 years have been 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. Interactions have been minimized by implementation of Incidental Take Regulations (ITRs) for the Beaufort (USFWS 2006, 2011b) and Chukchi seas (USFWS 2008b) and associated Letters of Authorization (LOAs) issued under the MMPA. The ITRs only authorize non-lethal incidental take. As part of the LOAs issued pursuant to these regulations, the oil and gas industry is required to report the number of polar bears observed, their response to industry, infrastructure, or activities, and if deterrence activities were required (see below). Reports indicate an average of 306 polar bears are observed annually by the oil and gas industry in the Beaufort Sea region (range 170–420; 2006–2009). About 81% of these bears showed no change in behavior, 4% altered their behavior by moving away from (or towards) the industrial activity, and the remaining 15% were intentionally harassed (hazed) to deter the bears.

Lethal take associated with the oil and gas industry has occurred on only one occasion during the periods covered by the Chukchi Sea (1991–1996 and 2008–present) and Beaufort Sea (1993–present) ITRs, when a polar bear was accidentally killed in August 2011 due to the misuse of a firecracker round. Prior to issuance of these regulations, lethal take of adult polar bears by industry in Alaska were also rare with only a few occurrences since 1968.

Formal section 7 consultations have been conducted on promulgation of the Chukchi and Beaufort sea ITRs, which authorize the incidental, unintentional taking of a small number of polar bears in these seas and the adjacent western and northern coasts of Alaska during oil and gas activities in arctic Alaska. These consultations and their conclusions were considered in the jeopardy analysis of this BO.

(A)



(B)

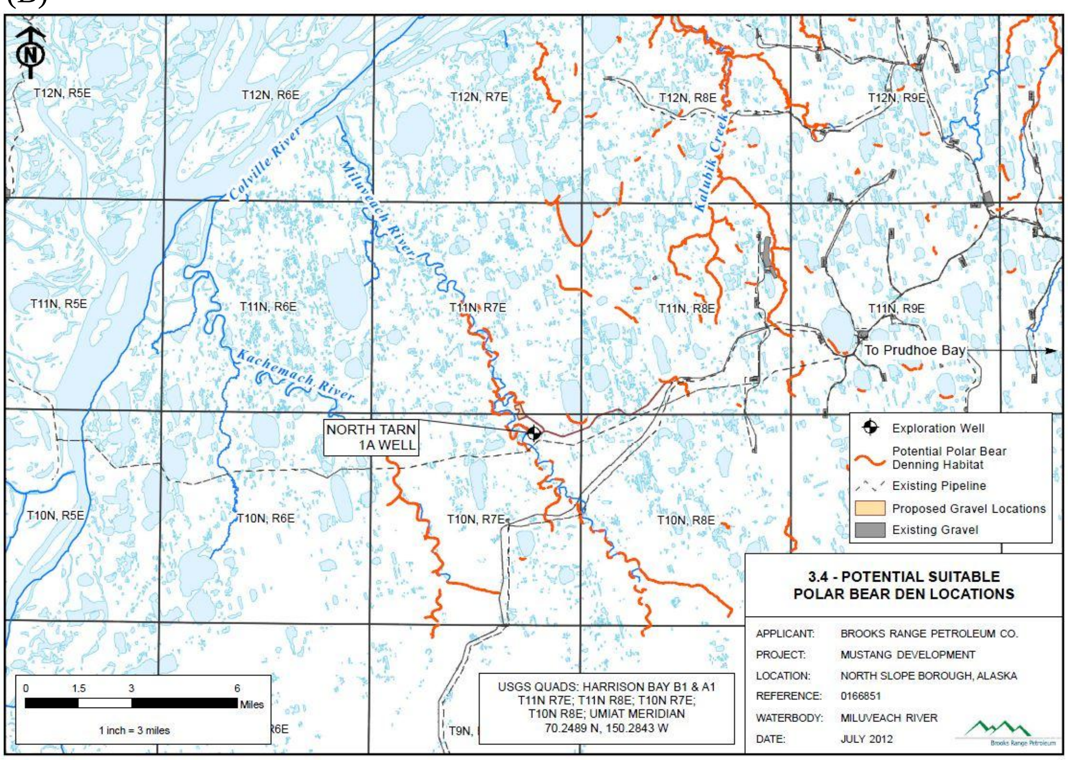


Figure 5.1. (A) Previously documented polar bear dens in the Mustang Development action area and; (B) and potential terrestrial denning habitat (OASIS 2012a and c).

