INTRA-SERVICE BIOLOGICAL OPINION

for

U.S. Fish & Wildlife Service's Issuance of a Section 10 Permit to Fairbanks Fish & Wildlife Field Office

for

Breeding Biology of Steller's Eiders and Other Waterfowl near Barrow, Alaska

June 1, 2010

INTRODUCTION

This document transmits the U.S. Fish and Wildlife Service's (Service's) final biological opinion (BO) based on our review of the Fairbanks's Fish and Wildlife Field Office's (FFWFO's) the Threatened and Endangered Species Permit Amendment Application for Recovery Permit number TE043136-0, known from here on as the revised permit, for threatened Steller's (*Polysticta stelleri*) and spectacled (*Somateria fischeri*) eiders in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.).

The purpose of this opinion is to fulfill the section 7 requirements for intra-service consultation on breeding biology studies on Steller's and spectacled eiders nesting near Barrow, Alaska. The 2010 recovery permit, TE043136-0, for the study entitled, "Breeding Biology of Steller's Eiders and Other Waterfowl near Barrow, Alaska" will allow the: 1) capture, handling, marking, and attachment of transmitters; 2) collection of biological tissue samples; 3) marking, floating, and candling of eggs; 5) nest monitoring; 6) searching for nests of spectacled eiders, Steller's eiders, and other waterfowl; and 7) trapping of foxes to reduce depredation on Steller's eider nests. This BO describes the effects of these actions on threatened spectacled and Steller's eiders, polar bears (*Ursus maritimus*), and proposed polar bear critical habitat pursuant to section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.).

Project effects on polar bears

Polar bears do not regularly to occur within the action area during summer, but the possibility of encountering a polar bear exists. The project participants have agreed to abide by Polar Bear Interaction Guidelines (Appendix A) to avoid potential conflict with polar bears. As a result of agreement to follow the guidelines, no adverse impacts to this species are anticipated.

Project effects on proposed polar bear critical habitat

Because no alteration to the physical or biotic features of polar bear habitat will be made, the Service concludes that the issuance of a section 10 permit for the proposed activities will have no effect on proposed polar bear critical habitat.

Project details were received on December 3, 2009 and May 10, 2010. Formal consultation began on 19 April 2010. The complete administrative record of this consultation is on file at the Service's Fairbanks Field Office.

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

BACKGROUND

The proposed action involves the issuance of recovery permits per section 10(a)1(A) of the Act. Section 10(a)1(A) specifically authorizes activities that are designed to assist in the conservation of listed species and which often directly affect listed species. Recovery of Steller's and

spectacled eiders is largely dependent on improving FFWFO's understanding of the reasons for their decline and taking corrective action where possible. As such, the collection of information regarding the ecology of these species is of paramount importance. Research needs that will be addressed by this action include studies of Steller's and spectacled eider ecology, demographics, and epidemiology that will in turn help the Eider Recovery Team and FFWFO identify and implement future recovery actions.

Section 7(a)(2) of the Endangered Species Act, (16 U.S.C. § 1531 et seq.), requires that each Federal agency shall insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of critical habitat of such species. When the action of a Federal agency may adversely affect a protected species, that agency (i.e., the "action" agency) is required to consult with either the National Marine Fisheries Service (NMFS) or the Service, depending upon the protected species that may be affected. For the actions described in this document, the action agency is the Service's FFWFO. Due to the protected species involved, the consulting agency is also the FFWFO. Section 7(b) of the Act requires that the consultation be summarized in a BO detailing how the action may affect protected species. Intra-service consultations must be held to the same rigorous consultation standards other federal agencies are required to meet under section 7. At all times during this consultation the Service has attempted to be as impartial as possible. Section 7 regulations allow a formal consultation to encompass a number of similar actions within a given geographic area or a segment of a comprehensive study plan (50 CFR 402.14).

THE PROPOSED ACTION

Study Area

Steller's and spectacled eiders nest in Alaska near Barrow at the northwestern corner of the Alaska coastal plain (71°18'N, 156°40'W). The Barrow area is dominated by ice-wedge polygons, shallow oriented lakes, and drained lake basins, all underlain by continuous permafrost. Plant communities include upland meadow, wet meadow, marshes with emergent vegetation, and open water in large and small lakes and ponds (Bunnell et al. 1975).

