United States Department of the Interior

U.S. FISH AND WILDLIFE SERVICE
Fairbanks Fish and Wildlife Field Office
101 12th Avenue, Room 110
Fairbanks, Alaska 99701

April 30, 2015

Janet Post
Regulatory Specialist
U.S. Army Corps of Engineers
District Office
Elmendorf Air Force Base, AK 99506

Re: Biological Opinion for East Barrow Shareholder Lot Roads project: POA-2014-414

Dear Ms. Post,

This document transmits the U.S. Fish and Wildlife Service's (Service) Biological Opinion (BO) on a proposal by UMIAQ, LLC. (UMIAQ) on behalf of the Native Village of Barrow (NVB) to construct a new road system to provide access to undeveloped housing lots in Barrow, Alaska (Figure 2.1). Because the project will impact waters of the United States, NVB has requested a section 404 permit from the U.S. Army Corps of Engineers (USACE). This BO describes the effects of the proposed project on threatened spectacled eiders (*Somateria fischeri*), Alaska-breeding Steller's eiders (*Polysticta stelleri*), and polar bears (*Ursus maritimus*) pursuant to section 7 of the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. 1531 et seq.).

The Service has determined the proposed action may affect, but is not likely to adversely affect polar bears. The Service has also determined that the proposed action *may adversely affect* listed spectacled and Alaska-breeding Steller's eiders. Following review of the status and environmental baseline of listed eiders, and analysis of potential effects of the proposed action to these species, the Service has concluded the proposed action *is not likely to jeopardize* the continued existence of spectacled or Alaska-breeding Steller's eiders.

A complete administrative record of this consultation is on file at the Fairbanks Fish and Wildlife Field Office, 101 12th Avenue, Fairbanks, Alaska, 99701. 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.

Sincerely,

Ted Swem
Branch Chief
Endangered Species

cc: Emily Smyth, UMIAQ

BIOLOGICAL OPINION

for

EAST BARROW
SHAREHOLDER LOT ROADS

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

April 30, 2015

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1. INTRODUCTION

This document transmits the U.S. Fish and Wildlife Service's (Service) Biological Opinion (BO) on a proposal by UMIAQ, LLC. (UMIAQ) on behalf of the Native Village of Barrow (NVB) to construct a new road system to provide access to undeveloped housing lots in Barrow, Alaska (Figure 2.1). Because the project will impact waters of the United States, NVB has requested a section 404 permit from the U.S. Army Corps of Engineers (USACE). This BO describes the effects of the proposed project on threatened spectacled eiders (*Somateria fischeri*), Alaska-breeding Steller's eiders (*Polysticta stelleri*), and polar bears (*Ursus maritimus*) pursuant to section 7 of the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. 1531 et seq.). We used information provided in previous BOs; communications with UMIAQ, USACE, 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 polar bears. The Service has also determined that the proposed action *may adversely affect* listed spectacled and Alaska-breeding Steller's eiders. Following review of the status and environmental baseline of listed eiders, and analysis of potential effects of the proposed action to these species, the Service has concluded the proposed action *is not likely to jeopardize* the continued existence of spectacled or Alaska-breeding Steller's eiders.

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 Description

The proposed project would include laydown of approximately 21.5 acres (0.09 km^2) of fill to construct approximately 3 mi (4.8 km) of gravel road (Figure 2.2). The project would be completed in the following phases, subject to available funding (Figure 2.3):

- **Phase 1**: Lengthens Iigu Street two blocks northeast to an extension from Sakeagak, and connects Sanatu and Ahgeak Streets. Phase 1 would require gravel placement onto approximately 3.47 acres (0.014 km^2) of tundra wetlands;
- **Phase 2**: Would require gravel placement onto approximately 4.49 (0.018 km^2) acres of tundra wetlands to construct Simik Street between Uula and Sakeagak, with connections to Qaiyann and Kignak Streets;
- **Phase 3**: Would require gravel placement onto approximately 4.57 (0.018 km^2) acres of tundra wetlands to construct Solomon Street between Uula and Sakeagak, with connections to Qaiyann and Kignak Streets;
- **Phase 4**: Would require gravel placement onto approximately 4.56 (0.018 km^2) acres of tundra wetlands to construct Aiken Street between Uula and Sakeagak, with connections to Qaiyann and Kignak Streets; and,
- **Phase 5**: Would require gravel placement onto approximately 4.41 (0.017 km^2) acres of tundra wetlands to construct Kaleak Street between Uula and Sakeagak, with connections to Qaiyann and Kignak Streets.

Construction of Phase 1 is anticipated to begin in the spring of 2015, although gravel laydown on undisturbed tundra would not occur from June 1 through July 31.

Mitigation Measures

Conservation measures that NVB plans to implement to reduce potential impacts from the project to listed species and other wildlife are listed below:

- Construction activities would not occur on undisturbed tundra from June 1 through July 31 to avoid impacts to nesting migratory birds;
- NVB will follow the *East Barrow Shareholder Lot Subdivision Roads Construction Operations Polar Bear Avoidance and Interaction Plan* which provides:
  - Procedures for early detection of bears, and avoidance of close encounters;
  - Procedures for minimizing bear attractants; and
  - Procedures for responding safely to bear encounters.

Action Area

The area lies between the new Samuel Simmonds Memorial Hospital on Uula Street and Sakeagak Street in Barrow, Alaska (Figure 2.2). It also extends between the existing Sanatu Street, south to the proposed Kaleak Street extension (Figure 2.3).

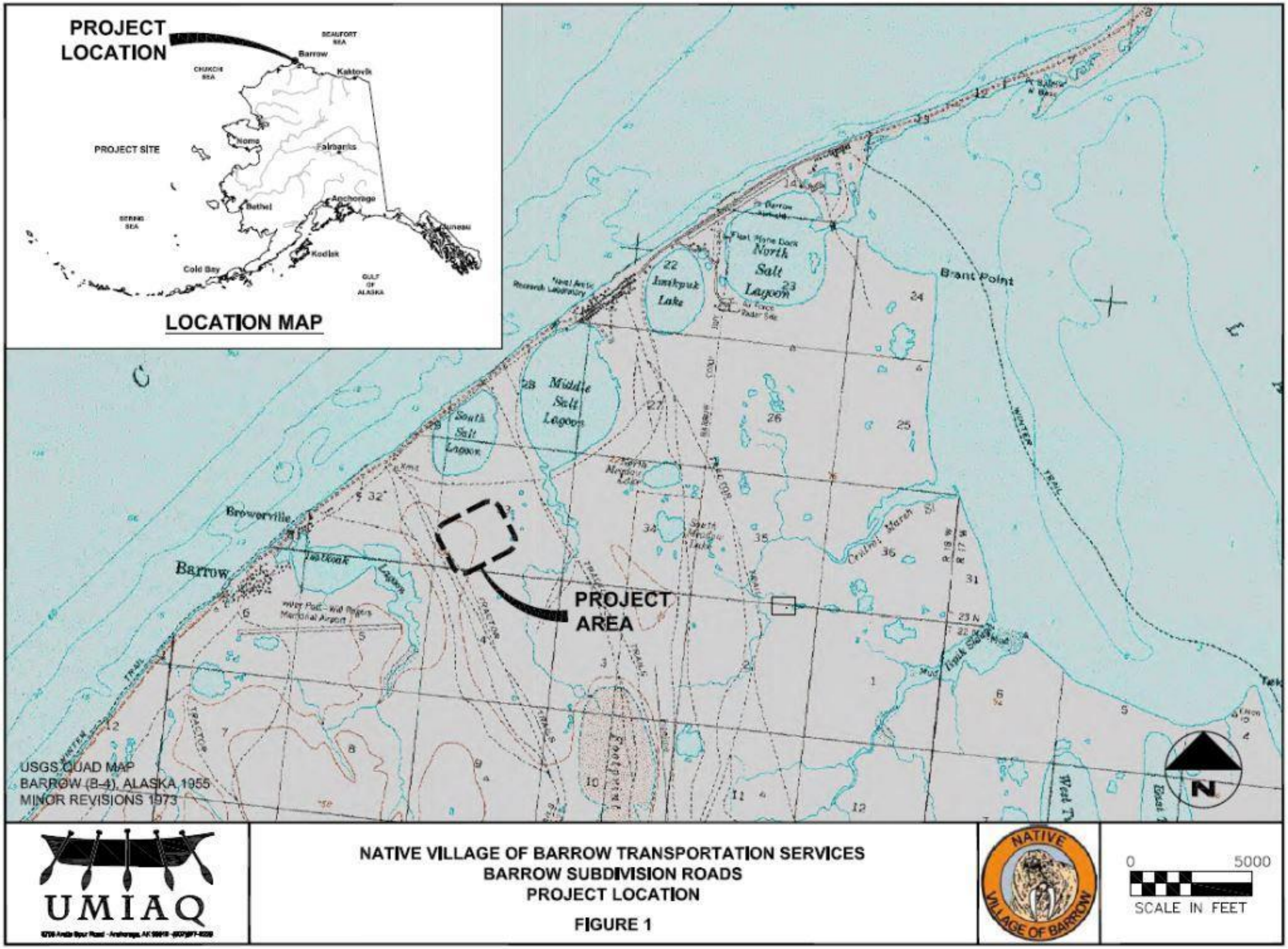

Figure 2.1. Location of the proposed project near Barrow, Alaska.

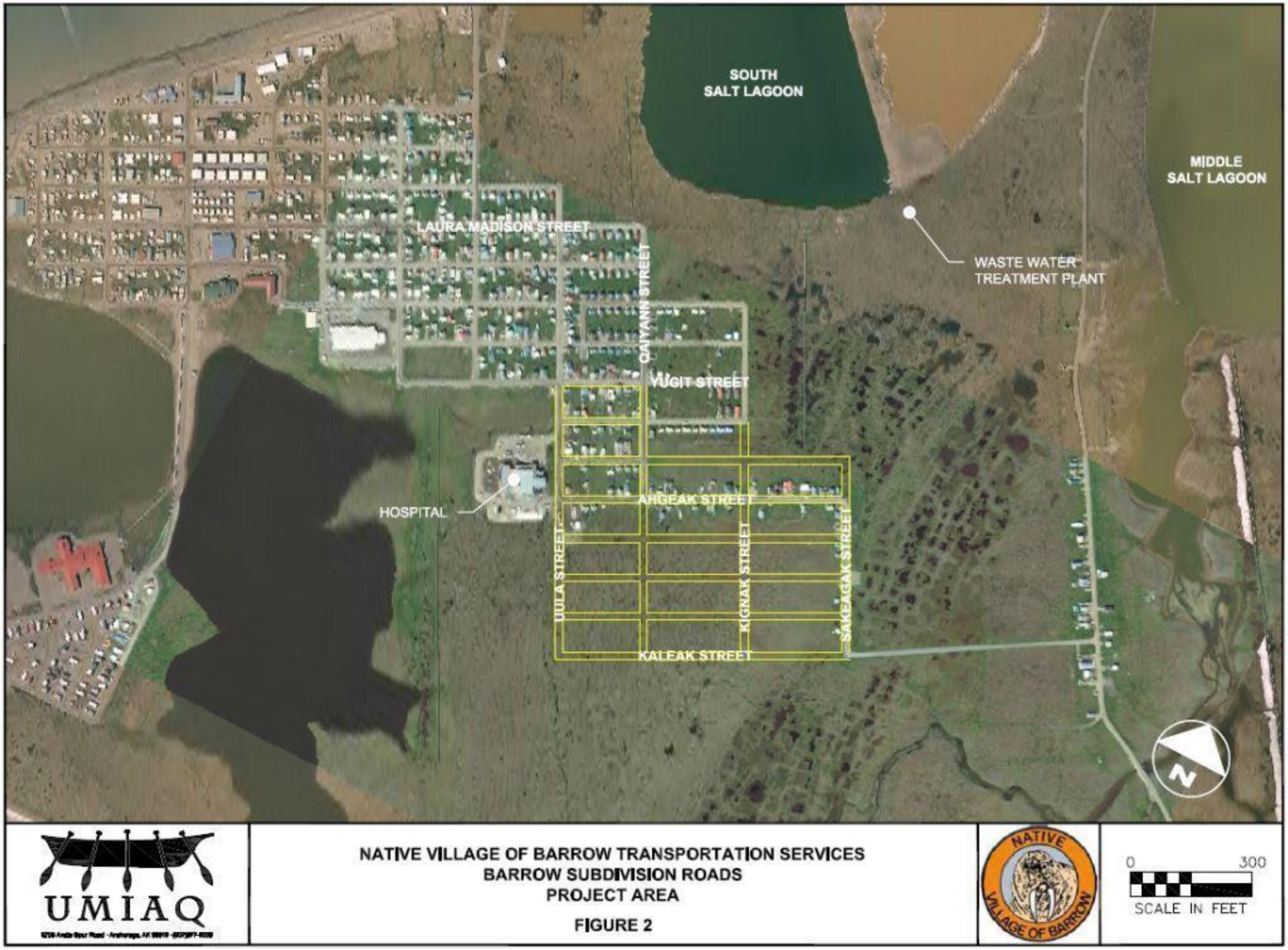

Figure 2.2. Detail of the proposed east Barrow roads project near Samuel Simmonds Memorial Hospital in Barrow, Alaska.