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 bear science and management, including harvest management.

Additionally, since passage of the MMPA 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 Inupiat from Alaska and Inuvialuit in Canada that was developed in 1988. Regulation of this harvest, which is considered sustainable, is based upon a voluntary harvest agreement between the Inuvialuit of Canada and the Inupiat of Alaska, who share subsistence hunting traditions within the range of the SBS stock. The Inuvialuit-Inupiat Polar Bear Management Agreement established quotas and recommendations concerning protection of denning females, family groups, and methods of take. Commissioners for the Inuvialuit-Inupiat Agreement set the original quota at 76 bears in 1988, and it was later increased to 80. At the Inuvialuit-Inupiat Polar Bear Management Meeting in July 2010, the quota was again reduced from 80 to 70 bears per year. The Native subsistence harvest from the SBS stock has averaged 36 bears removed per year (USFWS 2011a). During the period 2005–2009, six polar bears were harvested by residents of Nuiqsut (USFWS 2011a), which is located near the action area. Therefore, while subsistence use of polar bears probably does occur in the general vicinity of the action area, the number harvested is likely low.

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 and planned oil and gas operations within 40-km (25-mi) of the coast or offshore (Schliebe et al. 2006). Polar bears occurring in the action area may have been exposed to petroleum hydrocarbons associated with existing oil and gas industry operations on the North Slope.

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 the 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), however contaminant concentrations in the action area are not likely to pose a population-level threat to polar bears.

Climate change

Warming-induced habitat degradation and loss are negatively affecting some polar bear stocks, and unabated global warming will ultimately reduce the worldwide polar bear population (Obbard et al. 2010). Loss of sea ice habitat due to climate change is identified as the primary threat to polar bears (Schliebe et al. 2006, USFWS 2008a, Obbard et al. 2010). Patterns of increased temperatures, earlier spring thaw, later fall freeze-up, increased rain-on-snow events (which can cause dens to collapse), and potential reductions in snowfall are also occurring.

While climate change will have the largest impact on polar bears in the marine environment, it may also lead to changes in use and vulnerability of polar bears in the terrestrial environment. It is estimated that > 60% of females from the SBS stock den on land, with the remaining bears denning on drifting pack ice (Fischbach et al. 2007). Durner et al. (2006) noted that ice must be stable for ice-denning females to be successful. As climate change continues, the quality of sea ice may decrease, forcing more females to den on land (Durner et al. 2006), including within the action area. However, if large areas of open water persist until late winter due to a decrease in the extent of the pack ice, females may be unable to access land to den (Stirling and Andriashek 1992).

Climate change may also affect the availability and quality of denning habitat on land. Durner et al. (2006) reported that 65% of terrestrial dens found in Alaska between 1981 and 2005 were on coastal or island bluffs. These areas 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 polar 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 3-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 population 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 would have been frozen by early or mid-October, allowing polar bears to effectively access seals in the area. Since the late 1990s, the timing of ice formation in the fall has occurred later in November or early December, resulting in an increased amount of time that 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).

Summary

Primary threats to polar bears in the action area relate to increased use of coastal habitats by non-denning bears and increased use of maternal denning habitat on land resulting from climate change, which exposes polar bears to the effects of human activities in these areas with greater frequency. While other stressors exist and are managed, they are not currently thought to be significant threats to polar bear populations; however, each of these factors could become more significant in combination with future effects of climate change and the resultant loss of sea ice.

6. EFFECTS OF THE ACTION ON LISTED SPECIES

This section of the BO provides an analysis of the effects of the action on listed species and, where appropriate, critical habitat. Both direct effects (effects immediately attributable to the action) and indirect effects (effects that are caused by or will result from the proposed action and are later in time, but are still reasonably certain to occur) are considered. Interrelated and interdependent effects of the action are also discussed.

Our analyses of the effects of the action on species listed under the ESA include consideration of ongoing and projected changes in climate. The terms “climate” and “climate change” are defined by the Intergovernmental Panel on Climate Change (IPCC). “Climate” refers to the mean and variability of different types of weather conditions over time, with 30 years being a typical period for such measurements, although shorter or longer periods also may be used (IPCC 2007). The term “climate change” thus refers to a change in the mean or variability of one or more measures of climate (e.g., temperature or precipitation) that persists for an extended period, typically decades or longer, whether the change is due to natural variability, human activity, or both (IPCC 2007). Various types of changes in climate can have direct or indirect effects on species. These effects may be positive, neutral, or negative and they may change over time, depending on the species and other relevant considerations, such as the effects of interactions of climate with other variables (e.g., habitat fragmentation) (IPCC 2007). In our analyses, we use our expert judgment to weigh relevant information, including uncertainty, in our consideration of various aspects of climate change.