Study overview

In 2010, the researchers will continue to study abundance and distribution of Steller's eiders, their nests (i.e., ground-based breeding pair surveys, and ground-based nest searches), and will continue contaminants work (collection of blood from breeding hens and ducklings). If it is a nesting year for Steller's eiders, field crews will monitor nest survival, nest habitat use, and brood survival for this species. Project plans also include monitoring nest success of other waterfowl species (i.e., spectacled eiders and other sea ducks). Researchers will also continue a study aimed at determining the causes of nest failures by monitoring a small number of Steller's eider nests with time lapse digital cameras.

If Steller's eiders do not nest in 2010, researchers will use other sea duck species, including spectacled eiders, as surrogates for the nest camera study. Researchers also plan to continue studying contaminants in non-nesting years by capturing other species of sea ducks (i.e.

spectacled and king eiders, and long-tailed ducks) to further assess the exposure risk to lead by threatened eiders. In non-nesting years for Steller's eiders, researchers plan to capture and radio-mark adult spectacled eider females near hatch to determine brood survival and habitat use, and help determine priority recovery tasks.

Fox trapping

Project plans include reducing predation of Steller's eider nests by controlling foxes in the nesting area near Barrow. Using three trappers and two assistants on foot, daily trapping will occur in the Barrow Steller's Eider Conservation Planning Area from about May 23 to July 31, 2010. If Steller's eiders are not found nesting at Barrow in 2010, which will be known by the last week in June, the Service will terminate fox control operations for the year. Up to 120 arctic and up to 15 red fox may be taken. Specific zones of control activity within the Planning Area will be identified in consultation with Service personnel. Land use permits will be obtained from landowners. Please see Appendix B for more details.

Determining abundance and distribution of Steller's eiders near Barrow

To determine abundance and distribution of Steller's eiders near Barrow, two ground-based surveys will be conducted within 5 miles of the Barrow road system: a road survey to document the arrival of Steller's eiders, and a breeding pair (formerly called "foot survey") to document Steller's eider breeding pair distribution and abundance during the pre-nesting and early-nesting period. After the USFWS crew arrives in Barrow and prior to starting breeding pair surveys, the field crew in place will conduct road surveys to assess arrival, numbers, and locations of Steller's eiders. Road surveys are conducted from vehicles on existing roads near Barrow. Typically, Steller's eiders arrive in late May to early June.

Breeding pair foot survey

A ground-based breeding pair survey will be performed in spring when Steller's eiders arrive. The survey will begin immediately after pairs of Steller's eiders disperse from Footprint Lake and other wetlands where they typically congregate after arriving in Barrow. This survey will be conducted for about 10-14 days starting in mid-June. Study area boundaries can fluctuate, but generally include a 192 km^2 of tundra (Figure 1). Surveys will cover close to 100% of the area. Three teams of about 3-4 surveyors each will conduct the daily survey.

