BIOLOGICAL OPINION

for

DS-2S DEVELOPMENT PROJECT: MILUVEACH RIVER POA-2012-922

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

Prepared by:
Fairbanks Fish and Wildlife Field Office
U.S. Fish and Wildlife Service
101 12th Ave, Room 110
Fairbanks, AK 99701

August 9, 2013

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 Conoco Philips Alaska, Inc. (CPAI) to develop the Drillsite 2S (DS-2S) Project, which would access a hydrocarbon reservoir near the Miluveach River in the Kuparuk River Unit (KRU) west of Deadhorse, Alaska. Because the project will impact waters of the United States, CPAI has requested a section 404 permit from the U.S. Army Corps of Engineers (USACE). CPAI also submitted a Threatened and Endangered Species Data Summary for the DS-2S Project (Synopsis from the Environmental Evaluation; EE) prepared by ABR, Inc. to the Service on April 12, 2013.

This BO describes the effects of the proposed action on listed Alaska-breeding Steller's eiders (*Polysticta stelleri*), spectacled eiders (*Somateria fischeri*), polar bears (*Ursus maritimus*), and the candidate species, Yellow-billed Loon (*Gavia adamsii*), 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 EE; 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with the USFWS Alaska Region Marine Mammal Management (USFWS MMM) office; other Service documents; and published and unpublished literature to develop this BO.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 and is not likely to jeopardize the continued existence of the yellow-billed loon, 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 DS-2S Project include construction of a 9.83 acre production drill site (DS-2S) and associated drilling and production structures, a gravel road, pipelines, fiber optic cable, communications equipment, and elevated power lines (Figure 2.1). Pipelines will transport produced fluids from DS-2S approximately 9 mi (14.48 km) northeast to Central Processing Facility No. 2 (CPF-2). Sales quality crude would then be transported from CPF-2 to the Trans-Alaska Pipeline via the Kuparuk Oil Pipeline. Lean gas and seawater would be delivered to DS-2S via pipelines from CPF-1 and CPF-2 for injection into the reservoir. Ice roads would be constructed during the winter of 2013/spring 2014 and winter 2014/spring 2015 in support of gravel placement for the access road and pad and installation of flowlines and powerlines. Construction, drilling, and first production is planned to occur over approximately 4 years from 2013–2017. The operational life of the DS-2S Project is expected to be approximately 25-30 years.

Components of the DS-2S Project include:

- Ice roads and pads to support construction (Figures 2.2 and 2.3);
- a 1.5 mi (2.41 km) gravel access road;
- a pipeline rack to support 5 pipelines in transferring production fluids, water, and gas between DS-2S and existing KRU infrastructure (Figure 2.1);
- a road crossing at Meltwater Pipeline with associated valve platform and guard rails;
- road culverts at approximately 5 locations;
- powerlines and communication cables between DS-2S and existing infrastructure (Figure 2.1);
- approximately fifty-two power poles;
- 24 production wells;
- wellhead and valve shelters;
- trunk and lateral lines;
- a pipe rack;
- valve platforms;
- an emergency shutdown module;
- a remote electrical and instrumentation module;
- an electrical transformer, switch gear, and platform;
- a chemical injection module;
- a test separator module;
- an electric test heater module;
- a standby generator;
- a free-standing communication tower;
- 3 high-mast light poles;
- other facility lighting as needed;
- approximately 172 on-pad and 298 off-pad vertical support members (VSMs);
- two snow fences east and west of DS-2S (Figure 2.4); and
- a drill rig and camp during drilling activities.

CPAI has proposed the following schedule for development of the DS-2S project:

- October 2013 through June 2014: construct gravel road and pad;
- October 2013 through October 2015: construct power line, pipelines, snow fences, and install on-pad facilities;
- July through September 2015: begin drilling;
- October through December 2015: start of drill site production; and
- January through December 2016: drilling to continue through 2016.

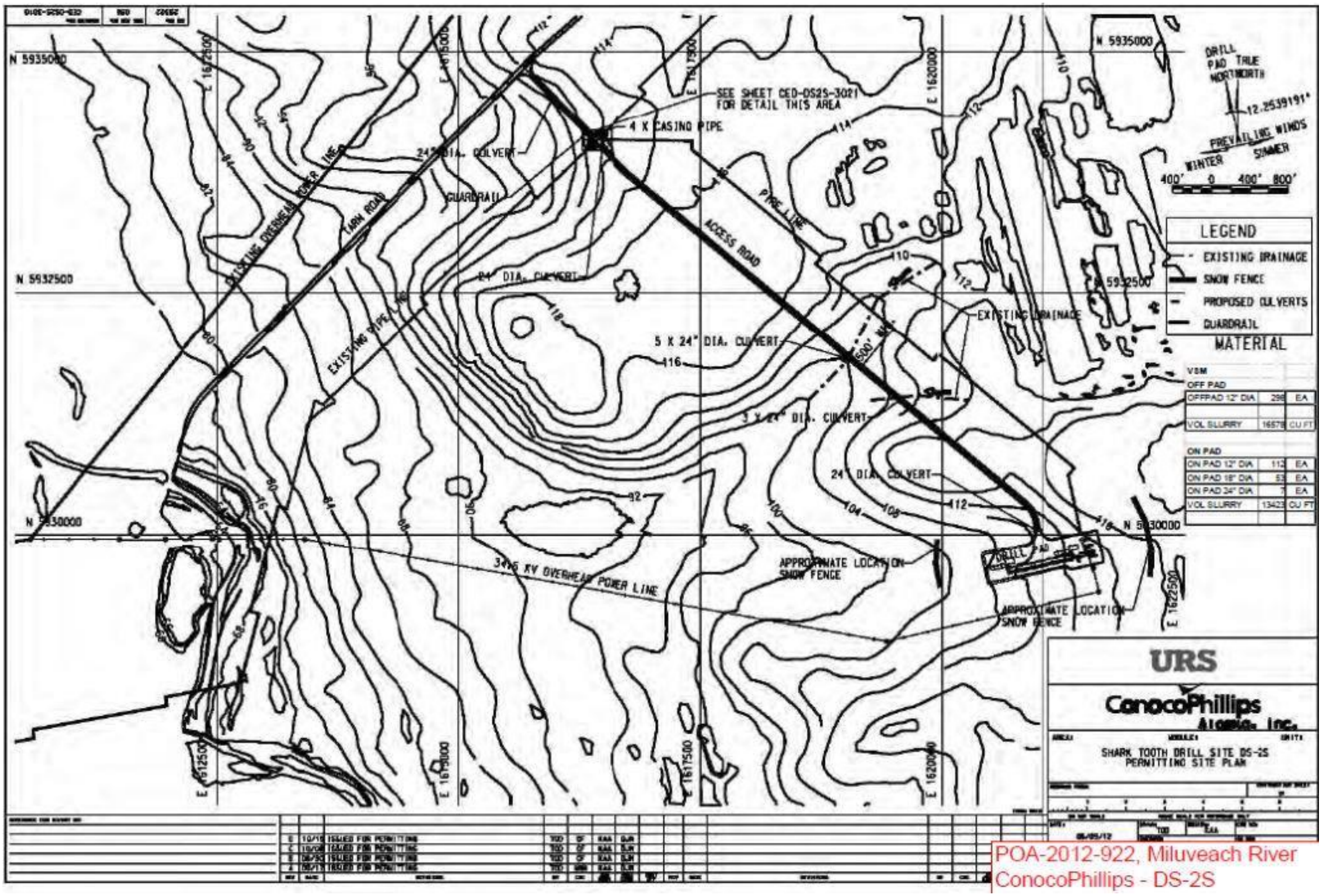

Figure 2.1. Proposed new infrastructure for the DS-2S Project (ABR 2013) including a production pad, gravel access road, flowlines, overhead powerlines, and snow fences in relation to existing infrastructure in the Kuparuk River Unit west of Deadhorse, Alaska.

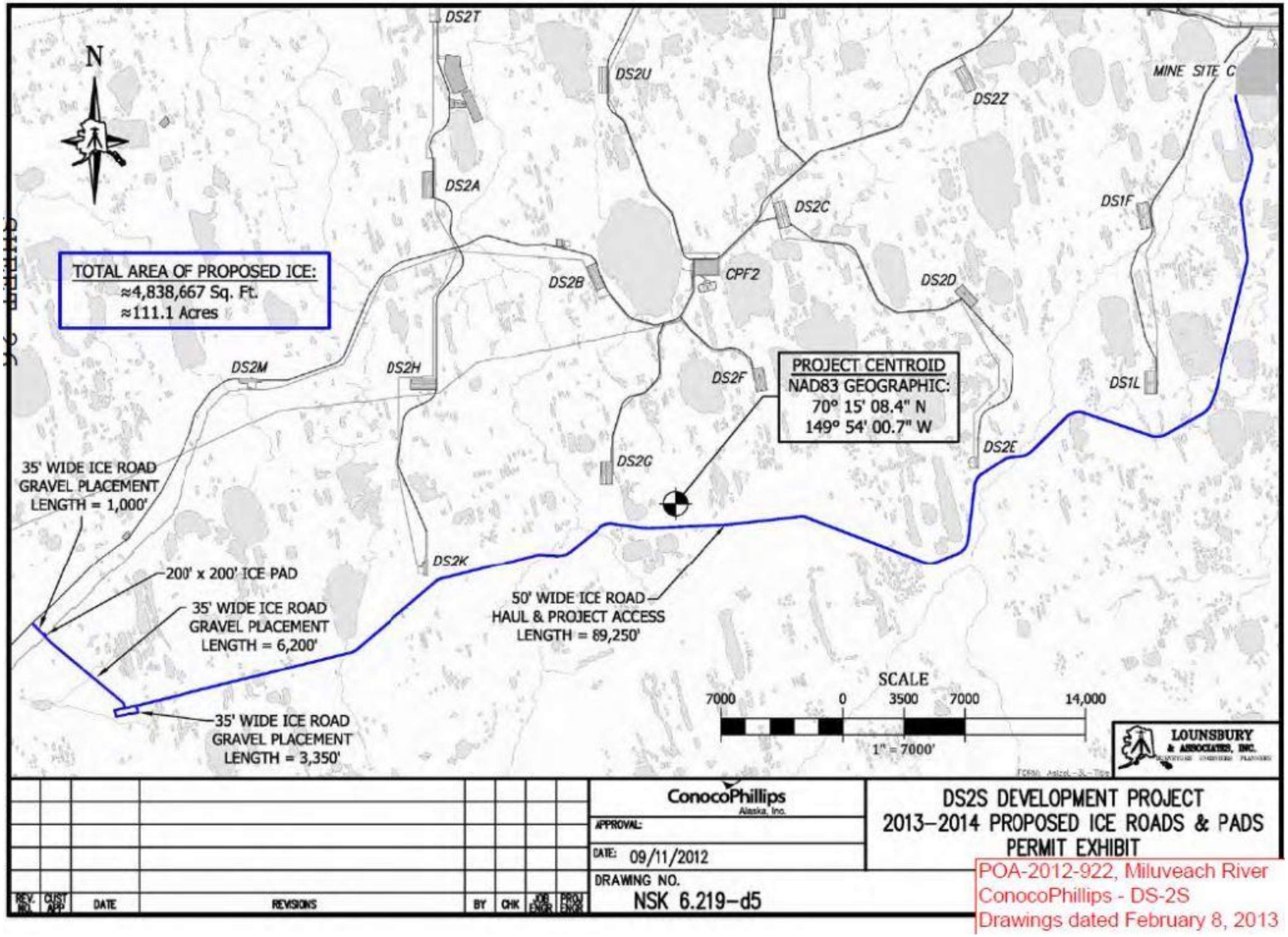

Figure 2.2. Proposed winter 2013 ice road route from Mine Site C overland to the DS-2S Project Area. This ice road would support gravel placement for the new production pad and access road.