Effects to spectacled eiders

Adverse effects to spectacled eiders could occur through collisions with structures, increased predator populations, oil spills, and long-term habitat loss; each of these factors is evaluated below.

Collisions with structures

Migratory birds suffer considerable mortality from collisions with man-made structures (Manville 2004). Birds are particularly at risk of collision when visibility is impaired by darkness or inclement weather (Weir 1976). There is also evidence that lights on structures increase collision risk (Reed et al. 1985, Russell 2005, numerous authors cited by Manville 2000). Anderson and Murphy (1988) monitored bird behavior and strikes to a 12.5 km power line in the Lisburn area (the southern portion of the Prudhoe Bay oil fields) during 1986 and 1987. They observed 25 different species of birds including spectacled eiders. Results indicated that strike rate was related to flight behavior, in particular the height of flight. Johnson and Richardson (1982) in their study of migratory behavior along the Beaufort Sea coast reported that 88% of eiders flew below an estimated altitude of 10 m (32 ft) and well over half flew below 5 m (16 ft). This tendency to fly low puts eiders at risk of striking objects in their path. A literature review by Day et al. (2005) also suggested that eider species maybe particularly susceptible to collisions with offshore structures as they fly low and at relatively high speed (approximately 45 mph).

Eiders migrating east during spring and west during summer/fall would be at risk of colliding with Mustang structures. These structures include buildings, the drill rig, and the communication tower. However, we expect most eiders to remain offshore during spring migration because they are thought to follow open water leads in the pack ice during their spring migration to the breeding grounds (Woodby and Divoky 1982, Johnson and Richardson 1982, Oppel et al. 2009, M. Sexson, USGS, pers. comm.). During post-breeding migration in summer and fall, we anticipate that male eiders would have the greatest collision risk in the action area. Satellite telemetry studies from the eastern ACP indicated that male spectacled eiders departed early in the summer and generally remained close to shore, sometimes crossing overland, during westward migration (TERA 2002; see also Petersen et al. 1999). However, we anticipate that the collision risk for spectacled eiders migrating through the action area from mid-May through late July would be greatly reduced by the visibility of structures during the 24 hours of daylight in the project area. When females and juveniles migrate during late summer/fall, decreasing daylight and more frequent exposure to foggy weather conditions could increase collision risk. Longer nights increase the time that eiders are vulnerable to collision with unseen structures, and may increase susceptibility to attraction or disorientation from lights. However, we anticipate that sea ducks, including spectacled eiders, are also more likely to migrate over open water in the Beaufort Sea (Petersen et al. 1999, TERA 2002), avoiding the inland Mustang structures. Collision risk is further reduced by design features which reduce outward-radiating light, minimizing the potential disorienting effects to eiders from facility lighting. Thus, we anticipate there would be a very low risk of spectacled eider mortality from collisions with project infrastructure. We also note that no collisions of spectacled eiders have been observed to date since monitoring began in 2007 at the nearby Pioneer Natural Resources Alaska, Inc. Oooguruk facilities, which include onshore and offshore structures.

In summary, we anticipate the likelihood of collisions of spectacled eiders with proposed structures would be very low given 1) good visibility of structures in late-spring and early summer due to extended daylight; 2) the tendency of migrating eiders to fly offshore and thereby avoid structures associated with Mustang during late summer and fall when darkness occurs, which increases collision risk; and 3) lighting would be designed to reduce the potential for disorienting flying eiders

Increased predator populations

Predator and scavenger populations have likely increased near villages and industrial infrastructure on the ACP (Eberhardt et al. 1983, Day 1998, Powell and Bakensto 2009). Reduced fox trapping, anthropogenic food sources in villages and oil fields, and an increase in availability of nesting/denning sites on human-built structures may have resulted in increased numbers of arctic foxes (*Vulpes lagopus*), common ravens (*Corvus corax*), and glaucous gulls (*Larus hyperboreus*) in developed areas of the ACP (e.g., Day 1998). Foxes are a primary predator of ground-nesting birds in the Prudhoe Bay Oilfield (Liebezeit and Zack 2008, 2010) and appear to occur at higher densities in the Prudhoe Bay region than adjacent areas (see review in Burgess 2000). Ravens may be highly efficient egg predators (Day 1998), and have been observed depredating Steller's eider nests near Barrow (Quakenbush et al. 2004). Ravens appear to have expanded their breeding range on the ACP by using manmade structures for nest sites (Day 1998). Therefore, as the number of structures and anthropogenic attractants associated with development increase, reproductive success of listed eiders may decrease.