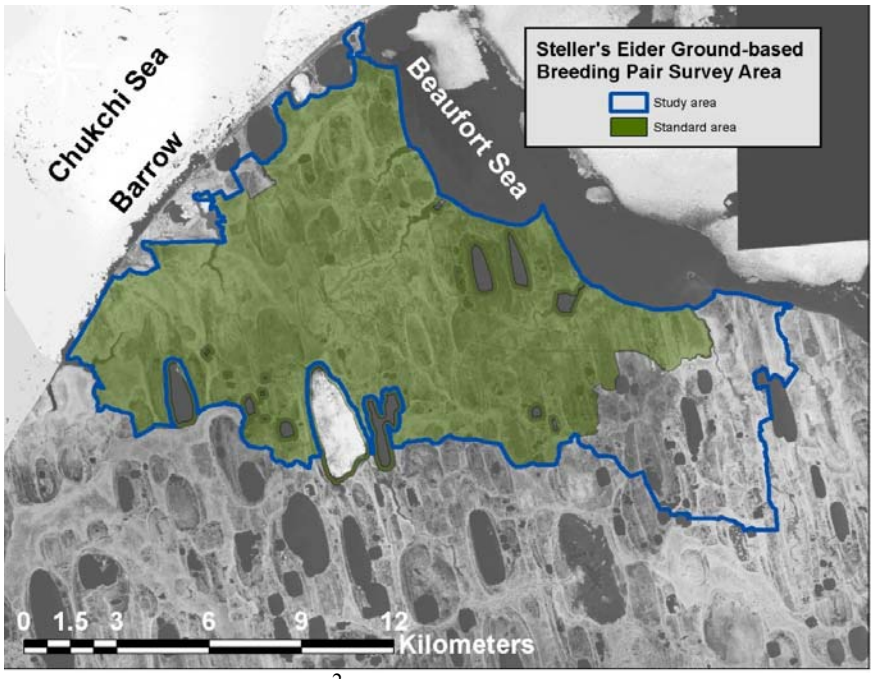

Figure 1. Barrow 192 km^2 study area (outlined in blue) and the 135 km^2 standard area surveyed all years (shaded in green) along the road system near Barrow, Alaska.

Determining nest success, and causes of nest failure for Steller's and spectacled eiders and other waterfowl

Nest surveys will also be within 5 miles of the Barrow road system. Low productivity may be contributing to observed population declines in Steller's eiders. Predation is thought to be the primary cause of Steller's eider nest failures near Barrow (Quakenbush et al. 1995). Between 1991 and 2008, nest success probability (the proportion of nests in which at least one egg hatches) averaged 0.34. Management actions to reduce fox predation are being implemented, but better understanding of the relative importance of all possible predators is needed. Due to significant overlap in patterns of nest depredation among predator species, examination of nest remains alone cannot identify the predators responsible for nest destruction. Camera monitoring has been used to identify predators while minimizing the frequency of nest visits by researchers. By monitoring nest survival of other waterfowl species (i.e. greater white-fronted geese, long-tailed ducks, and northern pintails), researchers can place Steller's and spectacled eiders nest survival in a context compared with other waterfowl species that nest near Barrow. Additionally, in years when Steller's eider do not nest near Barrow, monitoring nest survival of waterfowl that did nest may help to discover factors that contributed to the non-nesting. In 2009, field crews monitored survival of all waterfowl nests located near Barrow during a non-nesting year for Steller's eiders, and estimated nest survival probability of sea ducks that did nest at 0.07 (0.01, 0.20 95% CI). This indicated Steller's eiders would have had very low nest survival if they had nested, and sheds light on possible reasons behind foregoing nesting in 2009. Researchers also found nest survival in geese and swans to be relatively high in 2009 (0.70; 0.54, 0.81 95% CI), further illustrating the greater susceptibility to predation of smaller bodied waterfowl without bi-parental care.

Nest search survey

Nest searching will be conducted from late June to mid-July after completion of the ground-based breeding pair survey (Obritschkewitsch et al. 2001). Nest searchers will use two methods: targeted searches near observed territorial pairs and a search of areas previously used for nesting by Steller's eiders. Targeted searches will consist of searching areas near sightings of territorial pairs or males recorded during the breeding pair surveys or from information provided by other researchers. The other nest searching method involves searching as completely as possible areas used for nesting in past years. Although nesting use patterns have changed somewhat over time, some areas have been used consistently for nesting since 1991. Field crews will search areas used heavily in past years and other areas used more recently. An example of areas searched in recent years using this method can be seen in Figure 2.

During nest searching, 2-5 observers spaced ~10 m apart walk at the same pace, searching the area within 5 m to either side of themselves as they move through the area. This distance was chosen to maximize the likelihood of detecting hens on nests. In 2010 field crews will also use rope dragging to improve efficiency. Nest searching with a rope has been used widely for waterfowl in grasslands. Searchers will use one individual on either end of a 30-50 m rope. The two searchers will move forward and drag the rope over the tundra with a third person used as a spotter walking behind the rope to look for flushing waterfowl hens. This method permits fewer people to cover the same area that can be searched by a larger crew without a rope, and ensures complete coverage of an area. Nest searching method (with or without a rope) will be chosen based on habitat type and staffing constraints.