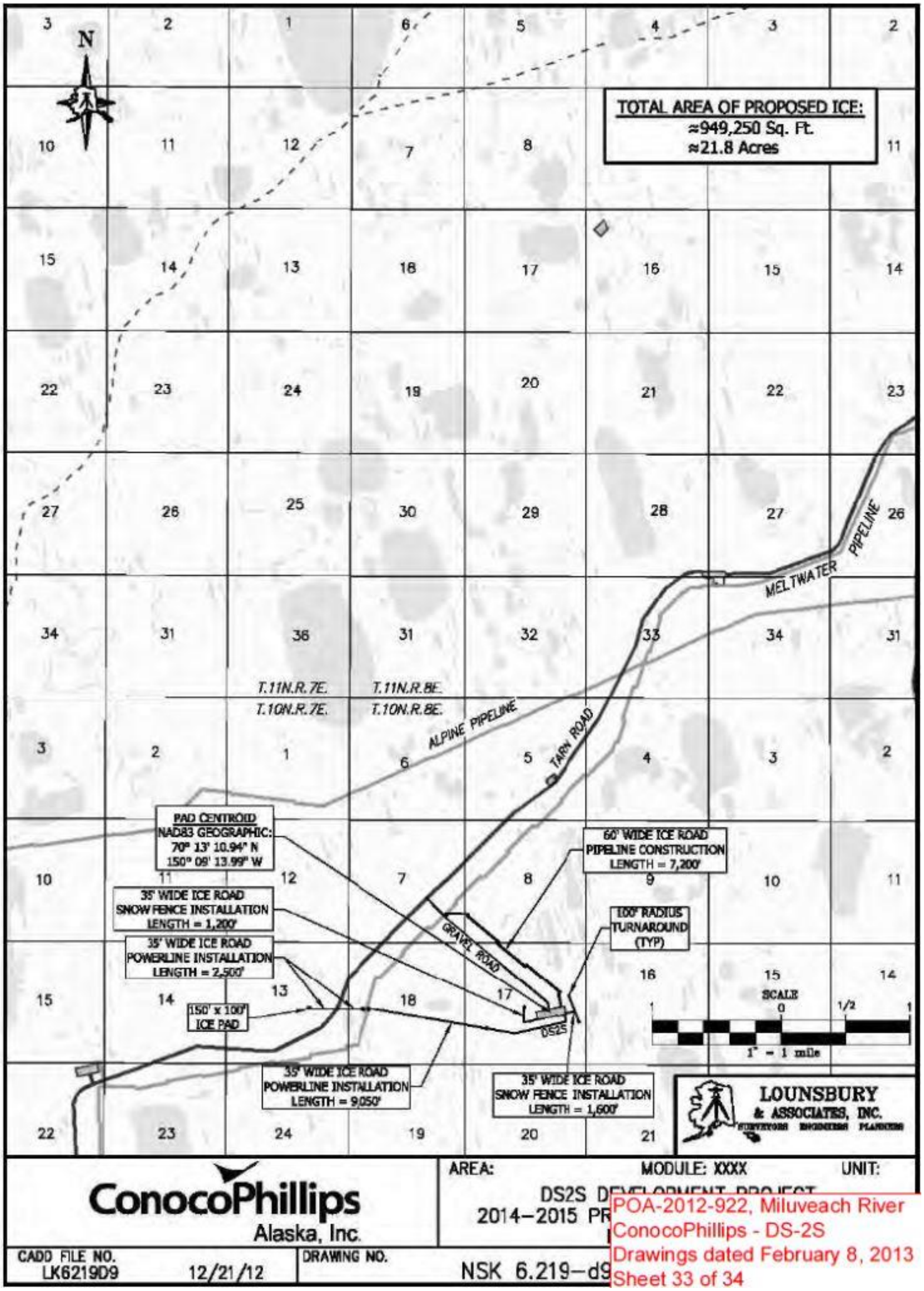

Figure 2.3. Proposed winter 2014-2015 ice roads in the DS-2S Project Area. These ice roads would support installation of pipeline racks and VSMs, as well as overhead powerlines.

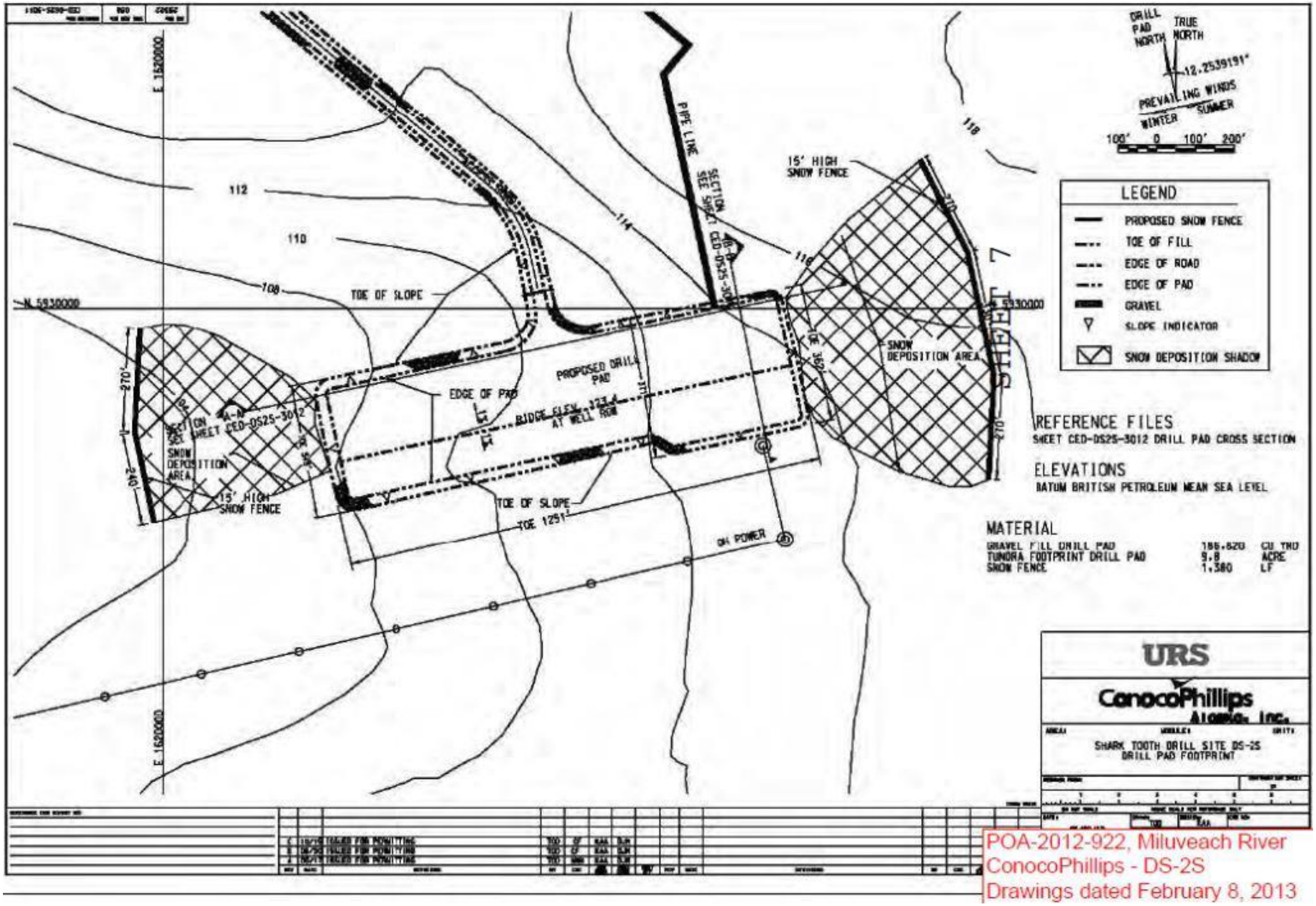

Figure 2.4. Snow fences would be installed adjacent to the proposed DS-2S production pad during the winter of 2014 and spring of 2015.

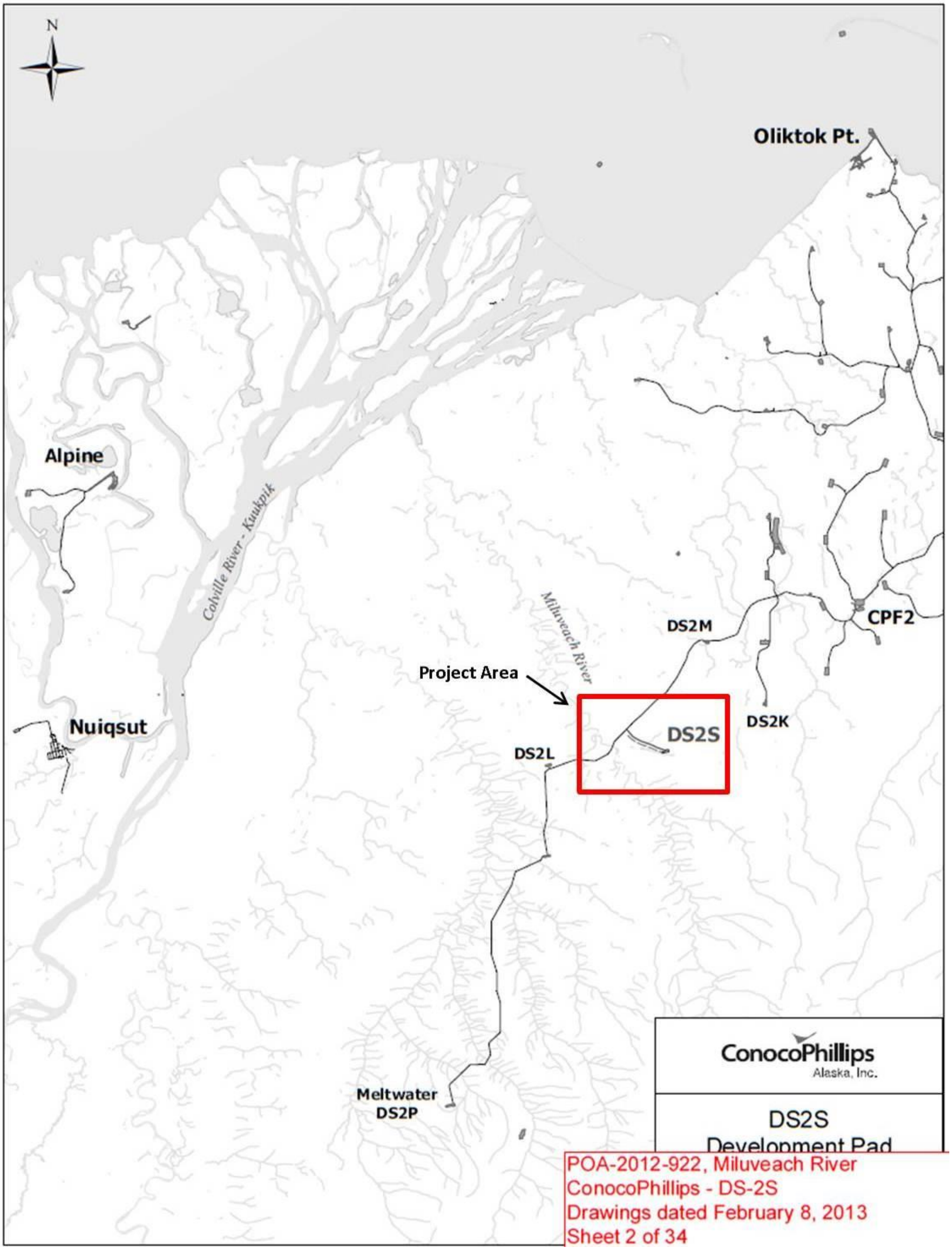

Figure 2.5. The proposed DS-2S Project area in relation to existing Kuparuk River Unit infrastructure west of Deadhorse, Alaska.