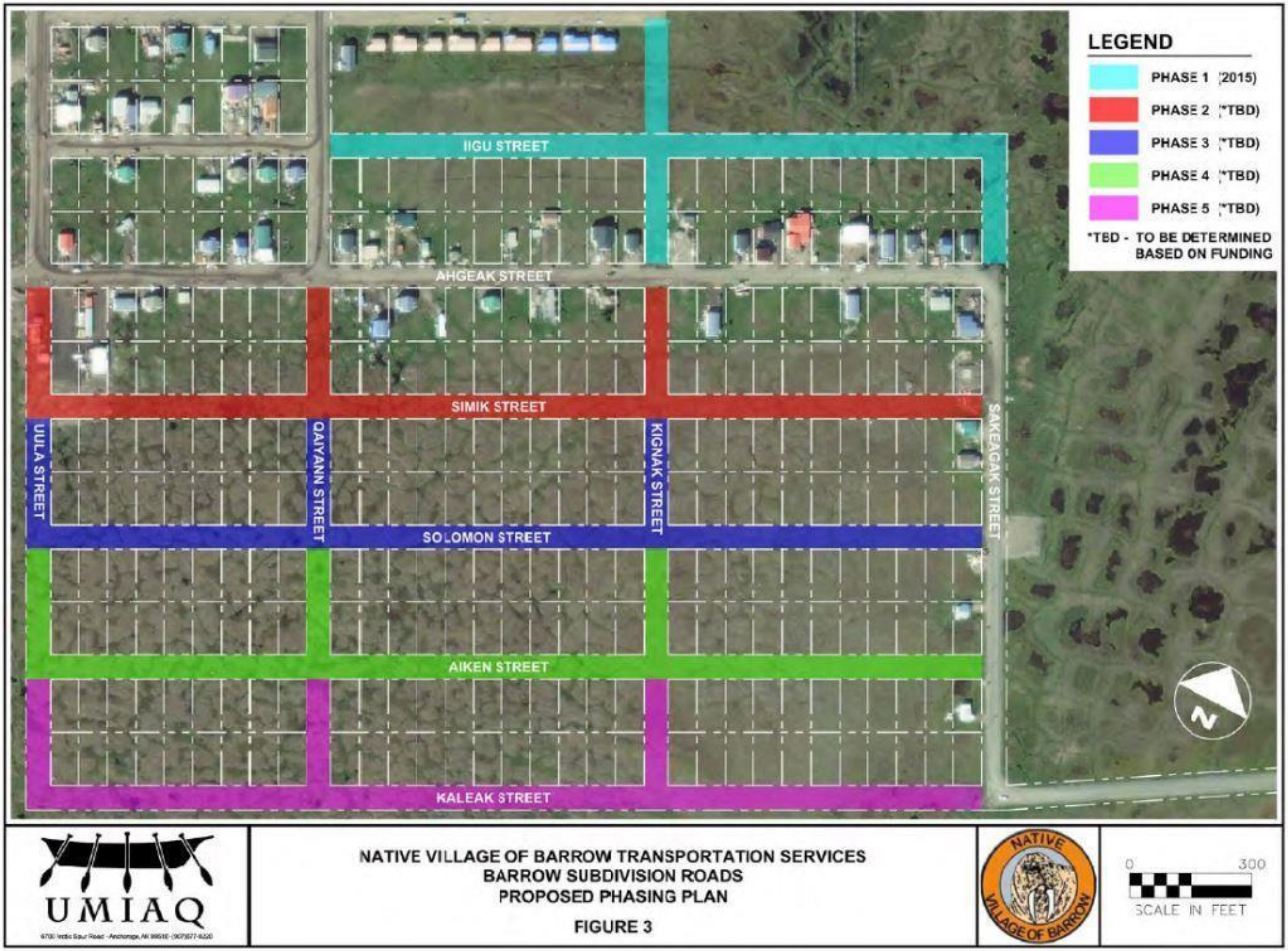

Figure 2.3. Proposed phases of the east Barrow subdivision road project including Iigu Street, which is proposed for construction in 2015.

3. EFFECT DETERMINATION FOR POLAR BEARS

Polar bear

The Service listed the polar bear as a threatened species under the ESA on May 15, 2008 (73 FR 28212). Polar bears may occasionally pass through or den in the area, although their density is low and encounters are expected to be infrequent. Transient (non-denning) bears that enter the action area could be disturbed by the presence of humans or equipment noise. 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. Furthermore, workers would be provided with NVB's *East Barrow Shareholder Lot Subdivision Roads Construction Operations Polar Bear Avoidance and Interaction Plan* for personnel to follow in the event that a polar bear enters the project area while workers are present.

In addition to transient animals, female polar bears may occasionally den near the project area. However, due to a lack of preferred habitat (characterized by steep, stable slopes that accumulate snow), and the proximity of the project to Barrow and existing levels of human activity, it is very unlikely that polar bears would den in the action area.

Because (1) the density of polar bears in the action area is low; (2) encounters with polar bears are expected to be infrequent; (3) behavioral effects to transient bears would be minor and temporary; (4) mitigation measures included in NVB's polar bear plan would minimize potential impacts in the event that transient polar bears are encountered; and (5) the very low probability of polar bears denning in the action area, we expect effects of the proposed action on polar bears would be insignificant. Therefore, we conclude that the proposed East Barrow Shareholder Lot Roads project is not likely to adversely affect polar bears.

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 as background for subsequent 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 of spectacled eiders 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 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 4.1B), where they remain until March–April (Lovvorn et al. 2003).

Life History
Breeding – In Alaska, spectacled eiders breed primarily on the Arctic Coastal Plain (ACP) of the North Slope 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, with breeding density varying 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).

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 foxes (*Alopex lagopus*). 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 6–92% 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 nest 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.

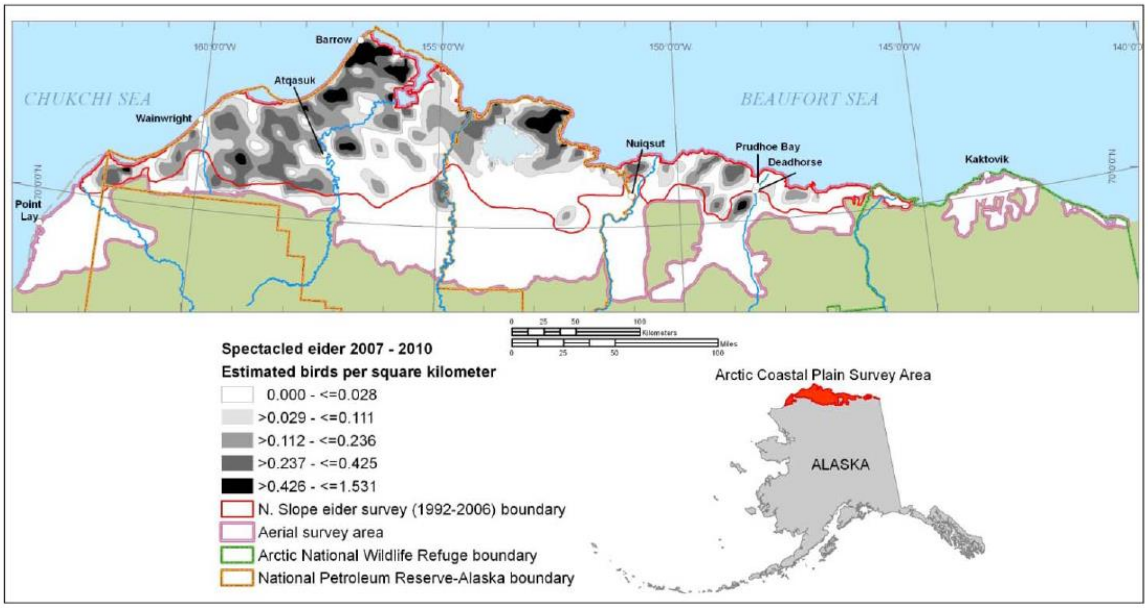

Figure 4.2. Density distribution of spectacled eiders observed on aerial transects sampling 57,336 km^2 of wetland tundra on the North Slope of Alaska during early to mid-June, 2007–2010 (Larned et al. 2011).

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. 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. Satellite telemetry and aerial surveys led to the identification of spectacled eider migrating, molting, and wintering areas. These studies are summarized in Petersen et al. (1995 and 1999) and Larned et al. (1995). Results of more 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 breeding status and success, and molt in September–October (Matt Sexson, USGS, pers. comm.).

Males generally depart breeding areas on the ACP when females begin incubation in late June (Anderson and Cooper 1994, Bart and Earnst 2005). Use of the Beaufort Sea by departing males is variable. Some appear to move directly to the Chukchi Sea over land, while the majority move rapidly (average travel of 1.75 days), over nearshore 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). Males appeared to prefer areas 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 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 indicate 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) found spectacled eiders show strong preference for specific molting locations, and concluded that 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 require adequate food resources, and apparently benthic community of Ledyard Bay (Feder et al. 1989, 1994a, 1994b) provides this for spectacled eiders. Large concentrations of spectacled eiders molt in Ledyard Bay using 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 molting areas in late October/early November (Sexson et al. 2014, Sexson 2015), migrating offshore in the Chukchi and Bering seas to a single wintering area in pack-ice lead complexes south/southwest of St. Lawrence Island (Figure 4.1B). 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 Sea 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 tens 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. Satellite telemetry data collected by the USGS Alaska Science Center (Figure 4.3; Sexson et al. 2014) suggests that spectacled eiders also use the spring 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).

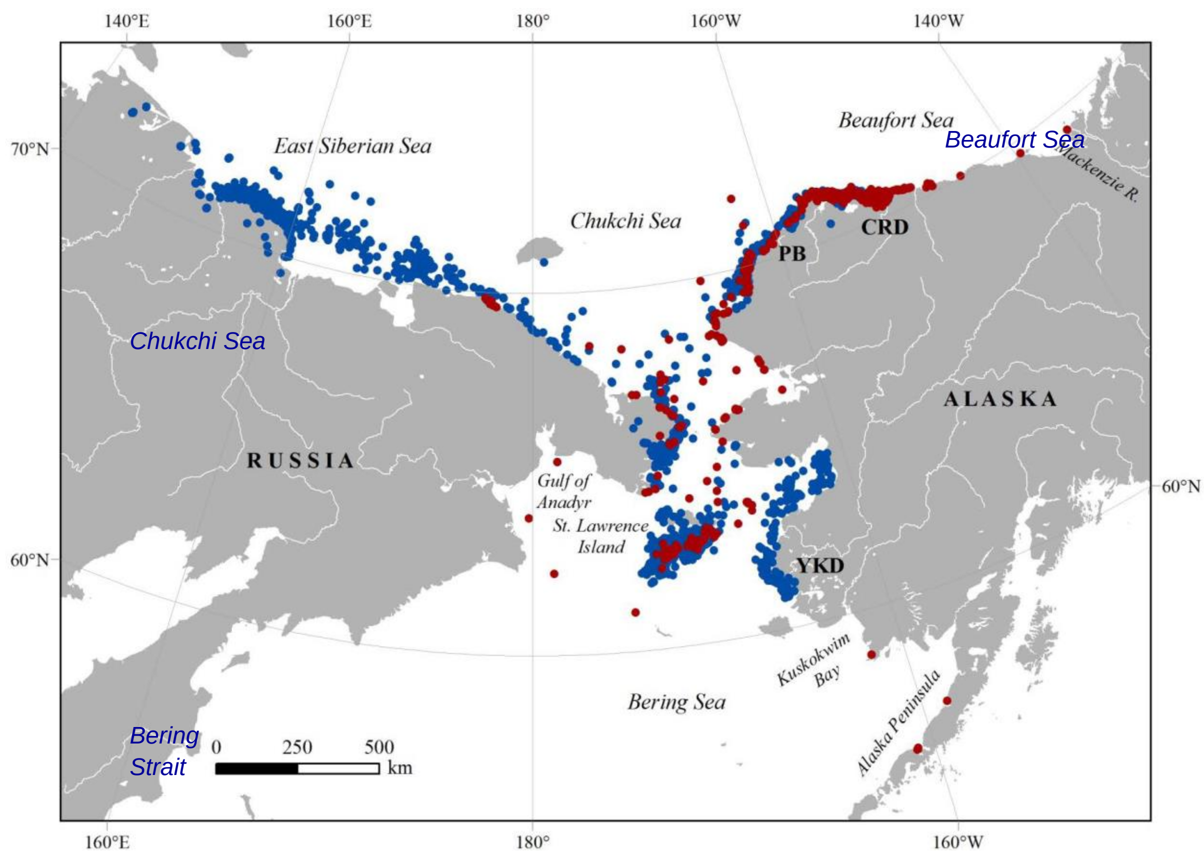

Figure 4.3. Satellite telemetry locations received from 89 adult (blue points, n = 6,813) and 27 juvenile (red points, n = 371) spectacled eiders between 30 May 2008 and 9 August 2012. We implanted satellite transmitters in spectacled eiders in the YK-Delta in 2008, at Peard Bay (PB) in 2009, and in the Colville River Delta (CRD) in 2009–2011. From Sexson et al. (2014).