Nest data will be recorded for all waterfowl nests located, including: location, species, date, time, presence of male and female, distance to flush, number of eggs, incubation stage (obtained by candling eggs), nest status, and nest lining. Contour feathers will be collected from nests where the species identification is unknown or it is believed to be a Steller's eider. Nest locations are not physically marked (to avoid attracting predators), but GPS coordinates are used to relocate nests.

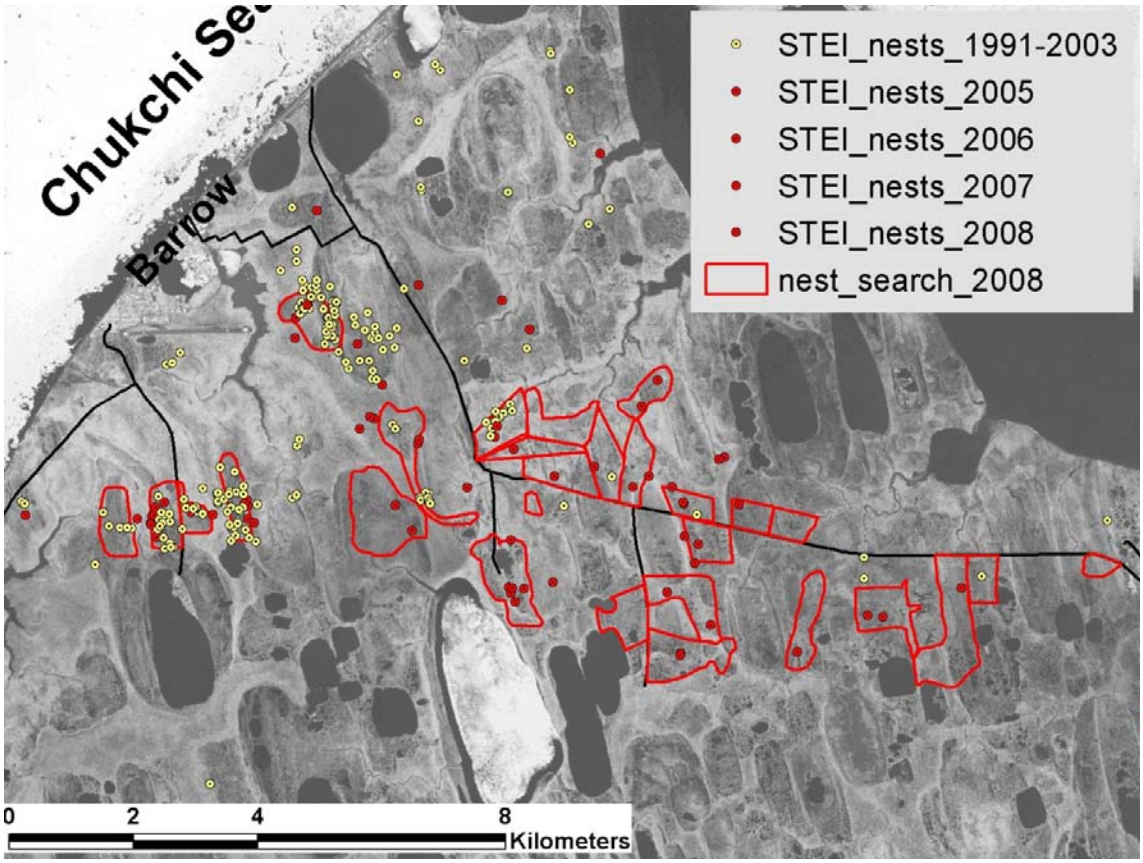

Figure 2. Map of Steller's eider (STEI) nests since 1991, and example nest search areas from 2008.

Nest monitoring

In 2010, field crews plan to continuously monitor up to ten nests using Reconyx digital cameras. Reconyx cameras were tested in 2006 and used in 2007-2009, and hens rarely flushed during camera installation or during maintenance visits. Cameras, attached to tripods, are placed 10-30 m from nests. Some of the Reconyx cameras are equipped with zoom lens, which allow field personnel to place them a further distance from nests (30 m), whereas non-zoom models will be ~10 m from the nest. Cameras will be visited approximately every 5 days to exchange data discs and batteries. Steller's eiders will be the priority species to monitor by camera, but if they are not available field crews will monitor spectacled eiders and other sea ducks. A small number of cameras may be placed on white-fronted geese to investigate the difference in nest survival between sea ducks and geese.