Project Details

Specific project components and associated construction, operations, and maintenance activities are summarized below. Project infrastructure and implementation are described further in the DS-2S Project EE (ABR 2013).

DS-2S

The approximately 10-acre (0.04 km^2) DS-2S drillsite would be constructed during winter and spring of 2014. DS-2S would support drilling and production operations and is designed to accommodate up to 24 production and injection wells on 30 ft (9.1 m) spacing.

Facilities at DS-2S would be installed from summer 2014 through spring 2015. Facility components would include wells, wellheads and valve shelters, trunk and lateral lines, pipe rack, valve platforms, emergency shutdown module, remote electrical and instrumentation module, electrical transformer, switchgears and platform, chemical injection module, test separator module, electric test module, standby generator, communication tower, 3 high-mast light poles, two snow fences, pipe rack and supports for cross country pipelines, access road, power lines, and drill rig and camp to support drilling operations.

Access road

The DS-2S access road would be between 52–70 ft (15.8-21.3 m) wide and run approximately 1.5 mi (2.41 km) southeast from the existing Tarn Road to DS-2S. Gravel placement would occur during the winter of 2013 and spring of 2014 and fill approximately 10.7 acres (0.04 km^2) of tundra habitat.

Pipelines

Five pipelines would be placed on VSMs at a minimum height of 7 ft (2.1 m) above ground level. These pipelines would transport production fluids, water, and gas approximately 1.5 mi (2.41 km) between DS-2S and existing KRU infrastructure (Figure 2.1).

Mine Site C

The primary gravel source would be Mine Site C located approximately 13 mi (22.40 km) northeast of DS-2S (Figure 2.3). This mine site would be accessed during the winter of 2013/2014 via an ice road and during the winter of 2014/2015 via the existing Tarn Road.

Ice roads

Ice roads would be constructed during the winters of 2013/2014 and 2014/2015 to support gravel pad and road placement (year 1) and other infrastructure associated with DS-2S (year 2). The first year ice road would be approximately 18.3 mi (29.4 km) in total length and traverse the tundra south of existing KRU infrastructure between Mine Site C and the project site, and between the project site and the Tarn Road (Figure 2.3). During the second winter season, ice roads would be constructed to support installation of pipeline between DS-2S and the Meltwater pipeline, overhead powerline installation, and snow fence construction around the DS-2S pad (Figure 2.4). These ice roads would total approximately 4.1 mi (6.6 km) in length (Figure 2.3)

Water supply
Local freshwater sources (lakes, ponds, and rivers) are proposed to provide water for the ice road system, drilling activities, and road maintenance. CPAI would be permitted to extract freshwater from specific sources by the Alaska Department of Natural Resources and the Alaska Department of Fish and Game. Approximately 22 million gallons of water would be required to support construction during the first winter season, 4 million gallons during the second winter season, and 8 million gallons would be required for the 18-month drilling campaign. Water withdrawals will be made in accordance with stipulations associated with State of Alaska water withdrawal permits.

Communications and electrical power.
A free-standing 100 ft (30.5 m) metal latticework communication tower would be installed on the DS-2S pad. Electrical power would be provided by 34.5 kV overhead powerlines fed from nearby existing KRU drillsites. The powerlines would be installed over approximately 2.25 mi (3.6 km) and require 52 power poles roughly 47 ft (14.3 m) in height. Guyed poles would be required at about 6 locations where the powerline would change direction, and at the beginning and termination of the line. Three power lines would be suspended from these poles in addition to a fiber optic cable for telecommunications.

Spill prevention and response
A spill prevention, control, and countermeasures (SPCC) plan has been developed in accordance with U.S. Environmental Protection Agency regulations, and an Oil Discharge Prevention and Contingency Plan (ODPCP) has been prepared in accordance with Alaska Department of Environmental Conservation regulations to cover drilling, production/operations, and oil transportation for the Kuparuk River Unit, including the DS-2S project.

Conservation Measures
Conservation measures that CPAI plans to implement to reduce potential impacts from the DS-2S Project to listed species and other wildlife are listed below:

- Design considerations were given to facility lighting (shielded to reduce outward-radiating light) to decrease the potential for bird strikes;
- Deterrent devices (pole caps) would be installed on power poles to reduce perching availability for predatory birds;
- Power line visibility to migratory birds would be enhanced by fault indicators, vibration dampeners, and air flow spoilers;
- Power pole guy wires would be covered with plastic sleeves to increase visibility to migratory birds;
- CPAI has developed a *Polar Bear Avoidance and Interaction Plan* for North Slope operations, including the DS-2S Project; the plan will be updated as needed 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 CPAI personnel working in polar bear habitat;
- Procedures for ice road/off-site operations including den detection and avoidance;
  - If requested by the Service's Marine Mammals Management office (USFWS MMM), CPAI will survey proposed ice road routes for potential polar bear dens using forward-looking infrared (FLIR) imaging technology prior to ice road construction. Conservation measures to avoid adverse effects to identified dens would be implemented based on recommendations by USFWS MMM and include operations maintaining a distance of 1 mi (1.6 km) from known dens.
- 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.

Action Area

The action area is approximately 8 mi (12.9 km) inland from Harrison Bay in the Beaufort Sea in the KRU approximately 42 mi (67.6) west of Deadhorse, Alaska (Figure 2.5). The action area includes the proposed production pad and access road, cross-tundra ice roads from Mine Site C (Figure 2.2), powerlines, pipelines, and freshwater sources associated with development and maintenance of DS-2S.

3. EFFECT DETERMINATION FOR STELLER'S EIDER AND YELLOW-BILLED LOON

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 extremely unlikely to nest near or migrate through the project area, we conclude that adverse effects would be discountable and that the proposed action is *not likely to adversely affect* Alaska-breeding Steller's eiders.

Yellow-billed loon

On March 25, 2009, the Service designated the yellow-billed loon a candidate for protection under the ESA because of the species' small population range-wide, concerns about levels of subsistence harvest, and other potential impacts to the species (74 FR 12932). Although rare, yellow-billed loons may be present in the action area from early June through September where they nest and rear broods in tundra ponds and lakes on Alaska's ACP. It is possible some nesting or brooding yellow-billed loons may be disturbed by the proposed activities. While disturbance associated with the proposed action may cause birds to flush, we expect this response to be insignificant as the disturbance would likely cause minor and temporary changes in behavior. Because available data indicate yellow-billed loons do not nest in high densities within the action area, and disturbances to nesting, feeding, or migrating birds would be temporary and minor, the Service concludes that adverse effects of the proposed action would be insignificant. Therefore, the proposed action is *not likely to jeopardize the continued existence* of the yellow-billed loon by reducing appreciably the likelihood of survival and recovery of this species in the wild by reducing its reproduction, numbers, and distribution.

4. STATUS OF THE SPECIES

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

Spectacled 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, 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 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, 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 primarily 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)

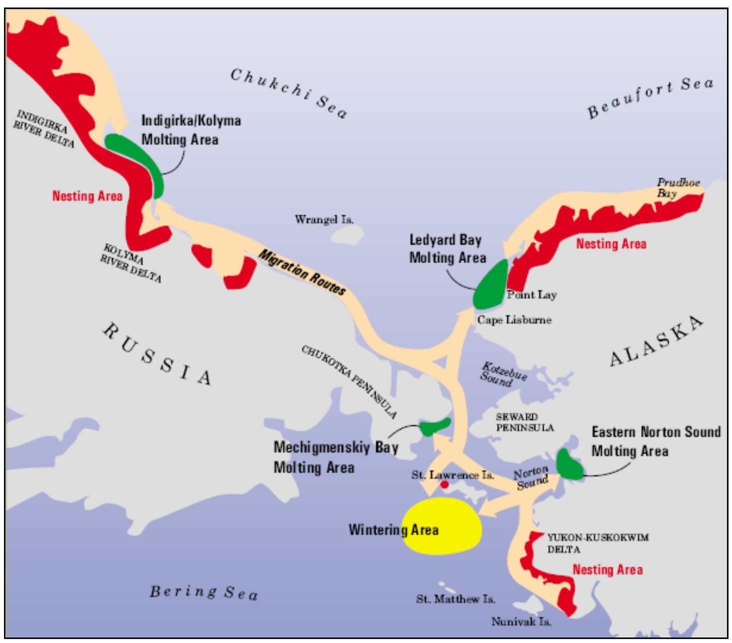

Figure 4.1. (A) Male and female spectacled eiders in breeding plumage. (B) Distribution of spectacled eiders. Molting areas (green) are used July –October. Wintering areas (yellow) are used October –April. The full extent of molting and wintering areas is not yet known and may extend beyond the boundaries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

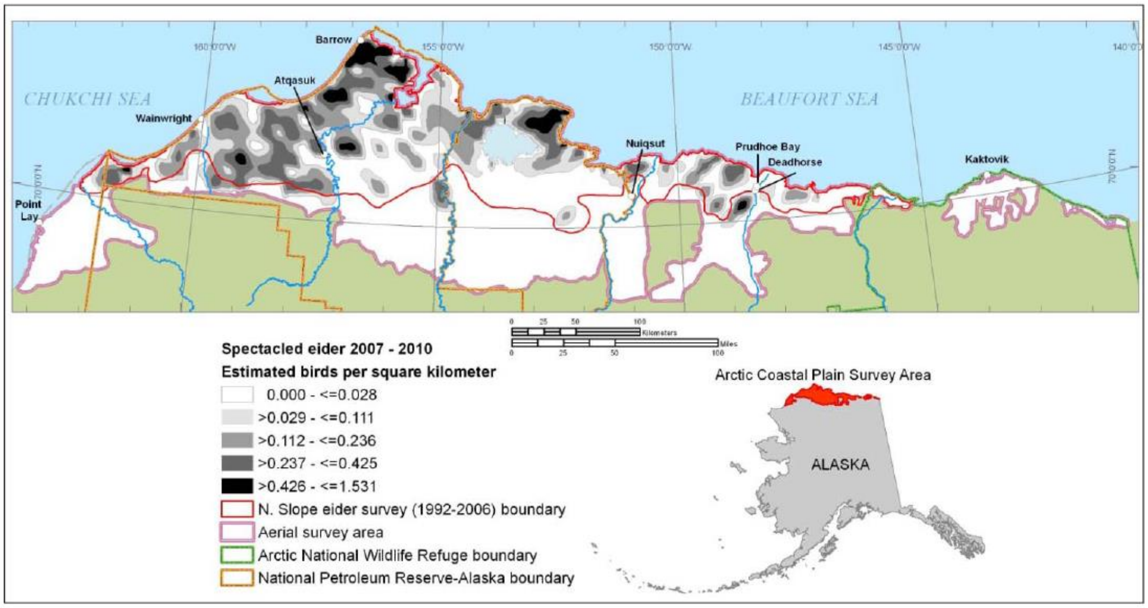

Figure 4.2. Density distribution of spectacled eiders observed on aerial transects sampling 57,336 km^2 of wetland tundra on the North Slope of Alaska during early to mid-June, 2007–2010 (Larned et al. 2011).

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 history 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 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' apparent 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 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).