Population indices for North Slope-breeding spectacled eiders prior to 1992 are unavailable. 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 is thought to have declined by about 96% from the 1970s to 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), who found a 79% decline in eider nesting near the Kashunuk River between 1969 and 1992. Aerial and ground survey data indicated that spectacled eiders declined 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 and Stehn (2013) 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 2012 and evaluate long-term trends in the YK-Delta breeding population from 1985 to 2012. 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 individuals or nests that were destroyed or abandoned (Fischer and Stehn 2013). The total number of spectacled eider nests on the YK-Delta in 2012 was estimated at 8,062 (SE 1110). The average population growth rate based on these surveys was 1.058 (90% CI = 1.005-1.113) in 2003–2012 and 0.999 (90% CI = 0.986-1.012) in 1985–2012 (Fischer and Stehn 2013). 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/are 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.

Steller's Eider

The Steller's eider is a small sea duck with circumpolar distribution and the sole member of the genus *Polysticta*. Males are in breeding plumage (Figure 4.4) from early winter through mid-summer. Females are dark mottled brown with a white-bordered blue wing speculum (Figure 4.4). Juveniles are dark mottled brown until fall of their second year, when they acquire breeding plumage.

Figure 4.4. Male and female Steller's eiders in breeding plumage.

Steller's eiders are divided into Atlantic and Pacific populations; the Pacific population is further subdivided into the Russia-breeding and Alaska-breeding populations. The Alaska-breeding population of Steller's eiders was listed as threatened on July 11, 1997 based on:

- Substantial contraction of the species' breeding range on the ACP and Y-K Delta;
    - Steller's eiders on the North Slope historically occurred east to the Canada border (Brooks 1915), but have not been observed on the eastern North Slope in recent decades (USFWS 2002).
- Reduced numbers breeding in Alaska; and
- Resulting vulnerability of the remaining Alaska-breeding population to extirpation (USFWS 1997).

In Alaska, Steller's eiders breed almost exclusively on the ACP and winter, along with the majority of the Russia-breeding population, in southwest Alaska (Figure 4.5). Periodic non-breeding of Steller's eiders, coupled with low nesting and fledging success, has resulted in very low productivity (Quakenbush et al. 2004). In 2001, the Service designated 2,830 mi^2 (7,330 km^2) of critical habitat for the Alaska-breeding population of Steller's eiders, including historical breeding areas on the Y-K Delta, molting and staging areas in the Kuskokwim Shoals and Seal Islands, molting wintering, and staging areas at Nelson Lagoon, and Izembek Lagoon (USFWS 2001). No critical habitat for Steller's eiders has been designated on the ACP.

Life History

Breeding – Steller's eiders arrive in small flocks of breeding pairs on the ACP in early June. Nesting on the ACP is concentrated in tundra wetlands near Barrow, AK (Figure 4.6) and occurs at lower densities elsewhere on the ACP from Wainwright east to the Sagavanirktok River (Quakenbush et al. 2002). Long-term studies of Steller's eider breeding ecology near Barrow indicate periodic non-breeding by the entire local population. From 1991-2010, Steller's eiders nests were detected in 12 of 20 years (Safine 2011). Periodic non-breeding by Steller's eiders near Barrow seems to correspond to fluctuations in lemming populations and risk of nest predation (Quakenbush et al. 2004). During years of peak abundance, lemmings are a primary food source for predators including jaegers, owls, and foxes (Pitelka et al. 1955a, Pitelka et al. 1955b, MacLean et al. 1974, Larter 1998, Quakenbush et al. 2004). It is hypothesized that Steller's eiders and other ground-nesting birds increase reproductive effort during lemming peaks because predators preferentially select (prey-switch) for hyper-abundant lemmings and nests are less likely to be depredated (Roselaar 1979, Summers 1986, Dhondt 1987, and Quakenbush et al. 2004). Furthermore, during high lemming abundance, Steller's eider nest survival (the probability of at least one duckling hatching) has been reported as a function of distance from nests of jaegers and snowy owls (Quakenbush et al. 2004). These avian predators aggressively defend their nests against other predators and this defense likely indirectly imparts protection to Steller's eiders nesting nearby.

Steller's eiders initiate nesting in the first half of June and nests are commonly located on the rims of polygons and troughs (Quakenbush et al. 2000, 2004). Mean clutch size at Barrow was 5.4 ± 1.6 SD (range = 1–8) over 5 nesting years between 1992 and 1999 (Quakenbush et al. 2004). Breeding males depart following onset of incubation by the female. Nest survival is affected by predation levels, and averaged 0.23 (±0.09, standard error [SE]) from 1991–2004 before fox control was implemented near Barrow and 0.47 (±0.08 SE) from 2005–2012 during years with fox control (USFWS, unpublished data). Steller's eider nest failure has been attributed to depredation by jaegers (*Stercorarius* spp.), common ravens (*Corvus corax*), arctic fox (*Alopex lagopus*), glaucous gulls (*Larus hyperboreus*), and in at least one instance, polar bears (Quakenbush et al. 1995, Rojek 2008, Safine 2011, Safine 2012).

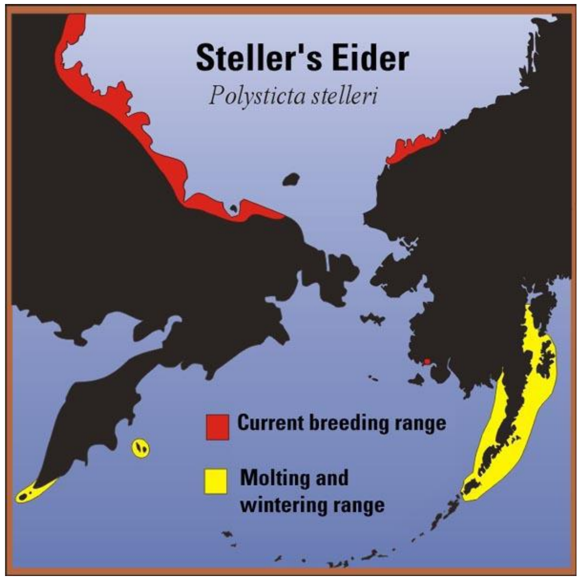

Figure 4.5. Steller's eider distribution in the Bering, Chukchi, and Beaufort seas.

Hatching occurs from mid-July through early August, after which hens move their broods to adjacent ponds with emergent vegetation dominated by *Carex* spp. and *Arctophila fulva* (Quakenbush et al. 2000, Rojek 2006, 2007, and 2008). In these brood-rearing ponds, hens with ducklings feed on aquatic insect larvae and freshwater crustaceans. In general, broods remain within 0.7 km of their nests (Quakenbush et al. 2004); although, movements of up to 3.5 km from nests have been documented (Rojek 2006 and 2007). Large distance movements from hatch sites may be a response to drying of wetlands that would normally have been used for brood-rearing (Rojek 2006). Fledging occurs 32–37 days post hatch (Obritschkewitsch et al. 2001, Quakenbush et al. 2004, Rojek 2006 and 2007).

Information on breeding site fidelity of Steller's eiders is limited. However, ongoing research at Barrow has documented some cases of site fidelity in nesting Steller's eiders. Since the mid-1990s, eight banded birds that nested near Barrow were recaptured in subsequent years again nesting near Barrow. Time between capture events ranged from 1 to 12 years and distance between nests ranged from 0.1 to 6.3 km (USFWS, unpublished data).

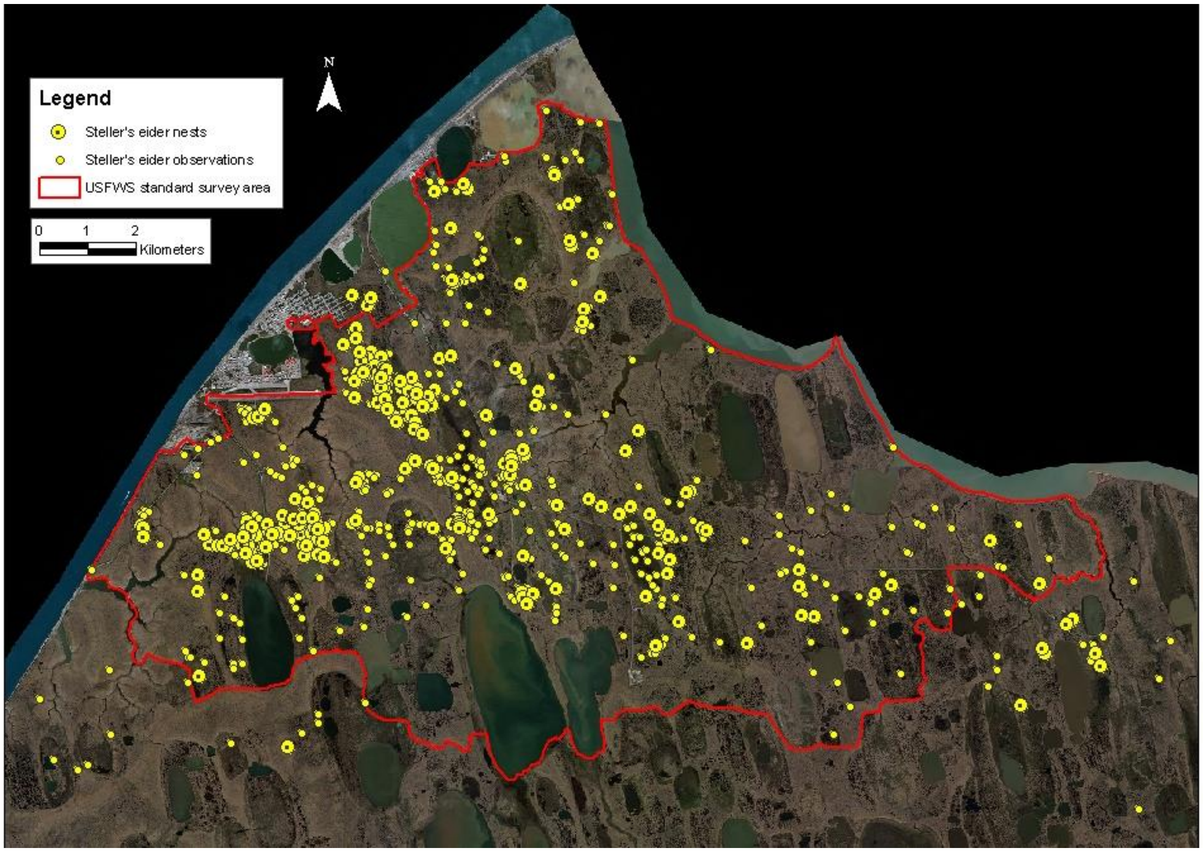

Figure 4.6. Steller's eider nest locations (1991–2010) and breeding pair observations (1999–2010). The red border represents the standard annual survey area. This survey is expanded beyond the standard area in some years.