Nests not monitored by camera will be visited approximately every 7 to 10 days during incubation. Incubation lasts ~24 days post-laying of the penultimate egg for many waterfowl species. Nests will be relocated with GPS coordinates and maps. When visiting a nest, field crews aim to confirm the presence of the female on the nest without flushing her. For many species personnel can confirm presence with binoculars from ~20 – 40 m away. If the hen is absent from the nest or accidentally flushed when approached, field crews will visit the nest briefly to count, age, and cover the eggs. Surgical gloves will be worn when touching the nest or eggs. Nest visits generally take only a few minutes. Field crews will avoid placing backpacks

within 20m of the nest and using more than 1 person to visit the nest to limit exposure to human odors and matting vegetation that may attract predators.

Consistent with past years, after nest failure or hatch, field crews will collect nest and brood-rearing habitat information for Steller's and spectacled eiders to characterize basic breeding requirements. Eggshell and contour feathers will be collected for possible future genetics work.

Determining Steller's eider breeding area fidelity, sampling for lead exposure, and collection of DNA and viral swabs

Determining female Steller's eider fidelity to the breeding area by capturing, marking and re-sighting hens at Barrow is a high priority recovery task. Breeding hens are captured late in incubation, ideally 2-3 days prior to hatch to reduce risk of nest abandonment. In addition to collecting banding information, captures allow us the opportunity to collect samples, including blood (primarily for contaminants screening but also for DNA testing and viral screening), cloacal swabs (for virus screening), and feathers (for isotope analysis). Field crews also plan to capture spectacled and king eiders and long-tailed ducks near hatch to collect samples for lead exposure on the North Slope (a high priority task for spectacled eiders). These additional species would be captured using the same methods as for Steller's eiders, and would provide additional samples to evaluate lead exposure risk in North Slope waterfowl.

Hen capture and banding

Hens will be captured by lowering a mist net onto the nest. This will be accomplished by two persons approaching the nest holding the mist net in a horizontal plane, with one panel of the net stretched fully between outstretched arms (method similar to that described in Bacon and Evard 1990). After lowering the net, the two persons will kneel on either end of the net and crawl towards the nest. In most cases, the hen stays tight on the nest until the trappers are in reaching distance. Alternatively, hens may be captured on the nest using a bow-net (Sayler 1962). Bow-nets are a string-activated nest traps constructed of netting on two semi-circular aluminum pole frames joined by a spring in the middle. Bow-nets are set on a nest while a female is absent; the researchers lead a string that is attached to the trigger out from the trap about 80m and then leaves the area to allow the female to return to the nest. In approximately 2 hours field personnel return to the site, trigger the trap, and retrieve the female from the trap.

USFWS metal tarsus bands (stainless steel, size 6 or 7a depending on species) and plastic color bands (yellow with black alpha-numeric code for Steller's eiders) will be applied to hens. Blood will be drawn from the jugular vein for lead contaminants, DNA, and hormone analyses. Cloacal swabs will be taken for viral screening. Body weight (to the nearest gram using a spring scale) and the following morphometric measurements will be taken: culmen (from center of bill to highest point of bill tip), tarsus (diagonal and total), and wing (wing chord and flattened wing) lengths (to the nearest mm with calipers and metric rulers).

Blood and fecal swab collection

Ingestion of lead shot has been identified as a cause of mortality in spectacled eiders (*Somateria fischeri*) on the Yukon-Kuskokwim Delta and may result in reduced over-winter survival and reduced fecundity (Flint and Grand 1997, Flint et al. 1997). Screening for exposure to lead in

Steller's and spectacled eiders on the Alaska breeding grounds has been identified as a high priority recovery task. Preliminary results have revealed lead in nesting Steller's eiders in Barrow (A. Matz, USFWS, unpublished data). In 2010, field crews plan to capture nesting female Steller's and spectacled eiders during late incubation to screen for the presence of lead. Field personnel also plan to capture other sea ducks as surrogates for lead exposure in Steller's eiders (i.e. spectacled and king eiders and long-tailed ducks).