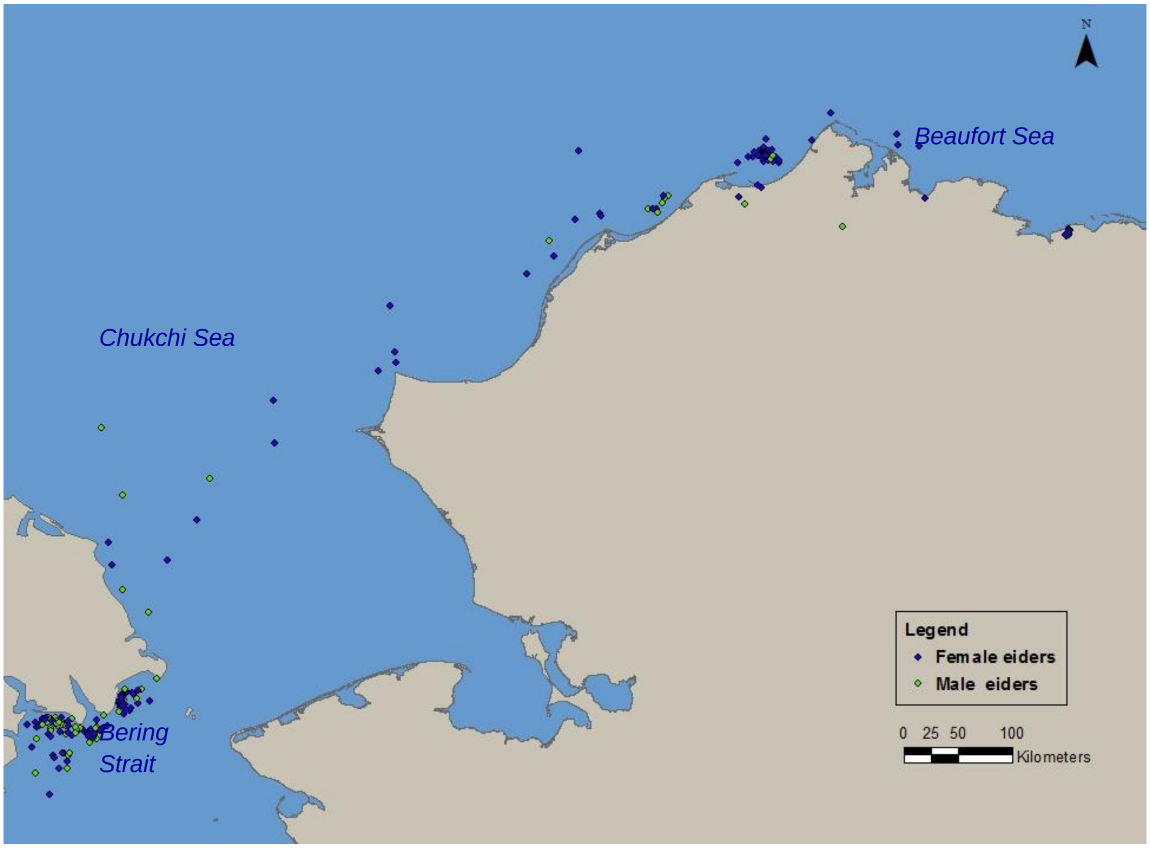

Figure 4.3. Spectacled eider satellite telemetry locations for 12 female and 7 male spectacled eiders in the eastern Chukchi Sea from 1 April – 15 June 2010 and 1 April – 15 June 2011. Additional locations from the northern coast of Russia are not shown. Eiders were tagged on the North Slope during the 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 historical 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. In a given year, the estimated number of nests reflects the minimum number of breeding pairs in the population and does not include non-nesting breeders or nests that were destroyed or abandoned (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

Status and Distribution

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

Polar bears are widely distributed throughout the Arctic where the sea is ice-covered for large portions of the year (Figure 4.4). The number of polar bears is estimated to be 20,000-25,000 with 19 recognized management subpopulations or "stocks" (Obbard et al. 2010). The International Union for Conservation of Nature and Natural Resources, Species Survival Commission (IUCN/SSC) Polar Bear Specialist Group ranked 11, four, and three of these stocks as "data deficient," "reduced," and "not reduced," respectively (Obbard et al. 2010). The status designation of "data deficient" for 11 stocks indicates that the estimate of the worldwide polar bear population was made with known uncertainty.

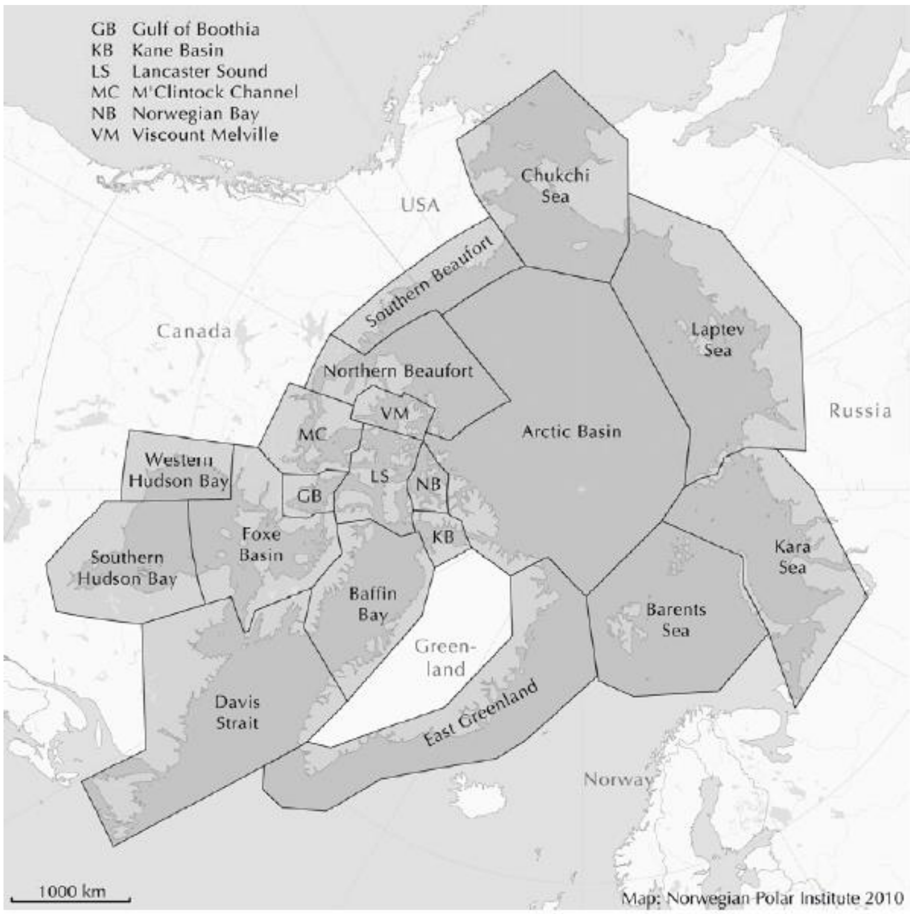

Figure 4.4. Distribution of polar bear stocks throughout the circumpolar basin (from Obbard et al. 2010).

Life History

For a complete life history of the polar bear, please see 73 FR 28212. We briefly describe the polar bear's food habits below.

Sea ice provides a platform for hunting and feeding, for seeking mates and breeding, for denning, for resting, and for long-distance movement. Ringed seals are polar bear's primary food source, and areas near ice edges, leads, or polynyas where ocean depth is minimal are the most productive hunting grounds (Durner et al. 2004). While polar bears primarily hunt seals for food, they may occasionally consume other marine mammals (73 FR 28212). While the main food source of polar bears is ice seals, bowhead whale carcasses have been available to polar bears as a food source on the North Slope since the early 1970s (Koski et al. 2005) and therefore may affect their distribution locally. Barter Island (near Kaktovik) has had the highest recorded concentration of polar bears on shore (17.0 ± 6.0 polar bears/100 km) followed by Barrow (2.2 ± 1.8) and Cross Island (2.0 ± 1.8; Schliebe et al. 2008). Record numbers of polar bears were observed in 2012 in the vicinity of the bowhead whale carcass "bonepile" on Barter Island; the USFWS observed a minimum, maximum, and average of 24, 80, and 52 bears respectively (USFWS 2012). The high number of bears on/near Barter Island compared to other areas is thought to be due in part to the proximity to the ice edge and high ringed seal densities (Schliebe et al. 2008), the whale harvest is at Kaktovik is lower than that at Barrow or Cross Island.

The use of whale carcasses as a food source likely varies among individuals and between years. Stable isotope analysis of polar bears in 2003 and 2004 suggested that bowhead whale carcasses comprised 11%-26% (95% CI) of the diets of sampled polar bears in 2003, and 0%-14% (95% CI) in 2004 (Bentzen et al. 2007). Polar bears depend on sea ice to hunt seals, and temporal and spatial availability of sea ice will likely decline. Thus, polar bear use of whale carcasses may increase in the future.

Threats to the Polar Bear

The arctic is losing sea ice, which will likely negatively affect polar bear populations. The loss rate of ice thickness is increasing (Haas et al. 2010), and trends in arctic sea ice extent and area (see http://nsidc.org/arcticseaicenews/faq/#area_extent for explanation of these terms) are negative (-12.2% and -13.5 %/decade, respectively; Comiso 2012). Declines in sea ice are more pronounced in summer than winter (NSIDC, 2011a, b). Positive feedback systems (i.e., sea-ice albedo) and naturally occurring events, such as warm water intrusion into the Arctic and changing atmospheric wind patterns, can cause fragmentation of sea ice, reduction in the extent and area of sea ice in all seasons, retraction of sea ice away from productive continental shelf areas throughout the polar basin, reduction of the amount of heavier and more stable multi-year ice, and declining thickness and quality of shore-fast ice (Parkinson et al. 1999, Rothrock et al. 1999, Comiso 2003, Fowler et al. 2004, Lindsay and Zhang 2005, Holland et al. 2006, Comiso 2006, Serreze et al. 2007, Stroeve et al. 2008). These climatic phenomena may also affect seal abundances, the polar bear's main food source (Kingsley 1979, DeMaster et al. 1980, Amstrup et al. 1986, Stirling 2002).

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

Because the polar bear depends on sea ice for its survival, loss of sea ice due to climate change is its largest threat worldwide, although polar bear subpopulations face different combinations of human-induced threats (Obbard et al. 2010). Arctic summer sea ice reached its lowest average extent in 2012 and has declined 13% since 1979 (NSIDC). The largest human-caused loss of polar bears is from subsistence hunting of the species, but for most subpopulations where subsistence hunting of polar bears occurs, it is a regulated and/or monitored activity (Obbard et al. 2010). Other threats include accumulation of persistent organic pollutants in polar bear tissue, tourism, human-bear conflict, and increased development in the Arctic (Obbard et al. 2010). Because uncertainty exists regarding the numbers of bears in some stocks and how human activities interact to ultimately affect the worldwide polar bear population, conservation and management of polar bears at the worldwide population level is challenging.

5. ENVIRONMENTAL BASELINE

The environmental baseline provides an analysis of the effects of past and ongoing human and natural factors leading to the current status of the species, their habitat, and ecosystem in 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. Within 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 KRU 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 spread over the life-span of a project, 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 *Effects of the Action on Listed Species*).

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 Ooguruk 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 ice formation. 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 the SBS stock (males, solitary females, and females with older cubs). Maternal dens have been observed near the action area (Figure 5.1, ABR 2013), although because limited denning habitat exists within the action area, few dens are likely to occur there. We also expect non-denning bears to occasionally travel through the action area.