Localized movements – Timing of departure from the breeding grounds near Barrow differs between sexes and between breeding and non-breeding years. In breeding years, male Steller's eiders typically leave the breeding grounds in late June to early July after females begin incubating (Obritschkewitsch et al. 2001, Quakenbush et al. 1995, Rojek 2006 and 2007). Females with fledged broods depart the breeding grounds in late August and mid-September to rest and forage in freshwater and marine habitat near the Barrow spit prior to fall migration along the Chukchi coast. Females with broods are often observed near the channel that connects North Salt Lagoon and Elson Lagoon (J. Bacon, NSBDWM, pers. comm.). In 2008, 10–30 Steller's eider adult females and juveniles were observed staging daily in Elson Lagoon, North Salt Lagoon, Imikpuk Lake, and the Chukchi Sea from late August to mid-September (USFWS, unpublished data).

Before fall migration in breeding and non-breeding years, some Steller's eiders rest and forage in in coastal waters near Barrow including Elson Lagoon, North Salt Lagoon, Imikpuk Lake, and the vicinity of Pigniq (Duck Camp; Figure 4.7). In breeding years, these flocks are primarily composed of males that remain in the area until the second week of July, while in non-breeding years, flocks are composed of both sexes and depart earlier than in nesting years (J. Bacon, North Slope Borough Department of Wildlife Management [NSBDWM], pers. comm.).

Safine (2012) investigated post-hatch movements of 10 Steller's eider hens with VHF transmitters in 2011. Most (8 of 10) females successfully reared broods to fledging. From late August through early September, females and fledged juveniles were observed in nearshore waters of the Chukchi and Beaufort seas from Point Barrow south along the coast approximately 18 km. During this period, marked Steller's eiders and broods frequented areas traditionally used for subsistence waterfowl hunting (e.g., Duck Camp; Figure 4.7).

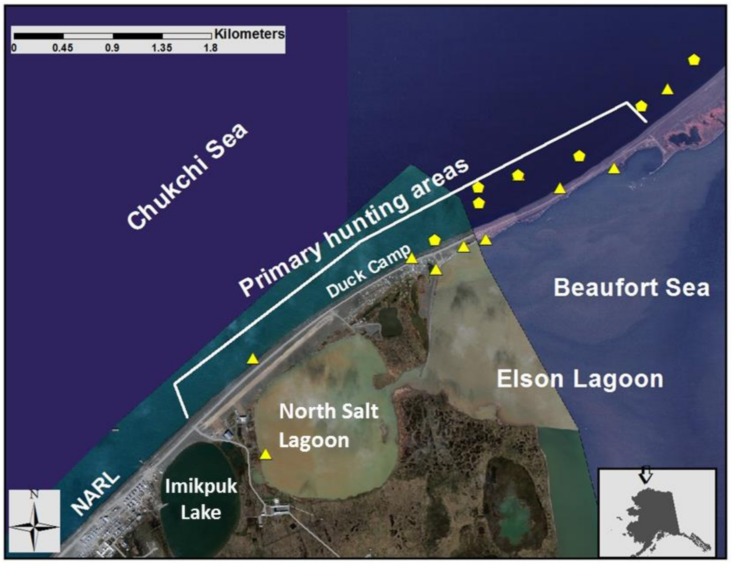

Figure 4.7. Some post-breeding and pre-migration staging areas for Steller's eiders near Barrow, Alaska. Locations of Steller's eider hens with successfully-fledged (triangles) and failed broods (pentagons) from mid-August to early September 2011.

Wing molt – Following departure from the breeding grounds, Steller's eiders migrate to southwest Alaska where they undergo complete flightless molt for about 3 weeks. Preferred molting areas are shallow with extensive eelgrass (*Zostera marina*) beds and intertidal mud and sand flats where Steller's eiders forage on bivalve mollusks and amphipods (Petersen 1980, 1981; Metzner 1993).

The Russia- and Alaska-breeding populations both molt in southwest Alaska, and banding studies found at least some individuals had a high degree of molting site fidelity in subsequent years (Flint et al. 2000). Primary molting areas include the north side of the Alaska Peninsula (Izembek Lagoon, Nelson Lagoon, Port Heiden, and Seal Islands; Gill et al. 1981, Petersen 1981, Metzner 1993) as well as the Kuskoskwim Shoals in northern Kuskokwim Bay (Martin et al. *in press*). Larned (2005) also reported > 2,000 eiders molting in lower Cook Inlet near the Douglas River Delta, and smaller numbers of molting Steller's have been reported around islands in the Bering Sea, along the coast of Bristol Bay, and in smaller lagoons along the Alaska Peninsula (e.g., Dick and Dick 1971; Petersen and Sigman 1977; Wilk et al. 1986; Dau 1987; Petersen et al. 1991).

Winter distribution – After molt, many Pacific-wintering Steller's eiders disperse throughout the Aleutian Islands, Alaskan Peninsula, and western Gulf of Alaska including Kodiak Island and lower Cook Inlet (Figure 4.8; Larned 2000a, Martin et al. *in press*), although thousands may remain in molting lagoons unless freezing conditions force departure (USFWS 2002). The Service estimates the Alaska-breeding population comprises only ~ 1% of the Pacific-wintering population of Steller's eiders. Wintering Steller's eiders usually occur in shallow waters (< 10 m deep), within 400 m of shore or in shallow waters further offshore (USFWS 2002). However, Martin et al. (*in press*) reported substantial use of habitats > 10 m deep during mid-winter, although this use may reflect nocturnal rest periods or shifts in availability of food resources (Martin et al. *in press*).

Spring migration – During spring migration, thousands of Steller's eiders stage in estuaries along the north coast of the Alaska Peninsula and, in particular, at Kuskokwim Shoals in late May (Figure 4.8; Larned 2007, Martin et al. *in press*). Larned (1998) concluded that Steller's eiders show strong site fidelity to specific areas[1] during migration, where they congregate in large numbers to feed before continuing northward.

[1] Several areas receive consistent use by Steller's eiders during spring migration, including Bechevin Bay, Morzhovoi Bay, Izembek Lagoon, Nelson Lagoon/Port Moller Complex, Cape Seniavin, Seal Islands, Port Heiden, Cinder River State Critical Habitat Area, Ugashik Bay, Egegik Bay, Kulukak Bay, Togiak Bay, Nanwak Bay, Kuskokwim Bay, Goodnews Bay, and the south side of Nunivak Island (Larned 1998, Larned 2000a, Larned 2000b, Larned et al. 1993).

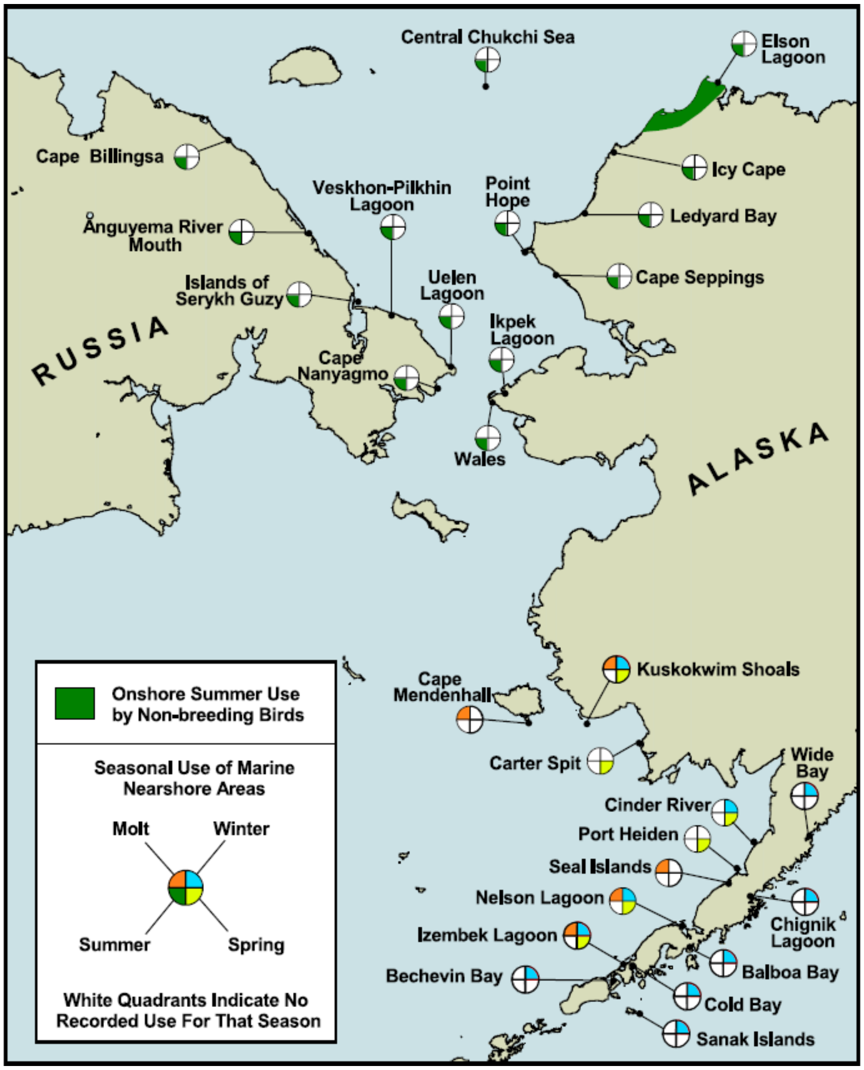

Figure 4.8. Distribution of Alaska-breeding Steller's eiders during the non-breeding season, based on locations of 13 birds implanted with satellite transmitters in Barrow, Alaska, during June 2000 and June 2001. Marked locations include all those at which a bird remained for at least three days. Onshore summer use areas comprise locations of birds that departed Barrow, apparently without attempting to breed in 2001 (USFWS 2002).

Spring migration usually includes movements along the coast, although some Steller's eiders may make straight line crossings of water bodies such as Bristol Bay (W. Larned, USFWS, pers. comm. 2000). Despite numerous aerial surveys, Steller's eiders have not been observed during migratory flights (W. Larned, USFWS, pers. comm. 2000). Steller's eiders likely use spring leads for feeding and resting as they move northward, although there is little information on distribution or habitat use after departure from spring staging areas.

Migration patterns relative to breeding origin – Information is limited on migratory movements of Steller's eiders in relation to breeding origin, and it remains unclear where the Russia- and Alaska-breeding populations converge and diverge during their molt and spring migrations.

Martin et al. (*in press*) attached satellite transmitters to 14 Steller's eiders near Barrow in 2000 and 2001. Despite the limited sample, there was disproportionately high use of Kuskokwim Shoals by Alaska-breeding Steller's eiders during wing molt compared to the Pacific population as a whole. However, Martin et al. (*in press*) did not find Alaska-breeding Steller's eiders to preferentially use specific wintering areas. A later study marked Steller's eiders wintering near Kodiak Island, Alaska and followed birds through the subsequent spring (n = 24) and fall molt (n = 16) migrations from 2004–2006 (Rosenberg et al. 2011). Most birds marked near Kodiak Island migrated to eastern arctic Russia prior to the nesting period and none were relocated on land or in nearshore waters north of the Yukon River Delta in Alaska (Rosenberg et al. 2011).

Alaska-breeding population abundance and trends – Stehn and Platte (2009) evaluated Steller's eider population and trends from three aerial surveys on the ACP:

- USFWS ACP survey
  - 1989–2006 (Mallek et al. 2007)
  - 2007–2008 (new ACP survey design; Larned et al. 2008, 2009)
- USFWS North Slope eider (NSE) survey
  - 1992–2006 (Larned et al. 2009)
  - 2007–2008 (NSE strata of new ACP survey; Larned et al. 2008, 2009)
  - Barrow Triangle (ABR) survey, 1999–2014 (ABR, Inc.; Obritschkewitsch and Ritchie 2015)

In 2007, the ACP and NSE surveys were combined under a single ACP survey design. Previously, surveys differed in spatial extent, timing, sampling intensity, and duration, and consequently, produced different estimates of population size and trend for Steller's eiders. These estimates, including results from previous analyses of the ACP and NSE survey data (Mallek et al. 2007, Larned et al. 2009), are summarized in Table 4.2. Most observations of Steller's eider from both surveys occurred within the boundaries of the NSE survey (Figure 4.9).