Estimating the effects of predators on spectacled eider production in the action area is extremely difficult. We expect structures associated with the Mustang Project would increase the number of potential nesting and perching sites for ravens and increased availability of anthropogenic food resources for predators may also occur in the project area. However, management of raven nest sites and proper waste management and disposal policies would reduce potential increases in predator productivity and depredation of spectacled eider nests. Provided these management policies are followed, we anticipate adverse effects to spectacled eiders from increased predator populations would be minimal.

Oil spills
Small spills would be more likely to occur than large spills, and the majority of small spills would occur on the development pad and be confined to a small area. Given the low density of spectacled eiders in the action area, small spills would only affect a few individuals and therefore, we would not anticipate population level effects from small spills.

Due to the inland location of the Mustang Project, we do not anticipate direct oil spills in the marine environment. A large spill would likely be limited to the terrestrial environment, including tundra wetlands, freshwater ponds, and lakes. Again, due to the low density of spectacled eiders in the action area, we would expect only a few individuals to be affected by a large terrestrial spill. Depending on the volume and location, oil from a large terrestrial spill could conceivably enter nearby Miluveach River and be transported to the marine environment. In the event that oil from a large terrestrial spill enters the marine environment via the Miluveach River a large number of spectacled eiders could be affected. However, given (1) the low likelihood of oil from a large spill entering the Miluveach River; (2) the 12 mi (19.3 km) distance separating the Mustang project from the Beaufort Sea; (3) oil spill response plans in place; (4) the fact that a large spill would have to occur during the short open-water season to reach the marine environment via Miluveach River; and (5) the low density of spectacled eiders in and around the action area, we anticipate potential adverse effects to spectacled eiders from large oil spills would be extremely unlikely to occur.

Long-term habitat loss
Permanent habitat loss will result from placement of gravel to construct the MDP (19.2 acres), access roads (19.7 acres), pipelines (0.2 acres), mine site (46.3 acres).
We do not anticipate significant long-term habitat loss from ice road construction or operations. Research indicates that damage occurrs on higher, drier sites with little or no damage in wet or moist tundra areas (Pullman et al. 2003) when ice roads are used. Jorgenson (1999) found impacts were limited to isolated patches of scuffed high microsites and crushed tussocks. McKendrick (2003) studied several riparian willow areas and found although some branches were damaged, the affected plants survived. Because listed eiders prefer to nest in low moist tundra areas (Anderson and Cooper 1994, Anderson et al. 2009), we do not anticipate limited damage in higher drier tundra habitat from ice roads would adversely affect spectacled eiders.

We also anticipate that indirect habitat loss via disturbance will occur within a 200-m (656.17-ft) zone of influence surrounding new development from on-pad activities, road operations, and pipeline maintenance. The two principal mechanisms through which disturbance can adversely affect eiders on their breeding grounds are:

1. Displacing adults and/or broods from preferred habitats during pre-nesting, nesting, brood rearing, and migration; and
2. Displacing females from nests, exposing eggs or small young to inclement weather or predators.

Loss of production

In the discussion below, we provide an assessment of potential loss of spectacled eider production resulting from the proposed action. This assessment uses estimates of spectacled eider density on the ACP from waterfowl breeding population survey data from the region (Larned et al. 2011). These estimates were developed at a coarse regional scale and are not site or habitat-specific; however, they reflect the best available data on the density of breeding spectacled eiders in the action area. Distribution on a local scale may vary based on the availability of preferred habitats.

Habitat loss could occur through direct or indirect effects. Direct loss of habitat would occur by placement of gravel onto approximately 86 acres (0.34 km^2) of tundra wetlands during construction of the pads and access road. Indirect habitat loss may occur through displacement of eiders within a 200-m zone of influence surrounding the gravel pad, gravel roads, mine site, and pipelines. The area encompassed by the zone of influence, or the area of total habitat loss, is estimated to be 1,249 acres (5.05 km^2). This estimate is likely conservative because we expect eiders nesting within 200 m of pipelines would be exposed to lower levels of disturbance in most years compared to those nesting near gravel roads and pads.