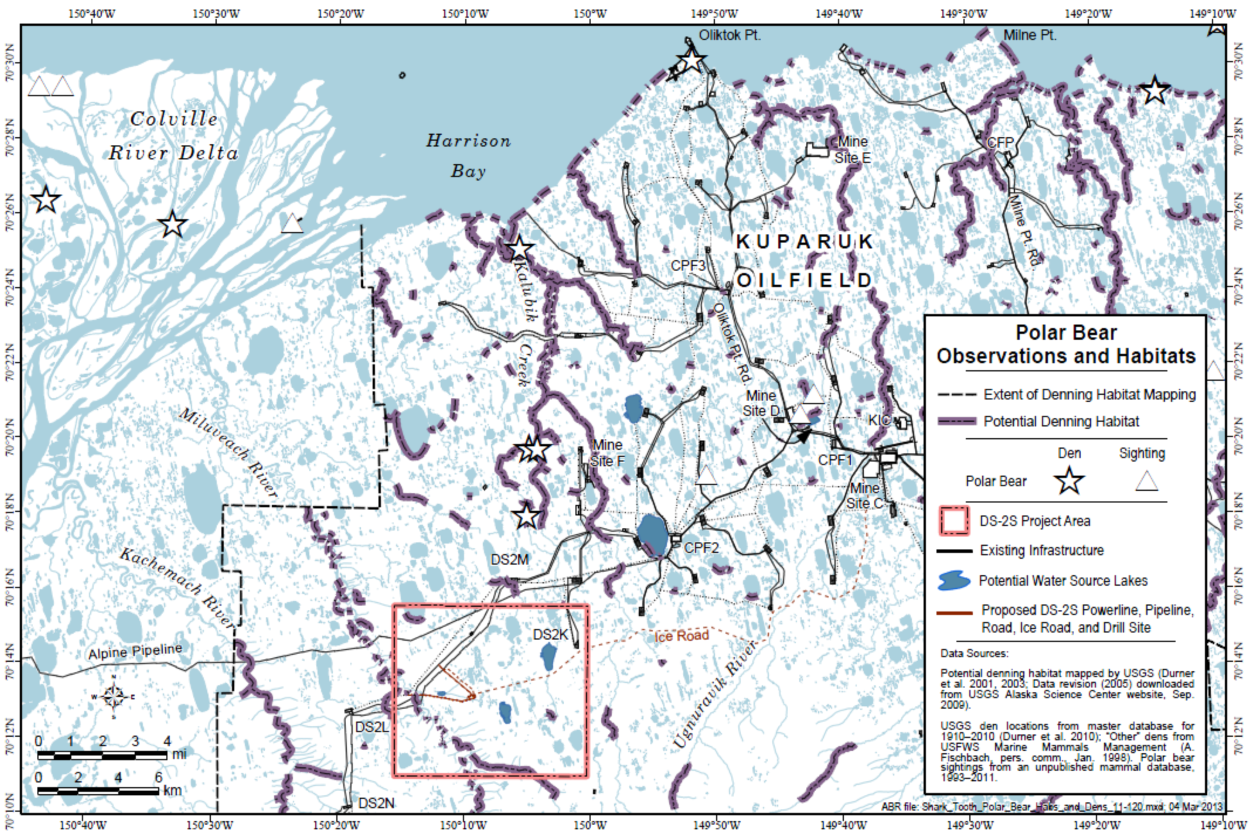

Figure 5.1. Polar bear habitats and observations of polar bear and polar bear dens in the DS-2S Project area and surrounding region 1910-2011(ABR 2013).

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 KRU 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 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 production facilities, or along roads and causeways that link these facilities. 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 was 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.

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 harvest 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 occurs in or near 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 25 mi (40 km) 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 deterred 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 unable to forage. 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 terrestrial denning habitat 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 may be 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 flight behavior of 25 migratory species near a 12.5 km power line in the Lisburn area (southern Prudhoe Bay oil fields) during 1986 and 1987. They witnessed four non-lethal collisions and detected 31 mortalities, including eiders. Results indicated that strike rate was related to flight behavior, in particular altitude. 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 near the ground puts eiders at risk of striking even relatively low objects in their path.

Eiders migrating east during spring and west during summer/fall would be at risk of colliding with DS-2S Project structures. These structures include the light poles, buildings, drill rig, communication tower, overhead powerlines, and guyed power poles. However, we expect most eiders to remain offshore during spring migration because they are thought to follow open water leads in pack ice during their spring migration to 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 depart early in summer and generally remain close to shore, sometimes crossing overland, during westward migration (TERA 2002; see also Petersen et al. 1999). However, we anticipate spectacled eider collision risk with DS-2S structures from mid-May through late July would be greatly reduced by the visibility of structures during 24 hours of daylight in the project area. When females and juveniles migrate during late summer/fall, decreasing daylight and frequent foggy weather conditions could increase collision risk. Longer nights increase the duration that eiders are vulnerable to collisions with unseen structures, and may compound susceptibility to attraction and disorientation from project lighting. However, we anticipate sea ducks, including spectacled eiders, would be more likely to migrate over open water in the Beaufort Sea (Petersen et al. 1999, TERA 2002), thereby avoiding inland DS-2S Project structures. We also expect collision risk with project lighting would be reduced by design features which shield outward-radiating light and minimize potential disorienting effects to eiders.

Overall, we anticipate risk of spectacled eider mortality from collisions with project infrastructure would be low. No spectacled eider collisions have been observed since monitoring began in 2007 at the nearby Pioneer Natural Resources Alaska, Inc. Oooguruk and Nuna facilities, however those developments avoided the use of overhead powerlines, hence that component of risk was absent. Because migratory birds are known to suffer injury or mortality from collisions with overhead wires, we believe the proposed overhead powerlines present the greatest risk of avian collisions with DS-2S features. The probability of collisions with overhead powerlines and guyed poles may be reduced by the use of fault indicators, vibration dampeners, air flow spoilers, and plastic sleeves. However, improved avian detection of elevated wires is ancillary to the principal design of these features, and information on the degree to which they may reduce collisions is lacking. Therefore, an unknown level of collision risk remains, and this risk will persist over the estimated 30-year project life. Several factors confound accurate collision estimates for spectacled eiders, including: 1) temporal changes in eider density and distribution; 2) lack of understanding how line orientation, type, and configuration contribute to avian collisions; and 3) how variations in weather and lighting conditions effect probability of collisions. The lack of empirical collision rate data is due to 1) diversity of search efforts; 2) variability in carcass detection rates due to observer bias and removal by predators; and 3) an unknown proportion of collisions that result in injury and are therefore difficult or impossible to detect.

Due to low spectacled eider density in the action area and the comparatively short length of proposed DS-2S powerlines (3.6 km), we anticipate few spectacled eider collisions with overhead power features. We acknowledge the proposed overhead power lines constitute a long-term, if not permanent, collision risk to migratory birds in the project area, including listed spectacled eiders. Although we have no means to reliably estimate numbers, we speculate, based on extremely subjective impressions of risk from recorded collisions at existing powerlines elsewhere on the North Slope, that 5 or fewer spectacled eiders would collide with wires over the life of the project. Therefore, the Service authorizes take of up to 5 spectacled eiders over the life of the project from injury or death attributed to collisions with DS-2S overhead powerlines. Given that the North Slope-breeding population of spectacled eiders is estimated to be 11,254 (8,338–14,167, 95% CI), and authorized take equates to 1 adult bird every six years, this impact would be so minor that population level effects from overhead line collisions are not expected.

In summary, we anticipate the likelihood of collisions of spectacled eiders with proposed DS-2S structures would be low because 1) good visibility of project structures in late-spring and early summer due to extended daylight likely reduces collision risk; 2) migrating eiders tend to fly offshore thereby avoiding inland DS-2S structures during late summer and fall when darkness increases collision risk; 3) facility lighting would be designed to reduce the potential for attracting or disorienting eiders in flight; 4) design features added to overhead powerlines may partially reduce potential collision risk; and 5) given the low density of spectacled eiders in the action area and comparatively short distance of overhead wires, few collisions with powerlines would be likely.

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 also 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 DS-2S Project would increase the number of potential nesting and perching sites for ravens and increase 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. Additionally, installation of pole caps on the proposed power poles would mitigate increased perch availability for predatory birds. Provided these management policies are followed, we anticipate adverse effects to spectacled eiders from increased predator populations would be reduced.

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 likely only affect a few individuals and therefore, we would not anticipate population level effects from small spills.

Due to the inland location of the DS-2S Project, we do not anticipate oil spills would reach 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 and we would not anticipate population-level effects.

Long-term habitat loss

Permanent habitat loss would result from placement of gravel to construct DS-2S (10 acres), access roads (10.7 acres), and pipelines (3.3 acres). We do not anticipate significant long-term habitat loss from ice road construction or operations. Research indicates that damage occurs 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 anticipate limited damage in higher drier tundra habitat from ice roads would not adversely affect spectacled eiders.

We also anticipate 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 maintenance activities. 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 and 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 24 acres (0.09 km^2) of tundra wetlands during construction of the pads and access road. Indirect habitat loss may occur through displacement of eiders from the surrounding area affected by disturbance. Assuming this affect may extend over roughly 200 m, the area encompassed by the zone of influence, or the area of total habitat loss, is estimated to be 469.80 acres (1.90 km^2). This estimate is likely conservative (i.e., biased high) 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) 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 (Larned et al. 2011). 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 (1.90 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 2 spectacled eider nests over an estimated 30-year project life[1]:

$$0.07 \text{ birds/km}^2 \times 0.5 \text{ nests/pair} \times 1.90 \text{ km}^2 = 0.066 \text{ nests annually}$$

$$0.066 \text{ nests annually} \times 31 \text{ years} = 2.06 \text{ spectacled eider nests}$$

Loss of eggs is of much lower significance for survival and recovery of the species than the death of an adult bird. For example, when nest success, fledging success, over-winter survival, and annual survival are taken in context, we estimate roughly 1-7 out of every 100 spectacled eiders hatched on the Y-K Delta would enter the breeding population (Grand and Flint 1997, Flint et al. 2000, Grand et al. 1998, and Flint pers. comm.). Similarly, we would expect only a small proportion of spectacled eider eggs or ducklings hatched on the North Slope to achieve reproductive potential.

Based on an average clutch size of 3.9 eggs for spectacled eiders (Petersen et al. 2000, Bart and Earnst 2005, Johnson et al. 2008), we estimate up to 8 eggs could be lost due to nest abandonment.

$$2.06 \text{ nests} \times 3.9 \text{ eggs or ducklings per nest} = 8.04 \text{ eggs lost}$$

Because the most recent population estimate for North Slope-breeding spectacled eiders is 11,254 (8,338–14,167, 95% CI), and recruitment into the breeding population is very low, we would not anticipate population level effects from the loss of 8 eggs from 2 abandoned nests as a result of disturbance associated with the proposed DS-2S Project.

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

[1] One year of construction plus an estimated 30-year field life.

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, ABR 2013). 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, which would be more constant and predictable, would allow more sensitive bears to select an alternative den site. However if requested by USFWS MMM, CPAI has committed to survey the proposed ice road routes for potential polar bear dens using FLIR technology prior to ice road construction in compliance with LOAs issued for the project under the Beaufort Sea ITRs and CPAI's Polar Bear Avoidance and Interaction Plan. Furthermore, if dens are detected within 1 mi (1.6 km) of proposed activities, work in the immediate area would cease, a 1 mile no-disturbance buffer would be established around the densite, and MMM would be contacted for guidance.

Disturbance to non-denning bears

Operations at the drill site, along pipelines, and ice roads may disturb and displace transient bears from the immediate area. However, we expect disturbances would be minor and temporary because transient bears would be able to respond to human presence or disturbance by departing the area. Additionally, 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). Furthermore, the Service expects that potential adverse effects to transient polar bears will be reduced by following CPAI's *Polar Bear Avoidance and 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 bears may need to be hazed if they approach work areas. Many acoustic and vehicular deterrence methods (starting a vehicle or revving an engine) are not likely to adversely affect polar bears (75 FR 61631). However, as described in LOA 13-INT-04, trained individuals may use mechanisms (e.g., chemical repellants, electric fences, and firearm projectiles) to harass or deter polar bears away from personnel and equipment. Polar bears could experience temporary disturbance and stress from some deterrence activities and may depart the area. Bears that are deterred using more aggressive methods (e.g., direct contact projectiles from firearms), would likely experience stress, short-term pain, and could be bruised. In extremely rare circumstances, if performed incorrectly, a polar bear may be severely injured or die.