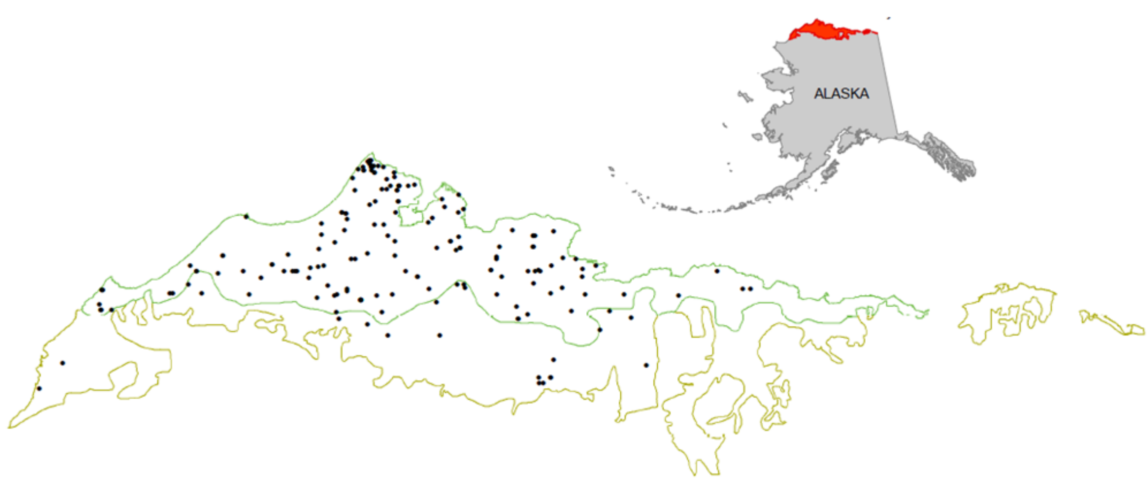

Figure 4.9. All Steller's eider sightings from the Arctic Coastal Plain (ACP) survey (1989–2008) and the North Slope eider (NSE) survey (1992–2006). The ACP survey encompasses the entire area shown (61,645 km^2); the NSE includes only the northern portion outlined in green (30,465 km^2; modified from Stehn and Platte 2009).

Following assessment of potential biases inherent in both surveys, Stehn and Platte (2009) identified a subset of the NSE survey data (1993–2008) that were determined to be "least confounded by changes in survey timing and observers." Based on this subset, the average population index[2] for Steller's eiders on the ACP was 173 (90% CI 88–258) with an estimated growth rate of 1.011 (90% CI 0.857–1.193). Average population size of Steller's eiders breeding on the ACP was estimated at 576 (292–859, 90% CI; Stehn and Platte 2009) assuming a detection probability of 30%[3]. Currently, this analysis provides the best available estimate of the Alaska-breeding Steller's eider population size and growth rate for the ACP. Note that these estimates are based on relatively few actual observations of Steller's eiders with none detected in some years.

The annual Barrow Triangle (ABR) survey provides more intensive coverage (50%, 1999–2004; 25–50%, 2005–2014) of the northern portion of the ACP. This survey has been conducted since 1999 over a 2,757 km^2 area south of Barrow (Figure 4.10) to compliment ground surveys closer to Barrow. Estimated Steller's eider density for the ABR survey area ranges from <0.01–0.03 birds/km2 in non-nesting years to 0.03–0.08 birds/km2 in nesting years. The estimated average population index for Steller's eiders within the Barrow Triangle was 99.6 (90% CI 55.5–143.7; Stehn and Platte 2009) with an estimated growth rate of 0.934 (90% CI 0.686–1.272). If we assume the same 30% detection probability applied to NSE estimates, average population size of Steller's eiders breeding in the Barrow Triangle area would be 332 (185–479, 90% CI).

Breeding population near Barrow, Alaska – The tundra surrounding Barrow supports the only significant concentration of Steller's eiders nesting in North America. Standardized ground surveys for eiders have been conducted near Barrow since 1999 (Figure 4.6; Rojek 2008). Counts of males are the most reliable indicator of Steller's eider presence because females are cryptic and often go undetected in counts. The greatest concentrations of Steller's eiders observed during Barrow ground surveys occurred in 1999 and 2008 with 135 and 114 males respectively (Table 4.2; Safine 2011). Total nests found (both viable[4] and post-failure) ranged from 0–78 between 1991 and 2011, while the number of viable nests ranged from 0–27. Steller's eider nests were found in 14 of 22 years (64%) between 1991 and 2012 (Safine 2013). Table 4.2. Steller's eider males, nests, and pair densities recorded during ground-based and aerial surveys conducted near Barrow, Alaska 1999–2012 (modified from Safine 2013).

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[2] Geographically extrapolated total Steller's eiders derived from NSE survey counts.
[3] Detection probability of 30% with a visibility correction factor of 3.33 was selected based on evaluation of estimates for similar species and habitats (Stehn and Platte 2009).
[4] A nest is considered viable if it contains at least one viable egg.

Table 4.2. Steller's eider males, nests, and pair densities recorded during ground-based and aerial surveys conducted near Barrow, Alaska 1999–2012 (modified from Safine 2013).

	Overall ground-based survey area			Standard Ground-based Survey Area[a]		Aerial survey of Barrow Triangle		
Year	Area (km^2)	Males counted	Pair density ($males/km^2$)	Males counted	Pair density ($males/km^2$)	Males counted	Pair density ($males/km^2$)[b]	Nests found near Barrow
1999	172	135	0.78	132	0.98	56	0.04	36
2000	136	58	0.43	58	0.43	55	0.04	23
2001	178	22	0.12	22	0.16	22	0.02	0
2002	192	1	<0.01	0	0	2	<0.01	0
2003	192	10	0.05	9	0.07	4	<0.01	0
2004	192	10	0.05	9	0.07	6	<0.01	0
2005	192	91	0.47	84	0.62	31	0.02	21
2006	191	61	0.32	54	0.40	24	0.02	16
2007	136	12	0.09	12	0.09	12	0.02	12
2008	166	114	0.69	105	0.78	24	0.02	28
2009	170	6	0.04	6	0.04	0	0	0
2010	176	18	0.10	17	0.13	4	0.01	2
2011	180	69	0.38	59	0.44	10	0.01	27
2012	176	61	0.35	55	0.41	37	0.03	19

[a]Standard area (the area covered in all years) is ~134 km^2 (2008 – 2010) and ~135 km^2 in previous years.
[b]Actual area covered by aerial survey (50% coverage) was ~1408 km^2 in 1999 and ~1363 km^2 in 2000 – 2006 and 2008. Coverage was 25% in 2007 and 2010 (~682 km^2) and 27% in 2009 (~736 km^2). Pair density calculations are half the bird density calculations reported in ABR, Inc.'s annual reports (Obritschkewitsch and Ritchie 2011).

Steller's Eider Recovery Criteria

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

Criteria used to determine when species are recovered are often based on historical abundance and distribution, or on the population size required to ensure that extinction risk, based on population modeling, is tolerably low. For Steller's eiders, information on historical abundance is lacking, and demographic parameters needed for accurate population modeling are poorly understood. Therefore, the Recovery Plan for Steller's Eiders (USFWS 2002) establishes interim recovery criteria based on extinction risk, with the assumption that numeric population goals will be developed as demographic parameters become better understood. Under the Recovery Plan, the Alaska-breeding population would be considered for delisting from threatened status if it has ≤ 1% probability of extinction in the next 100 years, and each of the northern and western subpopulations are stable or increasing and have ≤ 10% probability of extinction in 100 years.

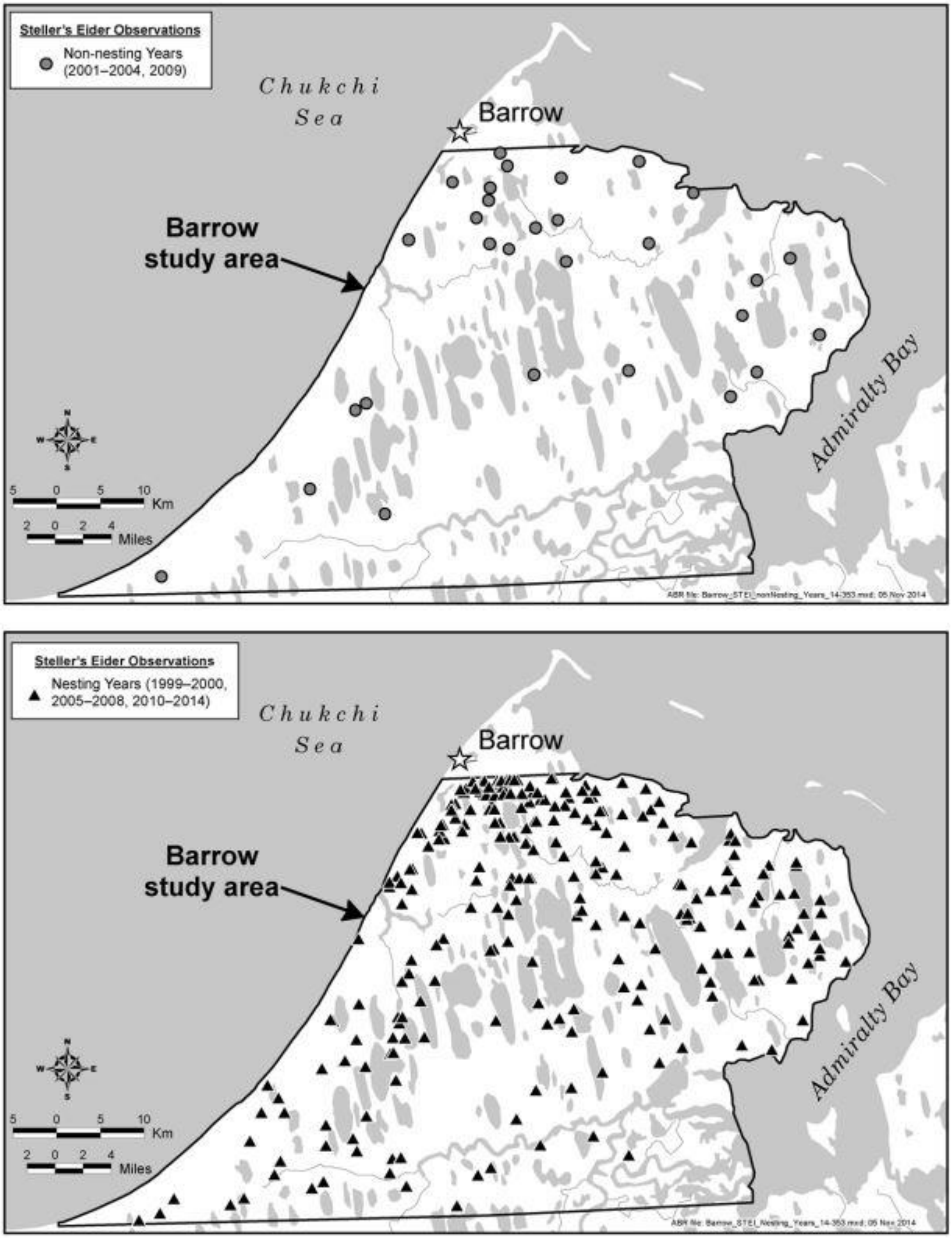


Figure 4.10. Locations of Steller's Eiders observed by ABR, Inc. during aerial surveys in non-nesting (top) and nesting years (bottom) near Barrow, Alaska, June 1999–2014 (Obritschkewitsch and Ritchie 2015).

5. ENVIRONMENTAL BASELINE

Regulations implementing the ESA (50 CFR §402.02) define the environmental baseline to include the past and present impacts of all Federal, State, or private actions and other human activities in the Action Area. Also included in the environmental baseline are anticipated impacts of all proposed Federal projects in the Action Area that have undergone section 7 consultation, and the impacts of State and private actions contemporaneous with the consultation in progress.

The environmental baseline also includes the effects of climate change on listed species. This BO considers ongoing and projected changes in climate using terms as 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). Results of scientific analyses presented by the IPCC show that most of the observed increase in global average temperature since the mid-20th century cannot be explained by natural variability in climate, and is "very likely" (defined by the IPCC as 90 percent or higher probability) due to the observed increase in greenhouse gas (GHG) concentrations in the atmosphere as a result of human activities, particularly carbon dioxide (CO_2) emissions from use of fossil fuels (IPCC 2007, Solomon et al. 2007). Various types of changes in climate can have direct or indirect effects on most 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).

High latitude regions such as Alaska's arctic waters and the North Slope are thought to be especially sensitive to the effects of climate change (Quinlan et al. 2005, Schindler and Smol 2006, Smol et al. 2005). While climate change will likely affect ecological communities in the arctic, it is difficult to predict with specificity or reliability how these effects will manifest. Biological, climatological, and hydrologic components of the ecosystem are interlinked and operate on multiple spatial, temporal, and organizational scales with feedback between the components (Hinzman et al. 2005). This BO uses expert judgment to weigh relevant information, including uncertainty, in consideration of climate change.