Spectacled eider density polygons constructed from data collected during the 2007–2010 waterfowl breeding population survey of the ACP (Larned et al. 2011; Figure 4.2) provide our best estimate of spectacled eider nest density in the action area. Estimated spectacled eider density in the action area ranged from 0.029 to 0.111 birds/km^2 (Figure 4.2). To estimate the potential number of spectacled eider pairs displaced by the proposed action per year, we multiplied the median estimated density in the action area (0.07 birds/km^2) by the estimated affected footprint (5.05 km^2). We assume the estimated number of pairs displaced is equivalent to the number of nests or broods that may be affected. We also assume that spectacled eiders will be present and attempt to nest annually in the action area. Finally, we assume that displaced pairs will not move and successfully nest elsewhere, which is an unproven and conservative assumption. The potential loss of production in terms of numbers of eggs or ducklings lost was based on an average clutch size of 3.9 for spectacled eiders in northern Alaska (Petersen et al. 2000, Bart and Earnst 2005, Johnson et al. 2008). Applying these assumptions and this logic, we estimate the proposed action would cause the failure of 3 nests containing 12 eggs/ducklings over an assumed 16-year project life[2] as follows:

0.07 birds/km^2 × 0.5 nests/pair × 5.05 km^2 = 0.2 nests annually

0.2 nests annually × 16 years = 3.2 nests

3.2 nests × 3.9 eggs or ducklings per nest = 12.48 eggs over 16 years, rounded down to 12 eggs.

To summarize, we estimate that the proposed action will result in the loss of 12 eggs over an assumed 16-year project life through direct loss of breeding habitat and disturbance

[2] One year of construction plus an estimated 15-year field life.

within a 200-m zone of influence surrounding the project infrastructure within the action area. These estimates are based on a series of conservative assumptions and represent estimated maximum potential impact to spectacled eiders.

Effects to polar bears

Adverse effects to polar bears could result from the proposed action primarily through disturbance, increased polar bear–human interactions, and habitat loss.

Denning polar bears

Denning polar bears are more sensitive than other cohorts to disturbance from noise (USFWS 2011a). If disturbed, females appear more likely to abandon their dens and relocate in fall before cubs are born (Lentfer and Hensel 1980, Amstrup 1993), than in spring when cubs may not survive if they leave the maternal den early (Amstrup and Gardner 1994). Industrial noise and activities that commence after denning is initiated may cause females to abandon dens prematurely, before cubs have developed enough to survive outside the den. In addition, females and cubs continue to rely on the den site after cubs first emerge and they have been observed to spend an average of 8 days in the area before a den site is abandoned (USGS data cited by USFWS 2006). Therefore, denning polar bears and females with young cubs may be particularly susceptible to disturbance.

Behavioral response of individual denning females and family groups to disturbance is variable. While observations of den abandonment associated with industry activities have been reported from northern Alaska (see review in USFWS 2011a), available data indicates such events have been infrequent and isolated (USFWS 2011a) and some studies have reported individual denning polar bears to be tolerant of human disturbance (e.g., Amstrup 1993, Smith et al. 2007). Additionally, USFWS (2011a) reported three examples (2006, 2009, and 2010) of pregnant female bears establishing dens prior to the onset of oil industry activity within 400 m (1,312 ft) of the den site and remaining in the den through the normal denning cycle.

Data indicate polar bears den at low densities in the action area [Figure 5.1 (A)]. However, use of terrestrial denning habitat by the SBS stock may increase in response to changes in sea ice habitat (Durner et al. 2006). Den abandonment would be most likely to occur during construction activities because ongoing activities during routine operations would allow more sensitive bears to select an alternative den site. However, BRPC has committed to conduct den surveys using FLIR sensors before beginning construction of roads and pads for the Mustang Development Project (OASIS 2012c) in compliance with LOAs issued for the project under the Beaufort Sea ITRs and the project's Polar Bear Interaction Plan. If dens are detected within 1.6 km of the proposed locations of ice roads and pads, then the USFWS will be contacted and a 1-mile (1.6-km) no-disturbance buffer will be established.