Although CPAI would have authorization to use projectiles to deter bears away from personnel, we expect the majority of deterrence events would not involve contact with the bear (Level B Harassment under the MMPA[2]), and most would cause only minor, temporary, behavioral changes (e.g., the bear departs the area). Very few deterrence events would entail techniques that would physically contact a bear, such as projectiles. For example, from 2006 through 2010, the entire North Slope oil and gas industry reported sightings of 1,414 polar bears, of which 209 (15%) were intentionally deterred (USFWS 2011a). During those previous events, between 0-5 polar bears were deterred using bean bags and between 0-1 with rubber bullets annually. Given (1) that approximately 15% of bears encountered by industry have been subject to deterrence (USFWS 2011a); (2) the low density of bears in the action area; and (3) the inland location of the proposed development, we expect very few bears in the action area would require deterrence; (4) the unlikely event that deterrence would result in injury; 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 the gravel pad, road, and pipeline, impacting approximately 0.11 km^2 (26 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 15 mi (24.1 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 would determine the number of polar bears affected.

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. Because polar bears are sparsely distributed in the action area, and measures are included in the interaction plan and

---

[2] 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.

LOAs to prevent or deter bears from entering the project area, a small spill would be unlikely to contact polar bears and would affect at most, a few individuals. Therefore, we would not anticipate population level effects on polar bears from small spills.

Large spills are very unlikely, but have the potential to affect more individuals. However, due to the inland location of the DS-2S Project, we do not anticipate large spills would reach the marine environment. A large spill would likely be limited to the terrestrial environment, including tundra wetlands, freshwater ponds, and lakes. Given 1) the low density of polar bears in the action area; 2) the extremely low likelihood of oil from a large spill entering the marine environment; and 3) oil spill response plans in place, we would expect only a few individual bears to be affected by a large terrestrial spill and we would not anticipate population level effects to polar bears.

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 surrounding lands 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 impacts of the proposed project to spectacled eiders, the Service identified potential adverse effects from collisions with structures, and direct and indirect long-term habitat loss. Using methods explained in the *Effects of the Action* section, the Service estimates loss of up to 5 spectacled eiders (including adults and/or fledged juveniles) and potential loss of production of up to 8 eggs from 2 nests. Given that this loss would occur over a 30-year project life, and the estimated loss of both eiders (roughly 1 adult or juvenile per 6 years) and potential production (roughly one nest per 15 years) is an extremely small proportion of the estimated North Slope-breeding population of spectacled eiders (10,942–14,890, 95% CI; Stehn et al. 2006), we believe spectacled eider loss that may result from the DS-2S project would not significantly affect the likelihood of survival and recovery of the species. Therefore, after reviewing the current status of the species, environmental baseline, and effects of the action, the Service concludes that the proposed action is *not likely to jeopardize the continued existence* of the spectacled eider by reducing appreciably its reproduction, numbers, or distribution, thereby reducing the likelihood of its survival and recovery in the wild.

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); disturbance and polar bear-human interactions would be unlikely to result in injury or death of a bear; and (3) large oil spills would be extremely unlikely to occur, 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 DS-2S Project that are not evaluated in this document.

In addition to listed eiders and polar bears, the area affected by DS-2S 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

The activities described and assessed in this BO may adversely affect spectacled eiders through collisions with structures, and direct and indirect long-term habitat loss. Methods used to estimate spectacled eider take from collisions and habitat loss are described in the *Effects of the Action* section. Based on these estimates, the Service authorizes take of up to *5 spectacled eiders (adults and/or fledged juveniles) and loss of production from 2 abandoned nests with eggs as* a result of the proposed action.

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. 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 frequent collisions between spectacled eiders and project structures are not 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.

11. REINITIATION NOTICE

This concludes formal consultation for the DS-2S Project (POA-2012-922). 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 5 spectacled eiders (adults and/or fledged juveniles) taken by collisions with DS-2S features over the life of the project;
   b. More than 8 spectacled eider eggs over the life of the project; and
   c. More than one polar bear hazed with projectiles annually.
2. New information reveals effects of the action 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.

12. LITERATURE CITED

ABR, Inc., 2013. Threatened and endangered species data summary for the DS-2S Project: Synopsis from the environmental evaluation. ABR, Inc., Environmental Research and Services. Fairbanks, Alaska.

Amstrup, S.C. 1993. Human disturbances of denning polar bears in Alaska. Arctic 46:246–50.

Amstrup, S.C. 2000. Polar bear. pp. 133–157 *in* J.J. Truett and S.R. Johnson, *eds.* The natural history of an Arctic oilfield: development and the biota. Academic Press, Inc. New York.

Amstrup, S.C., and C. Gardner. 1994. Polar bear maternity denning in the Beaufort Sea. Journal of Wildlife Management 58(1):1–10.

Amstrup, S. C., I. Stirling, and J.W. Lentfer. 1986. Past and present status of polar bears in Alaska. Wildlife Society Bulletin 14: 241–254.

Anderson, B. and B. Cooper. 1994. Distribution and abundance of spectacled eiders in the Kuparuk and Milne Point oilfields, Alaska, 1993. Unpublished report prepared for ARCO Alaska, Inc., and the Kuparuk River Unit, Anchorage, Alaska by ABR, Inc., Fairbanks, Alaska, and BBN Systems and Technologies Corp., Canoga Park, CA. 71 pp.

Anderson B.A. and S.M. Murphy 1988. Lisburn terrestrial monitoring program 1986 and 1987: The effects of the Lisburn powerline on birds. Final report by ABR Inc. for ARCO Alaska. 60pp.

Anderson, B., R. Ritchie, A. Stickney, and A. Wildman. 1998. Avian studies in the Kuparuk oilfield, Alaska, 1998. Unpublished report for ARCO Alaska, Inc. and the Kuparuk River Unit, Anchorage, Alaska. 28 pp.

Anderson B., A.A. Stickney, R.J. Ritchie, and B.A. Cooper. 1995. Avian studies in the Kuparuk Oilfield, Alaska, 1994. Unpublished report for ARCO Alaska, Inc. and the Kuparuk River Unit, Anchorage, Alaska.

Anderson, B. A., A. A. Stickney, T. Obritschkewitsch, J. E. Shook, and P. E. Seiser. 2009. Avian studies in the Kuparuk Oilfield, Alaska, 2008. Data Summary Report for ConocoPhillips Alaska, Inc., and the Kuparuk River Unit, Anchorage, AK, by ABR, Inc., Fairbanks, AK.

Bart, J. and S.L. Earnst. 2005. Breeding ecology of spectacled eiders *Somateria fischeri* in Northern Alaska. Wildfowl 55:85–100.

Bentzen T.W., E.H. Follman, S.C. Amstrup, G.S. York, M.J. Wooler, and T.M. O'Hara. 2007. Variation in winter diet of Southern Beaufort Sea polar bears inferred from stable isotope analysis. Canadian Journal of Zoology 85:596–608.

Bowes, G.W. and C.J. Jonkel. 1975. Presence and distribution of polychlorinated biphenyls (PCB) in arctic and subarctic marine food chains. Journal of the Fisheries Research Board of Canada. 32:2111–2123.

Bowman, T., J. Fischer, R. Stehn, and G. Walters. 2002. Population size and production of geese and eiders nesting on the Yukon-Kuskokwim Delta, Alaska in 2002. Field report. U.S. Fish and Wildlife Service, Waterfowl Management Branch. Anchorage, AK. 22pp.

Braune, B.M., P.M. Outridge, A.T. Fisk, D.C.G. Muir, P.A. Helm, K. Hobbs, P.F. Hoekstra, Z.A. Kuzyk, M. Kwan, R.J. Letcher, W.L. Lockhart, R.J. Norstrom, G.A. Stern, and I. Stirling. 2005. Persistent organic pollutants and mercury in marine biota of the Canadian Arctic: an overview of spatial and temporal trends. The Science of the Total Environment 351–352:4–56.

Burgess, R.M. 2000. Arctic Fox. Pages 159–178 *in* J.C. Truett and S.R. Johnson (eds.). The natural history of an Arctic oil field development and biota.

Comiso, J.C. 2003. Warming trends in the Arctic from clear sky satellite observations. Journal of Climate 16: 3498-3510.

Comiso, J.C. 2006. Arctic warming signals from satellite observations. Weather 61(3): 70-76.

Comiso, J.C. 2012. Large decadal decline of the arctic multiyear ice cover. Journal of Climate 25: 1176-1193. doi: 10.1175/JCLI-D-11-00113.1

Cottam, C. 1939. Food habits of North American diving ducks. USDA Technical Bulletin 643, Washington, D.C.

Coulson, J.C. 1984. The population dynamics of the Eider Duck *Somateria mollissima* and evidence of extensive non-breeding by adult ducks. Ibis 126:525–543.

Dau, C.P. 1974. Nesting biology of the spectacled eider, *Somateria fischeri* (Brandt), on the Yukon–Kuskokwim Delta, Alaska. University of Alaska, Fairbanks, Alaska. M.S. thesis. 72 pp.

Dau, C.P., and S.A. Kistchinski. 1977. Seasonal movements and distribution of the spectacled eider. Wildfowl. 28:65–75.

Day, R.H. 1998. Predator populations and predation intensity on tundra-nesting birds in relation to human development. Report prepared by ABR Inc., for Northern Alaska Ecological Services, U.S. Fish and Wildlife Service, Fairbanks, Alaska. 106 pp.

DeMaster, D.P., M.C.S. Kingsley, and I. Stirling. 1980. A multiple mark and recapture estimate applied to polar bears. Canadian Journal of Zoology 58:633–638.

Derocher, A.E., N.J. Lunn, and I. Stirling. 2004. Polar bears in a warming climate. Integrative and Comparative Biology 44:163–176.

Drent, R. and S. Daan. 1980. The prudent parent: energetic adjustments in breeding biology. Ardea 68:225–252.

Durner, G.M., S.C. Amstrup, and K.J. Ambrosius. 2006. Polar bear maternal den habitat in the Arctic National Wildlife Refuge, Alaska. Arctic 59(1):31–36.

Durner, G. M., S. C. Amstrup, and A. S. Fischbach. 2003. Habitat characteristics of polar bear terrestrial maternal den sites in Northern Alaska. Arctic 56:55–62.

Durner, G.M., S.C. Amstrup, R. Nielson, T. McDonald. 2004. Using discrete choice modeling to generate resource selection functions for female polar bears in the Beaufort Sea. Pages 107–120 *in* S. Huzurbazar (Editor). Resource Selection Methods and Applications: Proceedings of the 1st International Conference on Resource Selection, 13–15 January 2003, Laramie, Wyoming.

Eberhardt, L.E., R.A. Garrott, and W.C. Hanson. 1983. Winter movements of Arctic foxes, *Alopex lagopus*, in a Petroleum Development Area. The Canadian Field-Naturalist 97:66–70.

Ely, C.R., C.P. Dau, and C.A. Babcock. 1994. Decline in population of Spectacled Eiders nesting on the Yukon–Kuskokwim Delta, Alaska. Northwestern Naturalist 75:81–87.

Esler D., J.M. Pearce, J. Hodges, and M.R. Petersen. 1995. Distribution, abundance and nesting ecology of spectacled eiders on the Indigirka River Delta, Russia. Unpublished progress report. National Biological Survey, Alaska Science Center. 12 pp.

Feder, H.M., A.S. Naidu, J.M. Hameedi, S.C. Jewett, and W.R. Johnson. 1989. The Chukchi Sea Continental Shelf: Benthos–Environmental Interactions. Final Report. NOAA–Ocean Assessment Division, Anchorage, Alaska. 294 pp.

Feder, H.M., N.R. Foster, S.C. Jewett, T.J. Weingartner, and R. Baxter. 1994a. Mollusks in the Northeastern Chukchi Sea. Arctic 47(2): 145–163.

Feder, H.M., A.S. Naidu, S.C. Jewett, J.M. Hameedi, W.R. Johnson, and T.E. Whitledge. 1994b. The northeastern Chukchi Sea: benthos–environmental interactions. Marine Ecology Progress Series 111:171–190.

Fischbach, A.S., S.C. Amstrup, D.C. Douglas. 2007. Landward and eastward shift of Alaskan polar bear denning associated with recent sea ice changes. Polar Biology 30:1395–1405.