Status of listed eiders in the action area

Although density of nesting spectacled eiders varies across much of the ACP, they regularly breed near Barrow. Breeding Steller's eiders concentrate in tundra wetlands surrounding Barrow (Figure 5.1), and occur at very low densities elsewhere on the ACP (Larned et al. 2010). In the action area, both species arrive between late May and early June and may remain as late as mid-October. The channel at the south end of Middle Salt Lagoon is one of the first open-water areas available when eiders arrive in early June, and frequently functions as a staging area until terrestrial and freshwater habitats are snow-free. Multiple observations of spectacled eider breeding pairs in wetland complexes south of the action area suggest they may nest in the area

(Figure 5.1). In addition, numerous observations of Steller's eider breeding pairs and nests have occurred within the Barrow area (Figure 5.1), and a subset of pairs and nests have been observed within the action area (Figure 5.2A and B). Broods of both species may forage in the action area during late summer and early fall. Factors that may have contributed to the current status of spectacled and Steller's eiders in the action area include, but are not limited to, environmental contaminants, increased predator populations, incidental harvest, impacts of scientific research, and habitat loss through development and disturbance. Factors that affect adult survival may be most influential on population growth rates. Recovery efforts for both species are underway in portions of the action area.

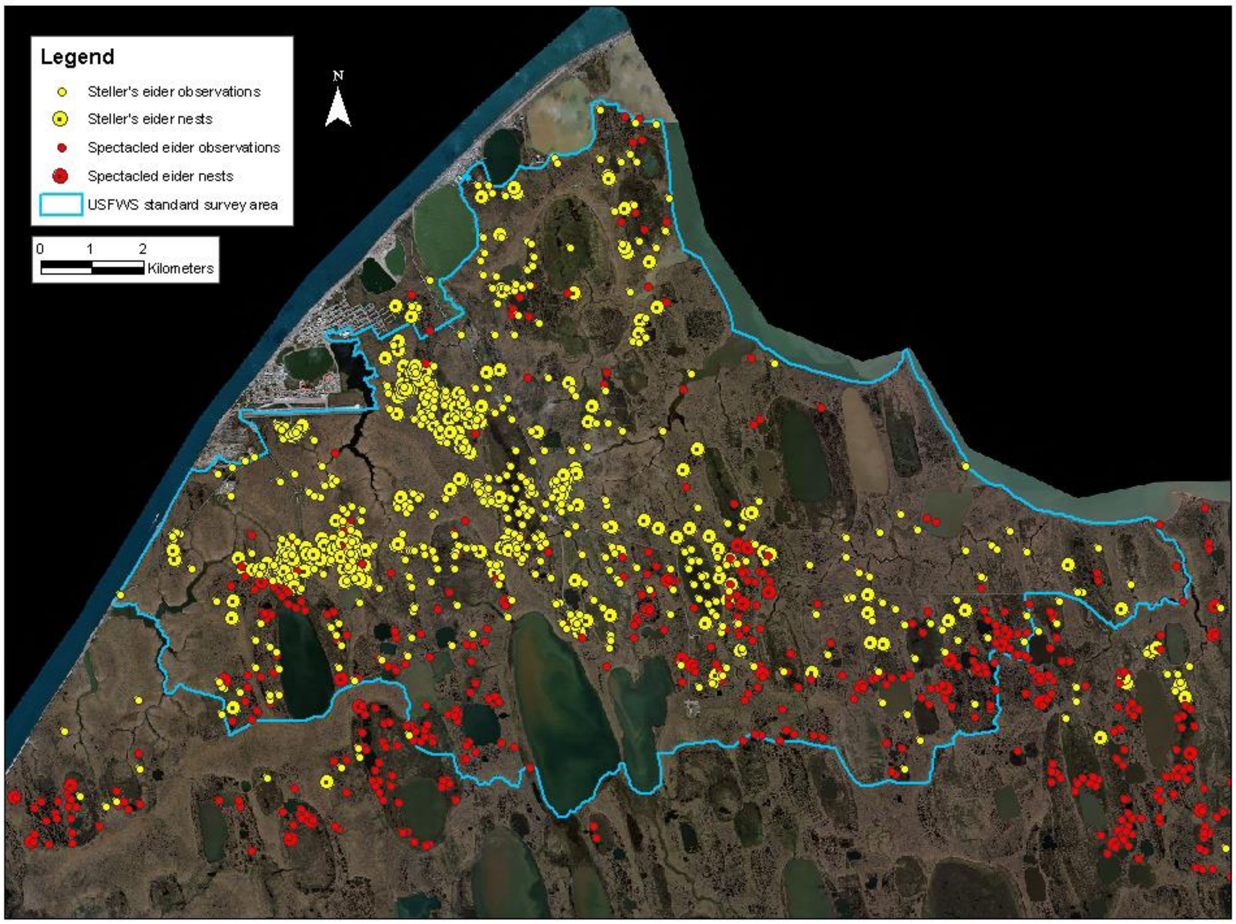
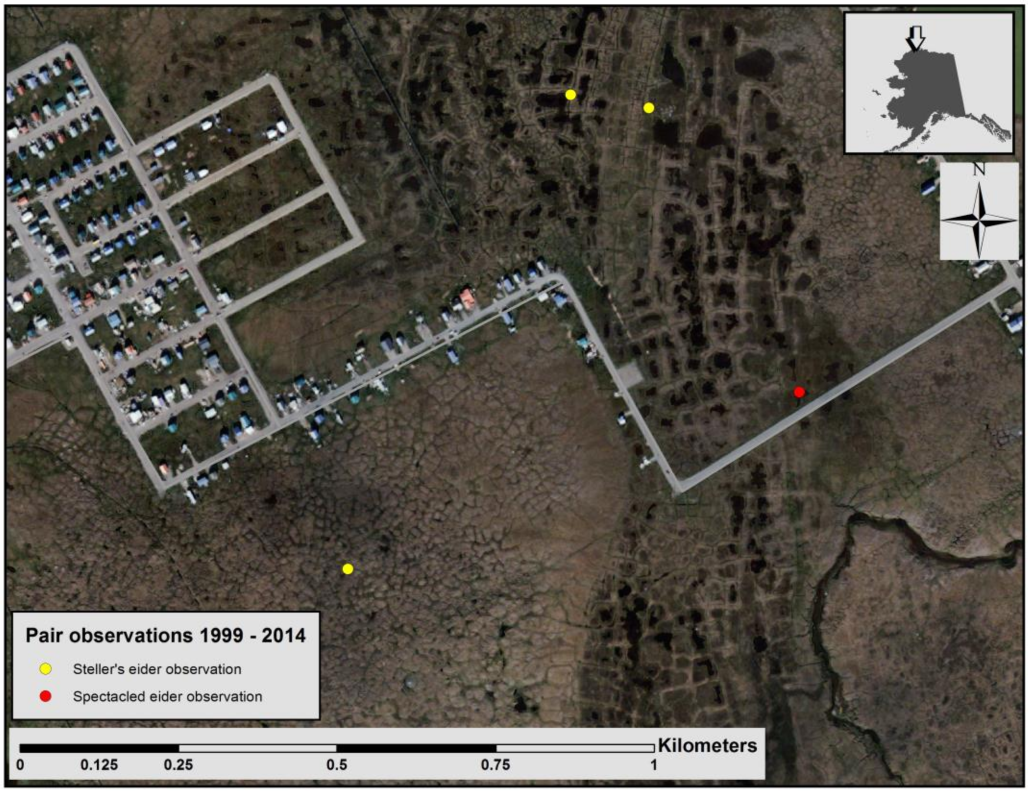


Figure 5.1. Observations of spectacled and Steller's eiders during USFWS breeding pair and nest foot surveys at Barrow, AK (1999–2010; Steller's eider nest locations 1991–2010).

(A)



(B)

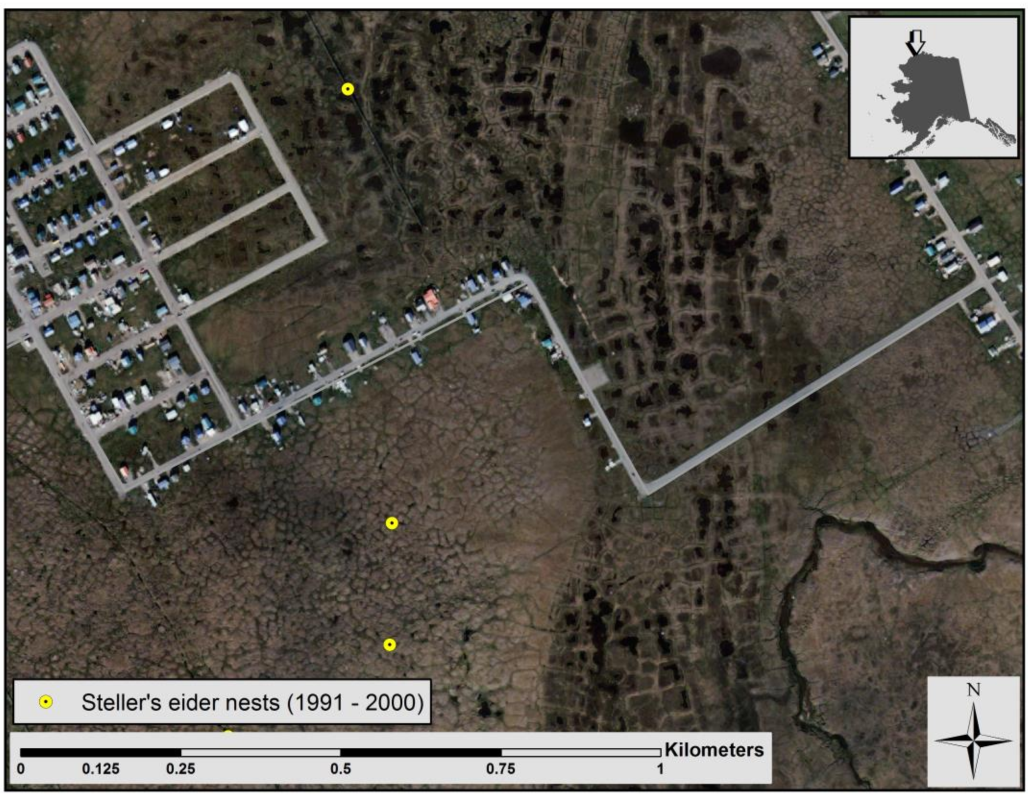


Figure 5.2. (A) Observations of spectacled and Steller’s eider pairs within the action area during USFWS breeding pair surveys between 1999 and 2014. (B) Documented Steller’s eider nests within the action area during USFWS nest surveys between 1991 and 2000.

Environmental contaminants
Deposition of lead shot in tundra wetlands and shallow marine habitat where eiders forage is considered a threat to spectacled and Steller's eiders. Lead poisoning of spectacled eiders has been documented on the Y-K Delta (Franson et al. 1995, Grand et al. 1998) and in Steller's eiders on the ACP (Trust et al. 1997; Service unpublished data). Blood samples from Steller's eider hens breeding near Barrow in 1999 showed that all (7 of 7) had been exposed to lead (indicated by > 0.2 ppm lead in blood) and one had experienced lead poisoning (>0.6 ppm lead; Figure 5.3). Subsequent isotope analysis confirmed lead in the Steller's eider blood was of lead shot origin, rather than a natural source (Trust et al. 1997, Matz et al. 2004). Waterfowl hunting with lead shot is prohibited in Alaska, and for all birds on the North Slope. Although the Service reports use of lead shot appears to be declining, residual lead shot will presumably be present in the environment, and available to waterfowl, for some unknown period into the future.