In the current recovery permit, the FFWFO is authorized to nest capture and collect blood and fecal samples from up to 20 adult Steller's and spectacled eider hens, and capture and band up to 40 Steller's or spectacled eider ducklings. The current Federal Bird banding Permit authorizes personnel to trap, band, and take blood and feather samples from all species of waterfowl, including threatened Steller's and spectacled eiders. Approximately 3 ml of blood will be collected, not to exceed 1% of body weight. In birds not undergoing surgery, guidelines suggest taking no more than 1% of body weight (assuming 1 ml blood = 1 gram). 3 ml whole blood sample is needed to perform all assays, and is within guidelines for a 500 g bird. This activity will only be conducted by personnel trained in the procedure (PI and avian technicians). Dr. Angela Matz, FFWFO contaminants ecologist, will coordinate the laboratory analysis of the samples.

Blood from captured Steller's and spectacled eiders (and other sea ducks) may also be used for DNA analysis, to screen for the presence of pathogenic viruses, and for quantification of cortisol and thyroid hormones. Field personnel will also collect a fecal sample or cloacal swab to analyze for hormones and virus exposure.

Determining Steller's and spectacled eider brood survival

Several high priority recovery tasks relate to brood monitoring for both Steller's and spectacled eiders. For Steller's eiders, the continuation of brood monitoring and determining post hatch to fledging duckling survival are high priority tasks listed in the most recent (December 2009) recovery task list. For spectacled eiders, evaluating factors affecting duckling growth and survival and evaluating and predicting effects of environmental change in breeding areas are high priority tasks listed in the most recent (December 2009) recovery task list.

To address the recovery tasks related to survival and habitat use of ducklings, field personnel will mark adult females just prior to hatch with radio-transmitters and re-sight females frequently to count brood size. With this type of data researchers can use known-fate models to estimate brood survival, or the probability that at least one duckling will survive to fledging or a specific period of time (i.e. 30 days; Flint and Grand 1997). Due to the low density of breeding eiders on the North Slope, radio-marked females are essential for locating ducklings for any captures later in brood rearing. Brood tracking has been done in past years for Steller's eiders in Barrow, but sample sizes have been limited. A continuation of this effort, to improve the precision of survival estimates and increase understanding of inter-annual variation, is important for managing this species. Spectacled eider broods have been tracked extensively on the YKD, but survival and habitat-use information from the North Slope breeding population is very scarce. For both species, documentation of current brood rearing habitat requirements is a priority to

help understand how eider populations may be affected by changes to the arctic breeding habitats predicted by climate change.

To assess factors affecting duckling growth and survival for spectacled eiders, field personnel may capture broods of marked females at approximately 30-35 days of age to measure duckling size and collect tissue samples for contaminants analysis. Spectacled eiders broods at ~35 days of age have been captured in recent years on the YKD, and their mass has been low compared to historic data (B. Lake, USFWS, Unpublished data). The low mass of YKD ducklings is thought to be related to habitat conditions (specifically salinity), and a comparison to ducklings from the North Slope where salinity is not currently believed to be a concern would provide a useful comparison. Measuring lead exposure in ducklings has been conducted on the YKD to examine exposure during the nesting season, and lead poisoning was believed to reduce juvenile survival to fledging (Flint et al. 2000). Data for lead exposure in ducklings is not available for the North Slope, and would be useful to compliment measurements for adult female sea ducks from Barrow.

Transmitter attachment to female Steller's and spectacled eiders and radio tracking broods
In 2010 up to 10 female Steller's or spectacled eiders will be equipped with a VHF transmitter to achieve the brood monitoring objective. The transmitters are prong and suture type (Mauser and Jarvis 1991, Rotella et al. 1993) modified with glue. Transmitters are manufactured by Advanced Telemetry Systems (model A4430 with mortality indicator, 9 g).