Fischer, J.B., R.A. Stehn, and G. Walters. 2011. Nest population size and potential production of geese and spectacled eiders on the Yukon–Kuskokwim Delta, Alaska, 1985–2011. Unpublished Report. U.S. Fish and Wildlife. Service, Anchorage, Alaska. 43 pp.

Fisk, A.T., K.A. Hobson, and R.J. Norstrom. 2001. Influence of chemical and biological factors on trophic transfer of persistent pollutants in the Northwater Polynya marine food web. Environmental Science and Technology 35:732–738.

Flint, P.L and J.B. Grand. 1997. Survival of spectacled eider adult females and ducklings during brood rearing. Journal of Wildlife Management 61:217–221.

Flint, P.L., J.B. Grand, J.A. Morse, and T.F. Fondell. 2000. Late summer survival of adult female and juvenile spectacled eiders on the Yukon–Kuskokwim Delta, Alaska. Waterbirds 23:292–297.

Flint, P.L and J.L. Schamber. 2010. Long-term persistence of spent lead shot in tundra wetlands. Journal of Wildlife Management 74:148–151.

Fowler, C., W.J. Emery, and J. Maslanik. 2004. Satellite-derived evolution of Arctic sea ice age: October 1978 to March 2003. Geoscience and Remote Sensing Letters, IEEE, Volume 1, Issue 2, April 2004 pp.71–74.

Franson, J., M.R. Petersen, C. Meteyer, and M. Smith. 1995. Lead poisoning of spectacled eiders (*Somateria fischeri*) and of a common eider (*Somateria mollissima*) in Alaska. Journal of Wildlife Diseases 31:268–271.

Gabrielson, M. and N. Graff. 2011 Monitoring of Nesting Spectacled Eiders on Kigigak Island, Yukon Delta NWR, 2011. Unpublished report. U.S. Fish and Wildlife Service, Yukon Delta National Wildlife Refuge, Bethel, Alaska 99559. 16 pp.

Garner, G.W., S.T. Knick, and D.C. Douglas. 1990. Seasonal movements of adult female polar bears in the Bering and Chukchi Seas. International Conference on Bear Research and Management 8:219–26.

Gorman, M.L. and H. Milne. 1971. Seasonal changes in adrenal steroid tissue of the common eider *Somateria mollissima* and its relation to organic metabolism in normal and oil polluted birds. Ibis 133:218–228.

Grand, J.B. and P.L. Flint. 1997. Productivity of nesting spectacled eiders on the Lower Kashunuk River, Alaska. The Condor 99:926–932.

Grand, J.B., P.L. Flint, and M.R. Petersen. 1998. Effect of lead poisoning on spectacled eiders survival rates. Journal of Wildlife Management 62:1103–1109.

Haas, C.; Hendricks, S.; Eicken, H., and A. Herber. 2010. Synoptic airborne thickness surveys reveal state of Arctic sea ice cover. *Geophysical. Research. Letters.* 37(9):L09501.

Harwood, C. and T. Moran. 1993. Productivity, brood survival, and mortality factors for spectacled eiders on Kigigak Island, Yukon Delta NWR, Alaska, 1992. Unpublished report prepared for U.S. Fish and Wildlife Service, Bethel, Alaska. 11pp + Appendix.

Hinzman, L.D., N.D. Bettez, W.R. Bolton, F.S. Chpin, M.B. Dyurgerov, C.L. Fastie, B. Griffith, R.D. Hollister, A. Hope, H.P. Huntington, A.M. Jensen, G.J. Jia, T. Jorgenson, D.L. Kane, D.R. Klien, G. Kofinas, A.H. Lynch, A.H. Lloyd, A.D. McGuire, F.E. Nelson, W.C. Oechel, T.E. Osterkamp, C.H. Racine, V.E. Romanovsky, R.S. Stone, D.A. Stow, M. Strum, C.E. Tweedie, G.L. Vourlitis, M.D. Walker, D.A. Walker, P.J. Webber, J.M. Welker, K.S. Winklet, K. Yoshikawa. 2005. Evidence and implications of recent climate change in northern Alaska and other arctic regions. Climatic Change 72: 251–298.

Holland, M., C.M. Bitz, and B. Tremblay. 2006. Future abrupt reductions in summer Arctic sea ice. Geophysical Research Letters 33 L25503: doi 10.1029/200661028024: 1-5.

Hunter, C.M., H. Caswell, M.C. Runge, E.V. Regehr, S.C. Amstrup, and I. Stirling. 2007. Polar bears in the southern Beaufort Sea II: demographic and population growth in relation to sea ice conditions. U.S. Dept. of the Interior, U.S. Geological Survey Administrative Report. 46 pp.

IPCC. 2007. Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, Pachauri, R.K., and A. Reisinger (eds.)]. IPCC, Geneva, Switzerland, 104 pp.

Johnson, C.B, J.P. Parrett, and P.E. Seiser. 2008. Spectacled eider monitoring at the CD–3 development, 2007. Annual report for ConocoPhillips Alaska, Inc., and Anadarko Petroleum Corporation, Anchorage, by ABR, Inc., Fairbanks, Alaska. 43 pp.

Johnson, R. and W. Richardson. 1982. Waterbird migration near the Yukon and Alaska coast of the Beaufort Sea: II. Molt migration of seaducks in summer. Arctic 35: 291–301.

Jorgenson, M.T. 1999. Assessment of tundra damage along the ice road to the Meltwater South exploratory well site. Unpublished report prepared for ARCO Alaska, Inc., Anchorage, AK, by ABR, Inc., Fairbanks, AK. 11pp.

Kingsley, M.C.S. 1979. Fitting the von Bertalanffy growth equation to polar bear age–weight data. Canadian Journal of Zoology 57:1020–25.

Kondratev, A. and L. Zadorina. 1992. Comparative ecology of the king eider *Somateria spectabilis* and spectacled eider *Somateria fischeri* on the Chaun tundra. Zool. Zhur. 71:99–108. (in Russian; translation by J. Pearce, National Biological Survey, Anchorage, Alaska).

Korschgen, C.E. 1977. Breeding stress of female eiders in Maine. Journal of Wildlife Management 41:360–373.

Koski W.R., J.C. George, G. Sheffield, M.S. Galginaitis. 2005. Subsistence harvests of bowhead whales (*Balaena mysticetus*) at Kaktovik, Alaska (1973–2000). J Cet Res Manage 7:33–37.

Lake, B. C. 2007. Nesting Ecology of Spectacled and Common Eiders on Kigigak Island, Yukon Delta NWR, Alaska, 2007. Unpublished report. U.S. Fish and Wildlife Service, Yukon Delta National Wildlife Refuge, Bethel, Alaska 99559. 18 pp.

Larned, W., G.R. Balogh, and M.R. Petersen. 1995. Distribution and abundance of spectacled eiders (*Somateria fischeri*) in Ledyard Bay, Alaska, September 1995. Unpublished progress report, U.S. Fish and Wildlife Service, Anchorage, Alaska. 11 pp.

Larned, W., R. Stehn, and R. Platte. 2010. Waterfowl breeding population survey Arctic Coastal Plain, Alaska 2009. Unpublished report. U.S. Fish and Wildlife Service, Anchorage, AK. 42 pp.

Larned, W., R. Stehn, and R. Platte. 2011. Waterfowl breeding population survey Arctic Coastal Plain, Alaska 2010. Unpublished report. U.S. Fish and Wildlife Service, Anchorage, AK. 52 pp.

Larned, W., K. Bollinger, and R. Stehn. 2012. Late winter population and distribution of spectacled eiders (*Somateria fischeri*) in the Bering Sea, 2009 and 2010. Unpublished report. U.S. Fish and Wildlife Service, Anchorage, AK. 25 pp.

Lentfer, J.W. and R.J. Hensel. 1980. Alaskan polar bear denning. International Conference on Bear Research and Management 4:101–8.

Lie, E., A. Bernhoft, F. Riget, S.E. Belikov, A.N. Boltunov, G.W. Garner, Ø Wiig, and J.U. Skaare. 2003. Geographical distribution of organochlorine pesticides (OCPs) in polar bears (*Ursus maritimus*) in the Norwegian and Russian Arctic. The Science of the Total Environment 306:159–170.

Liebezeit, J.R.. and S. Zack. 2008. Point counts underestimate the importance of arctic foxes as avian nest predators: evidence from remote video cameras in Arctic Alaskan oil fields. Arctic 61:153–161.

Liebezeit, J.R., and S. Zack. 2010. Avian habitat and nesting use of tundra-nesting birds in the Prudhoe Bay oilfield – long-term monitoring: 2010 annual report. Interim report prepared by the Wildlife Conservation Society in fulfillment of U.S. Bureau of Land Management grant L10AS0005737. 37 pp. Accessed 19 January 2012 through http://www.wcsnorthamerica.org/AboutUs/Publications/tabid/3437/Default.aspx.

Lindsay, R.W., and J. Zhang. 2005. The thinning of the Arctic sea ice, 1988-2003: have we passed a tipping point? Journal of Climate 18: 4879-4894.

Lovvorn, J.R., S.E. Richman, J.M. Grebmeier, and L.W. Cooper. 2003. Diet and body condition of spectacled eiders wintering in the pack ice of the Bering Sea. Polar Biology 26:259–267.

Manville, A.M., II. 2000. The ABCs of avoiding bird collisions at communication towers: the next steps. Proceedings of the Avian Interactions Workshop, December 2, 1999, Charleston, SC. Electric Power Research Institute. 15pp.

Manville, A.M., II. 2004. Bird Strikes and electrocutions at power lines, communication towers, and wind turbines; State of the art and state of the science – next steps towards mitigation. Proceedings 3rd International Partners in Flight Conference, March 20–24, 2002, Asilomar Conference Grounds, CA. USDA Forest Service General Technical Report PSW-GTR-191. 25pp.

McKendrick, J.D. 2003. Report on condition of willows at four streams crossed by the 2002 Grizzly ice road. Report prepared for ConocoPhillips, Alaska, Inc., Anchorage, AK by Lazy Mountain Research Company, Inc., Palmer, AK. 13pp.

Milne, H. 1976. Body weights and carcass composition of the common eider. Wildfowl 27:115–122.

Moran, T. 1995. Nesting ecology of spectacled eiders on Kigigak Island, Yukon Delta NWR, Alaska, 1994. Unpublished report prepared for U.S. Fish and Wildlife Service, Bethel, Alaska. 8pp + appendix.

Moran, T. and C. Harwood. 1994. Nesting ecology, brood survival, and movements of spectacled eiders on Kigigak Island, Yukon Delta NWR, Alaska, 1993. Unpublished report prepared for U.S. Fish and Wildlife Service, Bethel, Alaska. 33 pp + appendix.

National Snow and Ice Data Center (NSIDC). 2011a. Ice extent low at start of melt season; ice age increases over last year. NSIDC Press Release. Boulder, Co: Cooperative Institute for Research in Environmental Sciences, National Snow and Ice Data Center; 2011; 05 April 2011. 4 pp. Available at http://nsidc.org/arcticseaicenews/2011/040511.html (accessed December 19, 2011).

NSIDC. 2011b. Summer 2011: Arctic sea ice near record lows. NSIDC Sea Ice News and Analysis. Boulder, Co: Cooperative Institute for Research in Environmental Sciences, National Snow and Ice Data Center; 2011; 04 October 2011. 4 pp. Available at http://nsidc.org/arcticseaicenews/2011/100411.html, accessed December 19, 2011.

Obbard, M.E., G.W. Thiemann, E. Peacock, and T.D. DeBruyn, eds. 2010. Polar Bears: Proceedings of the 15th Working Meeting of the IUCN/SSC Polar Bear Specialist Group, Copenhagen, Denmark, 29 June–3 July 2009. Gland, Switzerland and Cambridge, UK: IUCN. vii + 235 pp.