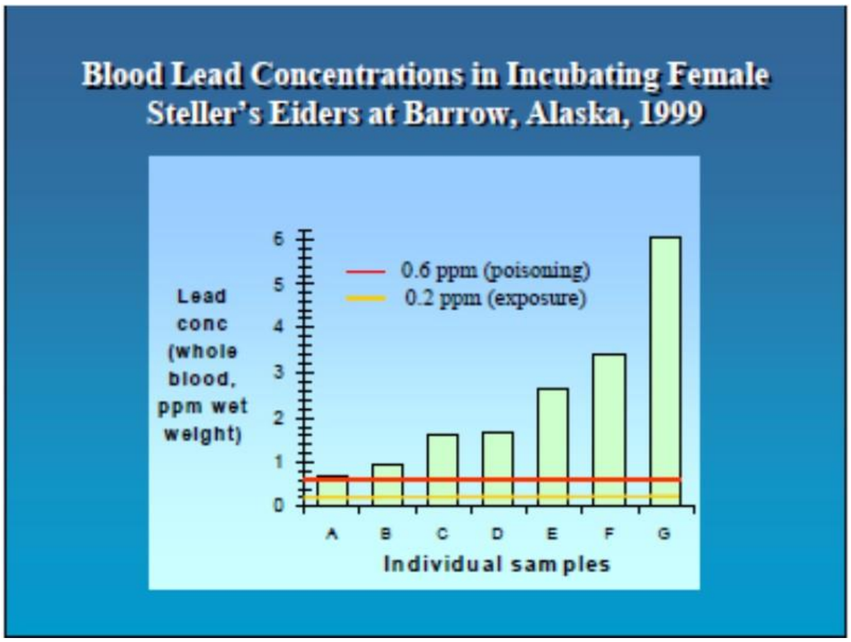


Figure 5.3. Blood lead concentrations in incubating female Steller's eiders at Barrow, Alaska. 1999.

Other contaminants, including petroleum hydrocarbons from local sources or globally distributed heavy metals, may also affect listed eiders. For example, spectacled eiders wintering near St. Lawrence Island exhibited high concentrations of metals as well as subtle biochemical changes (Trust et al. 2000). Additionally, spectacled eiders breeding and staging on the Colville River Delta may have experienced a variety of exposure to petroleum hydrocarbons, heavy metals, and other contaminants from nearby industrial development. However, risk of contaminant exposure and potential affects to listed eiders in the action area are unknown.

Increased predator populations
Poor breeding success of Steller's eiders near Barrow has been partially attributed to high predation rates (Obritschkewitsch et al. 2001). Predator and scavenger populations have likely increased near villages and industrial infrastructure on the ACP in recent decades (Eberhardt et al. 1983, Day 1998, Powell and Bakensto 2009). Reduced fox trapping, anthropogenic food

sources in villages, and an increase in availability of nesting/denning sites at man-made 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 (Day 1998). For example, ravens are 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 spectacled and Steller's eiders may decrease.

Incidental harvest

Although local knowledge suggests spectacled and Steller's eiders were not specifically targeted for subsistence, an unknown level of incidental harvest of both species occurred across the North Slope prior to listing spectacled and Steller's eiders under the ESA (Braund et al. 1993). All harvest of spectacled and Steller's eiders was closed in 1991 by Alaska State regulations and Service policy, and outreach efforts have been conducted by the North Slope Borough, BLM, and Service to encourage compliance. However, annual harvest surveys indicate that at least some listed eiders continue to be incidentally taken during subsistence activities on the North Slope. Ongoing efforts to help subsistence users avoid incidental harvest are being implemented in North Slope villages, particularly at Barrow, where the greatest perceived risk to Steller's eiders is expected due to their relatively high concentrations and occupancy of areas commonly used for hunting. Annual intra-service consultations are conducted for the Migratory Bird Subsistence Hunting Regulations, and although estimates are imprecise, harvest of all migratory bird species, including listed eiders, are reported annually.

Habitat loss

Destruction or modification of listed eider nesting habitat on the North Slope has been limited, and is not believed to have contributed substantially to population declines of spectacled or Steller's eiders. However, increased development and disturbance in recent decades has impacted listed eiders through loss of nesting habitat.

The human population of Barrow is increasing, and population growth is projected to continue at approximately 2% per annum until at least the middle of this century (BLM 2007). Assuming community infrastructure grows at roughly the same pace, the Barrow footprint could cover approximately 3,600 acres (14.6 km^2) by the 2040s (BLM 2007). In addition, oil and gas development has progressed westward across the ACP towards the National Petroleum Reserve – Alaska (NPR-A) and given industry interest in NPR-A and offshore in the Chukchi and Beaufort seas expressed in lease sales, seismic surveys, and exploratory wells, westward expansion of industrial development is likely to continue. However, potential effects of expected community and industry expansion on listed eiders are difficult to predict. Furthermore, these activities would require Federal permits (e.g., from the BLM and USACE) and separate section 7 consultation under the ESA as they are proposed.

Research

Field-based scientific research has also increased on the ACP in response to interest in climate change and its effects on Arctic ecosystems. While many activities have no impact on listed eiders (e.g., project timing occurs when eiders are absent, or employs remote sensing tools), on-tundra activities and remote aircraft landings may disturb listed eiders. Many of these activities are considered in intra-Service consultations, National Science Foundation consultations, or under a programmatic consultation with the BLM for summer activities in NPR-A.

Climate change

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

There are a wide variety of changes occurring across the circumpolar Arctic. Arctic landscapes are dominated by freshwater wetlands (Quinlan et al. 2005), which listed eiders depend on for forage and brood rearing. As permafrost thaws, some water bodies are draining (Smith et al. 2005, Oechel et al. 1995), or drying due to increased evaporation and evapotranspiration during prolonged ice-free periods (Schindler and Smol 2006, and Smol and Douglas 2007). In addition, productivity of some lakes and ponds is increasing in correlation with elevated nutrient inputs from thawing soil (Quinlan et al. 2005, Smol et al. 2005, Hinzman et al. 2005, and Chapin et al. 1995) and other changes in water chemistry or temperature are altering algal and invertebrate communities, which form the basis of the Arctic food web (Smol et al. 2005, Quinlan et al. 2005).

With reduced summer sea ice coverage, the frequency and magnitude of coastal storm surges has increased. During these events, coastal lakes and low lying wetlands are often breached, altering soil/water chemistry as well as floral and faunal communities (USGS 2006). When coupled with softer, semi-thawed permafrost, reductions in sea ice have significantly increased coastal erosion rates (USGS 2006), which may reduce available coastal tundra habitat over time.

Changes in precipitation patterns, air and soil temperatures, and water chemistry are also affecting terrestrial communities (Hinzman et al. 2005, Prowse et al. 2006, Chapin et al. 1995), and the range of some boreal vegetation species is expanding northward (Callaghan et al. 2004). Climate-induced shifts in distributions of predators, parasites, and disease vectors may also have significant effects on listed and un-listed species. Climate change may also cause mismatched phenology between listed eider migration, development of tundra wetland invertebrate stocks, fluctuation of small mammal populations, and corresponding abundance of predators (Callaghan et al. 2004, Quakenbush and Suydam 1999).

While the impacts of climate change are on-going and the ultimate effects on listed eiders within the action area are unclear, species with small populations are more vulnerable to the impacts of environmental change (Crick 2004). Some species may adapt and thrive under changing environmental conditions, while others decline or suffer reduced biological fitness.

6. EFFECTS OF THE ACTION ON LISTED SPECIES

This section of the BO analyzes direct, indirect, interrelated, and interdependent effects of the proposed Action on listed eiders. Both direct effects (effects immediately attributable to the action) and indirect effects (effects that are caused by or will result from the proposed action and are later in time, but are still reasonably certain to occur) are considered. Interrelated and interdependent effects of the action are also discussed.

Our analyses of the effects of the action on species listed under the ESA include consideration of ongoing and projected changes in climate. As discussed in the *Environmental Baseline*, 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 listed eiders
Adverse effects to spectacled and Steller's eiders could occur through long-term habitat loss, disturbance and displacement, and shooting. Additionally, adverse effects to listed eiders could occur from increased predator populations and collisions with structures or overhead lines as a result of interrelated and interdependent actions; each of these factors is evaluated below.

Long-term habitat loss

Permanent gravel fill — Habitat loss could occur through direct or indirect effects. Direct habitat loss occurs when extraction or placement of gravel fill permanently renders tundra habitat incapable of being used for nesting or brood rearing. We also anticipate indirect habitat loss via disturbance or displacement within a zone of influence surrounding new infrastructure from occupancy of the area and associated human activities. The two principal mechanisms through which disturbance and displacement can adversely affect listed eiders on their breeding grounds are:

1. Disturbing incubating or brood-rearing hens, potentially exposing eggs or small young to inclement weather and predators; and
2. Displacing adults and/or broods from preferred habitats during pre-nesting, nesting, brood rearing, and staging for migration.

In the discussion below, we estimate potential breeding habitat loss for listed eiders resulting from construction of the East Shareholder Lot Roads project. During the proposed project, direct, permanent habitat loss would result from the placement of gravel fill, impacting 21.5 acres (0.09 km^2) of wetlands (UMIAQ 2014; Figure 2.3). In addition to an estimated direct loss of 21.5 acres of wetlands for development of all 5 phases (UMIAQ 2014), indirect habitat loss may occur through disturbance and displacement of eiders in the surrounding zone of influence. To estimate impacts from disturbance and displacement in adjacent habitat, we generally assume an additional 200 m (656.17 ft) zone beyond the footprint of proposed infrastructure reflects the area within which indirect effects of disturbance or displacement may occur. Given this assumption, the area of total habitat loss for construction of all 5 phases of the proposed project, including indirect disturbance or displacement in the adjacent 200 m zone of influence, is estimated to be 90.9 acres (0.37 km^2).

Effects to nesting spectacled eiders

Our assessment of potential impacts uses estimates of spectacled eider density constructed from data collected during the 2007-2010 ACP aerial waterfowl survey (Larned et al. 2011). Waterfowl density is a continuous variable that reflects the heterogeneity of habitat on the North Slope, and spectacled eider density as described by these aerial surveys is divided into 5 categories ranging from 0.0 – ≤ 0.028 birds/km^2 to 0.426 – ≤1.531 birds/km^2 (Larned et al. 2011). These density categories were developed at a coarse regional scale and are not site- or habitat-specific; however, they provide a reasonable perspective on the variation in density of breeding spectacled eiders in the action area. Distribution on a local scale may vary based on the availability of preferred habitats.

Estimated spectacled eider density near Barrow ranged from 0.426-1.531 spectacled eiders/km^2 (Larned et al. 2011). To estimate the number of spectacled eider pairs potentially disturbed or displaced by the proposed project, we multiplied the median estimated density in the action area (0.9785 spectacled eiders/km^2) by the total estimated affected area 90.9 acres (0.37 km^2). We assume the estimated number of pairs displaced equates 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. Applying these assumptions and this logic, we estimate the proposed action would impact approximately 9 spectacled eider nests over an estimated 50-year project life:

$$0.978 \text{ spectacled eiders/km}^2 \times 0.5 \text{ nests/pair} \times 0.37 \text{ km}^2 \times 50 \text{ yrs} = 8.99 \text{ nests}$$

Because the most recent population estimate for North Slope-breeding spectacled eiders is 12,916 (10,942–14,890, 95% CI) we would not anticipate population level effects from the loss of 9 nests as a result of disturbance and displacement associated with the proposed East Barrow Shareholder Lot Roads project.

Effects to nesting Steller's eiders

We estimated the potential number of Steller's eider nests impacted by multiplying the average density of breeding pairs within the Service's standard survey area 1999–2012 (Safine 2013; 0.262 Steller's eider breeding pairs/km^2) by the estimated affected area (0.37 km^2). As with spectacled eiders, we assume the estimated number of pairs displaced equates to the number of nests or broods that may be affected. We also assume that Steller's 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. Applying these assumptions and this logic, we estimate the proposed action would cause the failure of roughly 2 Steller's eider nests over an estimated 50-year project life:

$$0.262 \text{ Steller's eider pairs/km}^2 \times 0.5 \text{ nest/pair} \times 0.37 \text{ km}^2 \times 50 \text{ yrs} = 2.41 \text{ nests}$$

Therefore, we estimate potentially 2 Steller's eiders nests could be impacted due to habitat loss from the East Barrow Shareholder Lot Roads project over an estimated 50 years. Because the most recent population estimate for Alaska-breeding Steller's eiders is 576 (292-859, 90% CI) we would not anticipate population level effects from the loss of 2 nests as a result of disturbance and displacement associated with the proposed project.

Shooting

Prior to the ESA listing of spectacled and Alaska-breeding Steller's eiders some subsistence harvest of these species occurred across the North Slope (Braund et al. 1993), and some shooting continues despite prohibitions against taking these species. Because the proposed roads may increase access to the surrounding area, spectacled and Steller's eiders would potentially be at risk of increased shooting. Furthermore, listed eiders often fly in mixed flocks with king and common eiders, and due to similarities in size and female/juvenile plumage, they may be subject to misidentification and inadvertent harvest during subsistence harvest of migrating eiders.