This anchor attachment technique (prong and glue method) is frequently used to attach small transmitters to the back of adult birds. This attachment method is used frequently for waterfowl. The advantage of the prong and glue design is that it does not encumber the wings, body or neck of the bird which is important for species such as waterfowl that have daily flights and migrate long distances in the fall. The prong and glue attachment method is for short term monitoring of nesting birds and assessing the timing and causes of mortality in newly hatched young. According to the manufacturer, some prong and glue transmitters are shed in 50 to > 150 days, with most lost when the bird undergoes its next molt. The 9 g transmitter used in this project is approximately 1.3% of the typical nesting Steller's eider hen's body weight of approximately 700 g.

The general attachment procedure is as follows: A 2-3 mm incision is made in the skin on the bird's back between the scapulas. The stainless steel prong is inserted in the incision and maneuvered to anchor the front of the transmitter to the bird's back. The incision site is closed with veterinary grade super glue (Vet Bond). The rear of the transmitter is glued to the bird's feathers with fast setting medium viscosity cyanoacrylate glue.

Field personnel will attempt to locate radio-marked females every three days until ducklings are about 15 days old, then every 7 days thereafter until the brood fledges, fails, or the signal can no longer be heard after repeated attempts. For tracking, field personnel will use a VHF radio-tracking receiver (Wildlife Track, WTI-1000) and 3-element hand-held Yagi antenna. Whenever possible, field personnel will attempt to observe broods from a distance (with binoculars) without altering hen and duckling behavior, and will leave the area as soon as possible. Tracking should not occur on stormy or unusually cold days when ducklings might seek sheltered areas or spend

more time being brooded. Field crews will record information on brood size, habitat use, location (GPS coordinates and description), interactions with predators, and time.

Capture, marking, and sampling of spectacled eider ducklings
If an adequate number of radio-marked spectacled eider broods survive to ~one month post-hatch, field personnel will attempt to capture ducklings in August. As hatch dates will be known from nest captures, duckling age will also be known (within a couple days), and capture efforts can target ducklings at 30 – 35 days of age to be consistent with previous studies (Flint et al. 2000, B. Lake, USFWS, Unpublished data). Known-age broods will be relocated using radio-telemetry, and field personnel will attempt to capture as many brood members as possible and the brood female. Field personnel will capture broods by driving them across ponds into staked mist-nets (Dau 1976, Flint et al. 2000). Ducklings will be banded with USFWS stainless steel bands, plastic tarsal makers, weighed, and morphological measurement will be taken. Field crews will collect 1-2 cc of blood from the jugular vein for lead and disease exposure analysis, and collect a cloacal swab to examine for exposure to viral pathogens. All members of a brood will be released simultaneously along with the adult female (if captured) to minimize risk of brood fragmentation. If the female is not captured, field personnel will move the ducklings as close her as possible, quickly release the ducklings, and leave the area immediately to allow the female to reunite with the brood. Efforts will be made to handle ducklings as quickly as possible and reunite the brood with the female.

STATUS OF THE SPECIES

Steller's eiders

Steller's eider life history and distribution
The Steller's eider is a circumpolar sea duck, and it is the smallest of the four eider species. Steller's eiders are divided into Atlantic and Pacific populations; the Pacific population is further divided into the Russia-breeding population along the Russian eastern arctic coastal plain, and the Alaska-breeding population. On June 11, 1997, the Alaska-breeding population of Steller's eiders was listed as threatened due to a substantial decrease in the species' breeding range in Alaska and the resulting increased vulnerability of the remaining Alaska-breeding population to extirpation (Federal Register 1997). The Service concluded the available information did not support listing the species range-wide because counts in 1992 indicated at least 138,000 Steller's eiders wintered in southwest Alaska, and the counts were too imprecise to determine trends with confidence. Although population size estimates for the Alaska-breeding population were also imprecise, it was clear Steller's eiders had essentially disappeared as a breeding species from YKD, where they had historically occurred in significant numbers, and that their ACP breeding range was much reduced. On the ACP, they historically occurred east to the Canada border (Brooks 1915), but have not been observed in the eastern ACP in recent decades (USFWS 2002). The Alaska-breeding population of Steller's eiders now nests primarily on the ACP, particularly around Barrow and at very low densities from Wainwright to at least as far east as Prudhoe Bay. A few pairs also apparently remain on the YKD (approximately 9 nests found in the last 14 years).