Disturbance to non-denning bears

Operations at the drill sites and tie-in pads and along pipelines may disturb and displace individual polar bears from the immediate area. However, polar bears exposed to routine industrial noises may acclimate to those noises and show less vigilance than bears not exposed to such stimuli (Smith et al. 2007). The Service expects that potential adverse effects to polar bears will be reduced by following the Polar Bear Interaction Plan and the applicant's compliance with existing and future authorizations issued under the MMPA, such as LOAs issued under the Beaufort Sea ITRs.

Increased polar bear–human interactions

Polar bear–human encounters can be dangerous for both the polar bear and human. For the bear, a human encounter may result in it being hazed from the area or, in worst case, killed in defense of life and property. While loud noises may deter bears from entering an area of operation, polar bears are also curious and commonly approach noise sources, such as industrial sites (Stirling 1988).

Polar bears are scarce in and around the action area. Furthermore, the inland location of the Mustang project decreases the likelihood that polar bears would be encountered. However, if polar bears enter the project area and approach industrial sites, deterrence may be necessary. We would expect polar bear deterrence activities associated with oil and gas activities to occur rarely in the action area. For example, reports for oil and gas activities in the Beaufort Sea from 2006-2009 show that an average of 306 polar bears are observed by industry each year (range 170 - 420). Of those observations, 81% of bears showed no change in behavior, 4% altered their behavior by moving away from (or towards) the industrial activity, and the remaining 15% were subjected to intentional hazing or other deterrence actions (USFWS 2011b).

Therefore, we would expect few polar bears that enter the action area would necessitate deterrence. Of those encounters requiring deterrence, we would expect most not to be result in injury or take, as defined by the ESA (although they would meet the definition of Level B Harassment under the MMPA[3]), and would not rise to the level of injury or take, as defined by the ESA. For example, passive acoustic deterrence such as vehicle engine noise would likely result in temporary behavioral changes as deterred bears depart the area, and in most cases these efforts are effective. Only rarely are deterrence methods required that might injure the bear, such as projectile rounds that could cause bruising. Finally, we expect lethal take, as a result of deterrence activities to be extremely unlikely to occur. For example, since the implementation of ITRs, LOAs, and authorization of intentional take, only two polar bears are known to have been killed due to encounters with industry on the North Slope of Alaska.

In summary, given that approximately 15% of bears encountered by industry have been subject to deterrence (USFWS 2011b), we expect very few bears in the action area would require deterrence, and estimate that up to one polar bear could be hazed annually with projectiles as a result of the proposed action. Therefore, given (1) the low density of

[3] Level B Harassment - 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 but which does not have the potential to injure a marine mammal or marine mammal stock in the wild.

polar bears in the action area; (2) the inland location of the proposed development; (3) the rare occasion that encounters are predicted to result in deterrence; (4) the unlikely event that deterrence would result in injury or take (projectile hazing); and (5) the extremely unlikely event that deterrence would result in lethal take, we expect the proposed action would have a minimal impact on polar bears.

Habitat Loss

Habitat loss would occur through the construction of gravel pads and roads, a gravel mine, and pipelines, impacting approximately 0.34 km^2 (86 acres) of tundra within the action area. It is possible a small amount of potential denning habitat may be destroyed or altered by project activities; however, denning habitat does not limit population size (C. Perham, pers. comm. in USFWS 2008c). Furthermore, the action area is approximately 12 mi (19.3 km) from the coast and the majority of denning bears occur closer to the coast, therefore, the small amount of habitat lost in the action area would likely have a minimal impact on denning bears.

Oil Spills

Oil and toxic substance spills may result from the proposed action, and oil is known to be highly toxic to polar bears (St. Aubin 1990). Bears can be affected by contacting spilled oil or ingesting contaminated prey (Stirling 1990). The size, location, and timing of a spill will determine the number of polar bears affected.

Polar bears are sparsely distributed in the action area. Thus, a small spill on the tundra is unlikely to contact polar bears, even if it enters lakes and wetland complexes. A large spill that enters marine waters through the Miluveach River has a greater potential to contact, and kill, polar bears or their prey. However, given (1) the low likelihood of oil from a large spill entering the Miluveach River; (2) the distance of the Mustang Development project from the Beaufort Sea; (3) oil spill response plans in place; (4) the fact that a large spill would have to occur during the short open-water season to reach polar bears and their prey in the marine environment via Miluveach River; and (5) the extremely low density of polar bears in and around the action area, we anticipate potential adverse effects to polar bears from large oil spills would be extremely unlikely to occur.

7. CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this BO. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. When analyzing cumulative effects of a proposed action, it is important to define both the spatial (geographic), and temporal (time) boundaries. Within these boundaries, the types of actions that are reasonably foreseeable are considered.

Future development by the State of Alaska or the North Slope Borough may occur in the area through developments like improved roads, transportation facilities, utilities or other infrastructure. However, the entire action area, and the undeveloped lands surrounding are wetlands, and are therefore subject to Section 404 permitting requirements by the USACE. This permitting process would serve as a federal nexus, and hence trigger a review of any major state or borough construction project in the area.

8. CONCLUSION

Regulations (51 CFR 19958) that implement section 7(a)(2) of the ESA define "jeopardize the continued existence of" as "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species."

Spectacled eider
In evaluating the impacts of the proposed project to spectacled eiders, the Service identified direct and indirect adverse effects that could result from habitat loss and disturbance. Using methods explained in the *Effects of the Action* section, the Service estimates the loss of 12 spectacled eider eggs from 3 nests. However, we expect this loss of production will not have a significant effect at the population level because only a small proportion of spectacled eider eggs or ducklings on the North Slope would eventually survive to recruit into the breeding populations. Thus, the loss of eggs is of much lower significance for survival and recovery of spectacled eiders than the death of an adult bird. For example, spectacled eider nest success recorded on the YK-delta ranged from 18-73% (Grand and Flint 1997). From the nests that survived to hatch, spectacled eider duckling survival to 30-days ranged from 25-47% on the YK-delta (Flint et al. 2000). Over-winter survival of one-year old spectacled eiders was estimated at 25% (P. Flint pers. comm.), with annual adult survival of 2-year old birds (that may enter the breeding population) of 80% (Grand et al. 1998). Combining these estimates, we estimate that 0.9–6.6% of eggs/ducklings would be expected to survive and recruit into the breeding population.

If we also apply these rates to the estimated loss of production for the Mustang Development Project, we would expect the project to preclude up to 1 adult from entering the North Slope population over a 16-year project life. The population of North Slope-breeding spectacled eiders was last estimated at 12,916 (10,942–14,890, 95% CI; Stehn et al. 2006) for the period of 2002– 2006. Applying the methods of Stehn et al. (2006) to more recent aerial survey data from the North Slope results in an estimate of 11,254 (8,338–14,167, 95% CI) for the period of 2007–2010. Given that the potential loss of recruitment of up to 1 adult eider is an extremely small proportion of the estimated population size and this loss would be distributed across 16 years, we believe the loss of production that may result from the Mustang Development Project will not significantly affect the likelihood of survival and recovery of spectacled eiders. After reviewing the current status of the species, the environmental baseline, and effects of the proposed action, the Service concludes that the proposed action *is not likely to jeopardize the continued existence* of the spectacled eider by reducing appreciably the likelihood of its survival and recovery in the wild by reducing reproduction, numbers, or distribution of the species.

Polar bear

We have assessed potential impacts to polar bears to ensure activities that may result from the action do not jeopardize the continued existence of the species as required under section 7(a)(2) of the ESA. As described in the *Effects of the Action*, activities that may result from the action could adversely affect polar bears through disturbance, an increase in polar bear-human interactions, habitat loss, and oil spills. A very small number of polar bears may also be adversely affected through polar bear-human interactions which may include intentional take. These adverse effects are expected to impact only the SBS polar bear stock, and lethal take or population level impacts to the species are not anticipated. Given that (1) habitat loss would be minor; (2) large oil spills would be extremely unlikely to occur; and (3) disturbance and polar bear-human interactions would be unlikely to rise to the level of take, we do not expect population-level impact to occur as a result of the proposed action. Therefore, we conclude that the proposed action is not likely to jeopardize the continued existence of the polar bear or prevent its survival and recovery in the wild.

Future Consultation

This BO's determination of non-jeopardy is based on the assumption that the USACE and their agents will consult with the Service on future activities related to the Mustang Development Project that are not evaluated in this document.

In addition to listed eiders and polar bears, the area affected by the Mustang Development Project may now or hereafter contain plants, animals, or their habitats determined to be threatened or endangered. The Service, through future consultation may recommend alternatives to future developments within the project area to prevent activity that will contribute to a need to list such a species or their habitat. The Service may require alternatives to proposed activity that is likely to result in jeopardy to the continued existence of a proposed or listed threatened or endangered species or result in the destruction or adverse modification of designated or proposed critical habitat. The Federal action agencies should not authorize any activity that may affect such species or critical habitat until it completes its obligations under applicable requirements of the ESA as amended (16 U.S.C. 1531 et seq.), including completion of any required procedure for conference or consultation.