The potential for listed eiders to be shot may be increased if characteristics of the new infrastructure serve to draw waterfowl early in spring. Accumulations of fugitive dust from the completed project would likely result in earlier snowmelt as darker dust-covered snow absorbs more solar radiation (NRC 2003). This phenomenon is expected to occur towards the southwest (leeward) side of the proposed project as prevailing winds in the action area are generally from the northeast. As accelerated snowmelt occurs within roadside dust shadows, habitat may become available to wildlife up to 14 days earlier than adjacent snow-covered tundra (Troy 1988, Walker and Everett 1987, Walker et al. 1987). When migratory birds arrive in spring, these conditions could lead to localized concentrations of listed eiders and other waterfowl near the proposed project where they would be more vulnerable to shooting.

Although spatial and temporal coverage of survey data vary, harvest of listed eiders is sometimes reported in subsistence surveys. For example in 1992, harvest of 995 spectacled and 321 Steller's eiders from North Slope villages was reported, including 494 and 160 in Barrow, respectively (Huntington 2009), although species misidentification may have plagued this estimate (Fuller and George 1997). Furthermore, the Alaska Migratory Bird Co-management Council reports estimate that up to 392 (31–984, 95% CI) spectacled eiders are harvested on the North Slope annually (Naves 2011). Variation in harvest survey timing, coverage, and methodology coupled with misidentification, inconsistent reporting, and other unquantifiable biases, confound our ability to estimate harvest reliably. However, available harvest reports, combined with density and distribution data, suggest tens to low hundreds of listed eiders are harvested each year in Alaska.

Overall, we anticipate risk of increased listed eider harvest as a result of increased subsistence access from the proposed project would be low. Given (1) interannual variation in timing of spring arrival and snowmelt; (2) the variability in density of listed eiders in and near the action area; and (3) lack of empirical harvest data, we speculate, based on extremely subjective impressions of risk, that 0–3 spectacled eiders and ≤ 1 Steller's eider could be shot each year as a result of increased access from the proposed infrastructure. Given that the North Slope-breeding population of spectacled eiders is estimated to be 12,916 (10,942–14,890, 95% CI), and 576 (292-859, 90% CI) for Steller's eiders, we would not expect population-level effects from this anticipated increase in potential shooting of listed eiders.

Interrelated and interdependent effects

Interrelated effects result from actions that are part of a larger action and depend upon the larger action for their justification (e.g., avian collisions due to installation of overhead powerlines), while interdependent effects are defined as actions having no independent utility apart from the proposed Action (50 CFR §402.02). Potential interrelated and interdependent effects of the East Barrow Shareholder Lot Roads project include collisions with structures and overhead powerlines to be built in the future, and increased predator populations.

Collisions with structures and overhead lines

Migratory birds suffer considerable mortality from collisions with man-made structures (Manville 2004). Birds involved in collisions with man-made structures may also experience severe injuries, including concussions, internal hemorrhaging, and broken bones. 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, particularly red steady-state lights, result in disorientation which increases 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.

During spring migration, we expect most eiders would remain offshore 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 moving overland, during westward migration (TERA 2002; see also Petersen et al. 1999). However, we anticipate listed eider collision risk with future shareholder lot structures would be greatly reduced by the visibility of structures during 24 hours of daylight in the project area from mid-May through late July. When females and juveniles migrate during late summer/fall, shorter daylight and frequent foggy weather conditions could increase collision risk. Longer nights increase the period that eiders are vulnerable to collisions with unseen structures, and may compound susceptibility to attraction and disorientation from lit structures. However, we anticipate sea ducks, including listed eiders, would be more likely to migrate over open water in the Chukchi Sea (Petersen et al. 1999, TERA 2002), thereby generally avoiding inland shareholder lot structures.

Because the purpose of the proposed infrastructure is to provide access to undeveloped residential lots in order to facilitate housing development (UMIAQ 2014), we anticipate structures such as buildings, light poles, and overhead powerlines would be constructed in the future. These features would pose a collision risk to eiders migrating east during spring and west during summer/fall, as well as those making local movements. However, because buildings are comparatively large, solid structures, we expect most eiders would be capable of detecting and avoiding buildings associated with future shareholder lot structures. Therefore, significant impacts to listed eiders from collisions with future shareholder lot buildings would not be anticipated.

Because migratory birds are known to suffer injury or mortality from collisions with overhead wires, we believe overhead powerlines would present considerable risk of avian collisions with future shareholder lot structures. We also acknowledge overhead power lines would constitute a long-term, if not permanent, collision risk to migratory birds in the project area, including listed eiders. 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. It is also conceivable that birds making local movements or migrating through the action area would detect and attempt to avoid solid man-made structures (e.g., residential buildings) and would thereby avoid associated overhead lights and wires. However, an unknown level of collision risk would remain, and this risk would persist over the life of the development. Several factors confound accurate estimation of overhead line collisions for listed 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.

In summary, we anticipate the likelihood of collisions of listed eiders with future shareholder lot structures would be low because 1) good visibility of structures in late-spring and early summer due to extended daylight would likely reduce collision risk; 2) migrating eiders tend to fly offshore and would thereby avoid inland structures in late summer and fall when darkness increases collision risk. However, if overhead powerlines or lights were installed, they would pose a collision risk to listed eiders, therefore consultation with USACE would be required for future installation of these structures and the Service would recommend design features (e.g., hooded lights to direct light downward and bird diverters on overhead lines and guy wires) to reduce the likelihood of collisions.

Increased predator populations

Predator and scavenger populations have likely increased near North Slope villages and industrial infrastructure in recent decades (Eberhardt et al. 1983, Day 1998, Powell and Bakensto 2009), and poor breeding success of Steller's eiders near Barrow has been partially attributed to high predation rates (Obritschkewitsch et al. 2001). Anthropogenic food sources and an increase in availability of nesting/denning sites at man-made structures may have resulted in increased numbers of foxes, ravens, gulls in developed areas (Day 1998). For example, although ravens did not historically nest on the North Slope, multiple raven pairs have established territories and nest annually on communication towers or other structures near Barrow.

Ravens are highly efficient egg predators (Day 1998), and have been observed depredating Steller's eider nests near Barrow (Quakenbush et al. 2004). For example, ravens were observed depredating 5 Steller's eider nests near Barrow between 1991 and 1999 and are capable of displacing female Steller's eiders and removing whole eggs from a nest (Quakenbush et al. 1995, 2004). A raven was also documented depredating a Steller's eider nest using remote nest cameras in 2007 (Rojek 2008). Although ravens are known to be highly efficient egg predators, estimating the effects of predators on listed eider production in the action area is extremely difficult. We expect new structures associated with shareholder lots would increase the number of potential nesting and perching sites for avian predators and increase availability of anthropogenic food resources for ravens and other predators in the project area. However, management of raven nest sites and proper waste management and disposal policies (e.g., adequate bins for disposal of household waste, and collection at regular intervals) would reduce potential increases in predator productivity and depredation of listed eider nests. Provided these management policies are implemented, we anticipate impacts to listed eiders from increased predator populations would be minimized.

7. CUMULATIVE EFFECTS

Regulations implementing the ESA (50 CFR §402.02) define "cumulative effects" as the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the Action Area. 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. Within the Action Area, continued community growth and infrastructure or utilities expansion will likely occur. However, these activities would require Federal permits (e.g., from the BLM and USACE) and separate consultation, and therefore are not considered cumulative effects under the ESA.

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 and Alaska-breeding Steller's eiders

In evaluating impacts of the proposed project to listed eiders, the Service identified direct and indirect adverse effects that could result from habitat loss through disturbance or displacement, and increased shooting. Using methods explained in the *Effects of the Action* section, the Service estimates impacts to approximately 9 spectacled and 2 Steller's eider nests from disturbance and displacement associated with the proposed project. Additionally, the Service estimates that between 0–3 spectacled and ≤ 1 Steller's eider could be shot annually as a result of increased access from the proposed infrastructure. Because man-made structures and overhead powerlines are not part of the proposed action, at this time we do not anticipate listed eider collisions with structures and overhead powerlines, or impacts from increased predator populations. However, installation of these features would require future consultation with USACE and the Service would recommend design features and other mitiagation measures to reduce the likelihood of impacts to listed eiders from these features.

Because these effects would impact a relatively small proportion of the estimated North Slope-breeding population of spectacled (10,942–14,890, 95% CI; Stehn et al. 2006) and Steller's eiders (292–859, 90% CI; Stehn and Platte 2009), and this loss would be distributed across approximately 50 years, we believe the estimated loss of spectacled and Steller's eiders from the proposed project would not significantly affect the likelihood of survival and recovery of these species. Therefore, after reviewing the current status of the species, the environmental baseline, and effects of the proposed action, the Service concludes that the proposed action is *not likely to jeopardize the continued existence* of the spectacled or Steller's eiders by reducing appreciably the likelihood of survival and recovery in the wild by reducing reproduction, numbers, or distribution of these species.

Future consultation

This BO's determination of non-jeopardy is based on the assumption that the USACE and their agents (UMAIQ or NVB) will consult with the Service on impacts of future activities related to the East Barrow Shareholder Lot Roads project (including installation of overhead lighting and powerlines, or extraction of gravel resources) that are not directly evaluated or enumerated in this document.

In addition to listed eiders, the area affected by the East Barrow Shareholder Lot Roads 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 (i.e., construction of the East Barrow Shareholder Lot Roads), 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 and Alaska-breeding Steller's eiders

As described in *Effects of the Action*, the activities described and assessed in this BO may adversely affect listed eiders through direct and indirect long-term habitat loss from disturbance and displacement, and increased shooting.

Habitat loss

Long-term habitat loss would occur directly from placement of gravel fill and indirectly through disturbance associated with human activities and occupancy of the area. Methods used to estimate loss of listed eider production resulting from habitat loss are described in the *Effects of the Action* section. Based on these estimates, the Service anticipates the *loss 9 spectacled eider nests with eggs and 2 Steller's eider nest with eggs* as a result of the proposed action from direct and indirect habitat loss through disturbance and displacement.

Increased shooting

Although the Service anticipates adverse effects to listed eiders from increased shooting as an interrelated effect of the proposed action, we do not provide authorization for this take. Under section 10(e) of the ESA, the provisions of the ESA shall not apply with respect to the taking of endangered and threatened species, by any Indian, Aleut, or Eskimo who is an Alaska Native who resides in Alaska, or any non-Native permanent resident of an Alaska Native village if such taking is primarily for subsistence purposes, unless the Secretary determines that the taking of an endangered or threatened species materially and negatively affects the species. Because the proposed roads would increase subsistence access to the surrounding area, the anticipated increased take of listed eiders through shooting as a result of infrastructure expansion would qualify under section 10(e), and therefore would not be prohibited by the ESA.

However, although the taking of listed species for subsistence purposes is not prohibited under the ESA, the taking of spectacled and Steller's eiders remains prohibited under the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. §§ 703-712). Therefore, the Service will refer the incidental or intentional shooting of spectacled or Steller's eiders for prosecution under the Migratory Bird Treaty Act.

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. In order to better understand common raven activity in the vicinity of human developments, the Service recommends reporting occupied raven nests in Barrow to the Endangered Species Branch, Fairbanks Fish and Wildlife Field Office as soon as they are discovered.

2. Work jointly with the Service to develop and implement strategies to avoid and minimize bird collisions.

3. The Service is committed to continue outreach and education efforts in Barrow to inform subsistence users of listed eider status, enhance stewardship of listed species, and promote mutual conservation goals.

11. REINITIATION NOTICE

This concludes formal consultation for the East Barrow Shareholder Lot Roads project. 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 is exceeded;
    a. More than 9 spectacled eider nests impacted over the life of the project;
    b. More than 2 Steller's eider nests impacted over the life of the project;
2. The action is subsequently modified in a manner that causes an effect to listed species or critical habitat not considered in this opinion (including but not limited to installation of overhead lighting or powerlines; see below);
3. New information reveals effects of the action agency that may affect listed species in a manner or to an extent not considered in this opinion; or
4. A new species is listed or critical habitat is designated that may be affected by the action.

It should be noted that installation of overhead lighting or powerlines, and buildings could result in adverse effects to spectacled and Alaska-breeding Steller's eiders through collisions and increased predator populations. The likelihood and magnitude of these effects may vary, possibly considerably, with design features and management plans incorporated into development of these features. In the event that future construction within the East Barrow Shareholder lots includes installation of overhead lighting or powerlines, consultation should be reinitiated to ensure that impacts are appropriately evaluated, enumerated, and exempted from incidental take prohibitions.

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

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