Oppel, S., D.L. Dickson, and A.N. Powell. 2009. International importance of the eastern Chukchi Sea as a staging area for migrating king eiders. Polar Biology 32:775–783.

Parker, H. and H. Holm. 1990. Pattern of nutrient and energy expenditure in female Common eiders nesting in the high arctic. Auk 107:660–668.

Parkinson, C.L., D.J. Cavalieri, P. Gloersen, H.J. Zwally, and J.C. Comiso. 1999. Arctic sea ice extents, areas, and trends, 1978-1996. Journal of Geophysical Research 104(C9):20837-20856.

Pearce, J.M., D. Esler and A.G. Degtyarev. 1998. Birds of the Indigirka River Delta, Russia: historical and biogeographic comparisons. Arctic 51:361–370.

Petersen, M.R. and D. Douglas. 2004. Winter ecology of spectacled eiders: environmental characteristics and population change. Condor 106:79–94.

Petersen, M., D. Douglas, and D. Mulcahy. 1995. Use of implanted satellite transmitters to locate spectacled eiders at sea. Condor 97: 276–278.

Petersen, M.R. and P.L. Flint. 2002. Population structure of pacific common eiders breeding in Alaska. Condor 104:780–787.

Petersen, M.R., J.B. Grand, and C.P. Dau. 2000. Spectacled Eider (*Somateria fischeri*). *In* A. Poole and F. Gill, editors. The Birds of North America, No. 547. The Birds of North America, Inc., Philadelphia, PA.

Petersen, M.R., W.W. Larned, and D.C. Douglas. 1999. At-sea distribution of spectacled eiders: a 120-year-old mystery resolved. The Auk 116(4):1009–1020.

Petersen, M.R., J.F. Piatt, and K.A. Trust. 1998. Foods of Spectacled Eiders *Somateria fischeri* in the Bering Sea, Alaska. Wildfowl 49:124–128.

Platte, R.M. and R.A. Stehn. 2011. Abundance and trend of waterbirds on Alaska's Yukon–Kuskokwim Delta coast based on 1988 to 2010 aerial surveys. Unpublished report, U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, Alaska. April 29, 2011. 43 pp.

Powell, A.N. and S. Backensto. 2009. Common ravens (Corvus corax) nesting on Alaska's North Slope Oil Fields. Final Report to CMI, Minerals Management Service OCS Study 2009-007, Alaska. 41 pp.

Prestrud, P. and I. Stirling. 1994. The International Polar Bear Agreement and the current status of polar bear conservation. Aquatic Mammals. 20: 113-124.

Proshutinsky, A.Y. and M. Johnson. 2001. Two regimes of Arctic's circulation from ocean models with ice and contaminants. Marine Pollution Bulletin 43:61–70.

Pullman, E.R., M.T. Jorgenson, T.C. Cater, W.A. Davis, and J.E. Roth. 2003. Assessment of ecological effects of the 2002–2003 ice road demonstration project. Final report prepared for ConocoPhillips Alaska, Inc., by ABR, Inc., Fairbanks, Alaska. 39pp.

Quakenbush, L.T., R.S. Suydam, K.M. Fluetsch, & C.L. Donaldson. 1995. Breeding biology of Steller's eiders nesting near Barrow, Alaska, 1991–1994. Ecological Services Fairbanks, AK, U.S. Fish & Wildlife Service, Technical Report NAES-TR-95-03. 53 pp.

Quakenbush , L., R. Suydam, T. Obritschkewitsch, and M. Deering. 2004. Breeding biology of Steller‘s eiders (*Polysticta stelleri*) near Barrow, Alaska, 1991–1999. Arctic 57:166–182.

Raveling, D.G. 1979. The annual cycle of body composition of Canada Geese with special reference to control of reproduction. Auk 96:234–252.

Reed, J.R., J.L. Sincock, and J.P. Hailman. 1985. Light attraction in endangered procellariiform birds: reduction by shielding upward radiation. Auk 102: 377–383.

Regehr, E.V., S.C. Amstrup and I. Stirling. 2006. Polar bear population status in the Southern Beaufort Sea. Report Series 2006-1337, U.S. Department of the Interior, U.S. Geological Survey, Anchorage, Alaska. 20 pp.

Regehr, E.V., C.M. Hunter, H. Caswell, S.C. Amstrup, and I. Stirling. 2010. Survival and breeding of polar bears in the southern Beaufort Sea in relation to sea ice. Journal of Animal Ecology 79:117–127.

Rode, K.D., S.C. Amstrup, and E.V. Reghr. 2010. Reduced body size and cub recruitment in polar bears associated with sea ice decline. Ecological Applications. 20: 798–782.

Rothrock, D.A., Y. Yu, and G.A. Maykut. 1999. Thinning of the Arctic sea-ice cover, Geophysical Research Letters 26: 3469-3472.

Russell, R. W. 2005. Interactions between migrating birds and offshore oil and gas platforms in the northern Gulf of Mexico: final report. U.S. Department of the Interior, Minerals Management Service (MMS), Gulf of Mexico Outer Continental Shelf (OCS) Region, OCS Study MMS 2005-009, New Orleans, Louisiana, USA.

Safine, D.E. 2011. Breeding ecology of Steller's and spectacled eiders nesting near Barrow, Alaska, 2008–2010. U.S. Fish and Wildlife Service, Fairbanks Fish and Wildlife Field Office, Fairbanks, Alaska. Technical Report. 66 pp.

Schliebe, S., T.J. Evans, K. Johnson, M. Roy, S. Miller, C. Hamilton, R. Meehan, and S. Jahrsdoerfer. 2006. Status assessment in response to a petition to list polar bears as a threatened species under the U.S. Endangered Species Act. U.S. Fish and Wildlife Service, Marine Mammals Management, Anchorage, Alaska. 262 pp.

Schliebe S., K.D. Rode, J.S. Gleason, J. Wilder, K. Proffitt, T.J. Evans, and S. Miller. 2008. Effects of sea ice extent and food availability on spatial and temporal distribution of polar bears during the fall open-water period in the Southern Beaufort Sea. Polar Biology 31: 999–1010.

Serreze, M.C., M.M. Holland and J. Stroeve. 2007. Perspectives on the Arctic's Shrinking Sea-Ice Cover. Science 315: 1533-1536.

Servheen, C., S. Herrero, and B. Peyton. 1999. Bears status survey and conservation action plan. Cambridge, UK: IUCN/SSC Bear and Polar Bear Specialist Groups.

Smith, L., L. Byrne, C. Johnson, and A. Stickney. 1994. Wildlife studies on the Colville River Delta, Alaska, 1993. Unpublished report prepared for ARCO Alaska, Inc., Anchorage, Alaska. 58 pp.

Smith, T. G., S. Partridge, S. Amstrup, and S. Schliebe. 2007. Post-den emergence behavior of polar bears (Ursus maritimus) in northern Alaska. Arctic 60:187-194.

St. Aubin, D.J. 1990. Physiologic and toxic effects on polar bears. Pages 235-239 *in* Geraci, J.R. and D.J. St. Aubin, *eds.* Sea Mammals and oil: confronting the risks.

Academic Press, Inc. New York, New York.

Stehn, R., C. Dau, B. Conant, and W. Butler. 1993. Decline of spectacled eiders nesting in western Alaska. Arctic 46: 264–277.

Stehn, R., W. Larned, R. Platte, J. Fischer, and T. Bowman. 2006. Spectacled eider status and trend in Alaska. U.S. Fish and Wildlife Service, Anchorage, Alaska. Unpublished Report. 17 pp.

Stirling, I. 2002. Polar bears and seals in the eastern Beaufort Sea and Amundsen Gulf: a synthesis of population trends and ecological relationships over three decades. Arctic 55:59-76.

Stirling, I. 1988. Polar bears. University of Michigan Press, Ann Arbor, Michigan, USA. 220 pp.

Stirling, I. 1990. Polar bears and oil: ecological perspectives. Pages 223–34 *in* Geraci, J.R. and D.J. St. Aubin, *eds*. Sea Mammals and Oil: Confronting the Risks. Academic Press, Inc. New York, New York.

Stroeve, J., M. Serreze, S. Drobot, S. Gearheard, M. Holland, J. Maslanik, W. Meier, and T. Scambos. 2008. Arctic Sea Ice Extent Plummets in 2007. EOS, Transactions, American Geophysical Union 89(2):13-14.

TERA (Troy Ecological Research Associates). 2002. Spectacled eider movements in the Beaufort Sea: Distribution and timing of use. Report for BP Alaska Inc., Anchorage, Alaska and Bureau of Land Management, Fairbanks, Alaska. 17 pp.

USFWS. 1993. Final rule to list the Spectacled Eider as threatened. U.S. Fish and Wildlife Service. May 10, 1993. Federal Register 58(88):27474–27480.

USFWS. 1996. Spectacled Eider Recovery Plan.. Prepared for Region 7, U.S. Fish and Wildlife Service, Anchorage, Alaska. 100 pp + Appendices.

USFWS. 1999. Population status and trends of sea ducks in Alaska. Migratory Bird Management, Anchorage, Alaska.

USFWS. 2006. Marine mammals; incidental take during specified activities. Final rule [to authorize the nonlethal, incidental, unintentional take of small numbers of polar bears and Pacific walruses during year-round oil and gas industry exploration, development, and production and operations in the Beaufort Sea and adjacent northern coast of Alaska]. U.S. Fish and Wildlife Service, Anchorage, Alaska. Federal Register 71:43926–43953.

USFWS. 2008a. Determination of threatened status for the polar bear (*Ursus maritimus*) throughout its range; final rule. U.S. Fish and Wildlife Service. Federal Register 73:28212–28303.

USFWS. 2008b. Marine mammals; incidental take during specified activities. Final rule [to authorize the nonlethal, incidental, unintentional take of small numbers of polar bears and

Pacific walruses during year-round oil and gas industry exploration, development, and production and operations in the Chukchi Sea and adjacent western coast of Alaska]. U.S. Fish and Wildlife Service, Anchorage, Alaska. Federal Register 73:33212–33255.

USFWS. 2008c. Biological Opinion for Bureau of Land Management for the Northern Planning Areas of the National Petroleum Reserve – Alaska. U.S. Fish and Wildlife Service, Fairbanks, Alaska.

USFWS. 2011a. Marine mammals; incidental take during specified activities. Final rule [to authorize the nonlethal, incidental, unintentional take of small numbers of polar bears and Pacific walruses during year-round oil and gas industry exploration, development, and production and operations in the Beaufort Sea and adjacent northern coast of Alaska]. U.S. Fish and Wildlife Service, Anchorage, Alaska. Federal Register 76:47010–47054.

USFWS. 2011b. Programmatic biological opinion for polar bears (*Ursus maritimus*), polar bear critical habitat, and conference opinion for the Pacific walrus (*Odobenus rosmarus divergens*) on the Beaufort Sea incidental take regulations. U.S. Fish and Wildlife Service, Fairbanks, Alaska. 92 pp.

USFWS. 2012. Trip Report: Polar Bear Conservation Activities at Barter Island September 5-October 3, 2012. By: Susanne Miller, Marine Mammals Management, U.S. Fish and Wildlife Service, Anchorage, Alaska.

Warnock, N. and D. Troy. 1992. Distribution and abundance of spectacled eiders at Prudhoe Bay, Alaska: 1991. Unpublished report prepared for BP Exploration (Alaska) Inc., Environmental and Regulatory Affairs Department, Anchorage, Alaska, by Troy Ecological Research Associates (TERA), Anchorage, Alaska. 20 pp.

Weir, R. 1976. Annotated bibliography of bird kills at man-made obstacles: a review of the state of the art and solutions. Unpublished report prepared for Department of Fisheries & Environment, Canadian Wildlife Service-Ontario Region.

Woodby, D.A. and G.J. Divoky. 1982. Spring migration of eiders and other waterbirds at Point Barrow, Alaska. Arctic 35: 403–410.