9. 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 by the Service 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 that include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), 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).

USACE has a continuing duty to regulate the activity covered by this ITS. If USACE (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 ITS through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse.

Spectacled Eider

As described in *Effects of the Action*, the activities described and assessed in this BO may adversely affect spectacled eiders through direct and indirect long-term habitat loss. Long-term habitat loss would occur directly from placement of gravel fill and indirectly through disturbance associated with facility operations and pipeline maintenance. Methods used to estimate loss of spectacled eider production resulting from long-term habitat loss are described in the *Effects of the Action* section. Based on these estimates of loss of spectacled eider production, the Service anticipates that *12 spectacled eider eggs or ducklings* are likely to be taken as a result of the proposed action through long-term direct and indirect habitat loss (harm).

While the incidental take statement provided in this consultation satisfies the requirements of the ESA, it does not constitute an exemption from the prohibitions of take of listed migratory birds under the more restrictive provisions of the Migratory Bird Treaty Act. However, the Service will not refer the incidental take of any migratory bird or bald eagle for prosecution under the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. §§ 703–712), or the Bald and Golden Eagle Protection Act of 1940, as amended (16 U.S.C. §§ 668–668d), if such take is in compliance with the terms and conditions specified herein.

Polar Bear

Although we have enumerated the extent of anticipated take of marine mammals, the Service is not authorizing take of marine mammals under the ESA at this time because such take has not yet been authorized under the Marine Mammal Protection Act and/or its 2007 Amendments. After take has been authorized under the MMPA, take under the ESA that results from actions conducted in compliance with all requirements and stipulations set forth in the MMPA authorization will be considered by the Service to also be authorized under the ESA.

10. REASONABLE AND PRUDENT MEASURES

These reasonable and prudent measures (RPMs) and their implementing terms and conditions (T&Cs) aim to minimize the incidental take anticipated from activities described in this BO.

Polar Bear

This action may result in take of polar bears. As stated previously, the Service is not authorizing incidental take for polar bears at this time; therefore, this ITS does not include RPMs or implementing T&Cs for this species. However, LOAs issued for this action will contain conditions to minimize impacts to polar bears.

Spectacled Eiders

As described in *Section 10 – Incidental Take Statement,* activities conducted by the USACE and their agents are anticipated to lead to incidental take of spectacled eiders through long-term habitat loss and disturbance of nesting females during the life of the project.

RPM 1 – Breeding spectacled eiders may remain on the tundra in the action area through late August, but are considered to be most vulnerable to the effects of disturbance through the early brood-rearing stage. Accordingly, off-pad activities within the action area will not be scheduled between June 1 and July 31.

11. TERMS AND CONDITIONS

To be exempt from the prohibitions of Section 9 of the ESA, the USACE must comply with the following terms and conditions, which implement the RPMs described above. These terms and conditions are non-discretionary.

T&C 1 – Off-pad activities within the action area shall not be scheduled between June 1 and July 31. If off-pad activities must be conducted during the June 1 – July 31 window, BRPC shall consult with USFWS to evaluate potential effects from these activities to spectacled eiders and determine whether additional conservation measures are required.

12. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs federal agencies to use 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 actions be implemented:

1. While no collisions between spectacled eiders and project structures are anticipated, the Service recommends reporting all sea duck collisions to the Endangered Species Branch, Fairbanks Fish and Wildlife Field Office to improve our understanding of collision risks to eiders in the project area. Contact Shannon Torrence at 907-455-1871 for information on how to report bird collisions.

2. In order to better understand common raven activity in the vicinity of oil and gas infrastructure, the Service recommends reporting the results of raven nest monitoring in an annual report to the Endangered Species Branch, Fairbanks Fish and Wildlife Field Office by December 31, each year.

13. REINITIATION NOTICE

This concludes formal consultation for the Mustang Development Project (POA-2012-236). 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 for spectacled eiders or polar bears is exceeded;
    a. More than 12 spectacled eider eggs or ducklings taken over the life of the project, or more than one polar bear hazed with projectiles annually;
2. New information reveals effects of the action agency that may affect listed species 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 species 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.

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