Steller's eiders arrive in pairs on the ACP in early June, but may be periodic breeders; Steller's eiders near Barrow nested in 11 of 19 years since 1991 (summarized by Rojek 2007 and 2008 Service unpublished data). Non-breeding years are common in long-lived eider species and are typically related to inadequate body condition (Coulson 1984), but reasons that Steller's eiders forego breeding may be more complex. In the Barrow area Steller's eider nesting has been related to lemming numbers and other environmental cues; nest success could be enhanced in years of lemming abundance because nest predators are less likely to prey-switch to eider eggs and young, or because avian predator such as pomarine jaegers (*Stercorarius pomarinus*) and snowy owls (*Nyctea scandiaca*) that nest nearby (and consume abundant lemmings) may protect eider nests from mammalian predators such as arctic fox (Quakenbush and Suydam 1999, and summarized by Rojek 2008).

When they do breed, Alaska-breeding Steller's eiders nest on coastal tundra adjacent to small ponds or within drained lake basins, occasionally as far as 90 km inland. Nests are initiated in the first half of June (Quakenbush et al. 1995), and hatching occurs from July 7 to August 3 (Quakenbush et al. 1998). Nests located in the vicinity of Barrow were in wet tundra, in drained lake basins or low-center or low indistinct flat-centered polygon areas (Quakenbush et al. 1998). Average clutch sizes at Barrow varied from 4.6 - 6.6, with clutches of up to 8 eggs reported (Quakenbush et al. 1998, Rojek 2006, 2007). Nest success (proportion of nests with at least one egg hatched) at Barrow averaged 23% from 1991-2007 (Rojek 2008). As with spectacled eiders, nest and egg loss was attributed to predation by jaegers, common raven (*Corvus corax*), arctic fox, and possibly glaucous gulls (*Larus hyperboreus*) (Quakenbush et al. 1995, Obritschkewitsch et al. 2001, Rojek 2008).

One or two days after hatch, hens move their broods to adjacent ponds with emergent vegetation, particularly *Carex* spp. and *Arctophila fulva* (Quakenbush et al. 1998, Rojek 2006, 2007) Here they feed on insect larvae and other wetland invertebrates. Broods may move up to several kilometers from the nest prior to fledging (Quakenbush et al. 1998, Rojek 2006, 2007). Fledging occurs from 32-37 days post hatch (Obritschkewitsch et al. 2001, Quakenbush et al. 2004, Rojek 2006).

Departure from the breeding grounds differs between sexes and between breeding and non-breeding years. Male Steller's eiders typically leave the breeding grounds after females begin incubating, around the end of June or early July (Quakenbush et al. 1995, and Obritschkewitsch et al. 2001). Females whose nests fail may remain near Barrow later in summer; a single failed-breeding female equipped with a transmitter in 2000 remained near the breeding site until the end of July and stayed in the Beaufort Sea off Barrow until late August (Martin et al. in prep). Successfully-breeding females and fledged young depart the breeding grounds in early to mid-September. In a non-breeding year, males and females bearing satellite-transmitters dispersed across the area between Wainwright and Admiralty Inlet in late June and early July, with most birds entering marine waters by the first week of July. They were tracked at coastal locations from Barrow to Cape Lisburne, and made extensive use of lagoons and bays on the north coast of Chukotka (Martin et al. in prep.).

After the breeding season, Steller's eiders move to marine waters where they undergo a complete flightless molt for about three weeks. The combined (Russia- and Alaska-breeding) Pacific

population molts in numerous locations in southwest Alaska, with exceptional concentrations in four areas along the north side of the Alaska Peninsula: Izembek Lagoon, Nelson Lagoon, Port Heiden, and Seal Islands (Gill et al. 1981, Petersen 1981, Metzner 1993). Molting areas are characterized by extensive shallow eelgrass (*Zostera marina*) beds and intertidal sand flats and mudflats, where Steller's eiders forage on marine invertebrates such as mollusks and crustaceans (Petersen 1980, 1981; Metzner 1993).

After molt, many of the Pacific-wintering population of Steller's eiders disperse to winter in the eastern Aleutian Islands, the south side of the Alaskan Peninsula, and east to Cook Inlet, although thousands may remain in lagoons used for molt unless or until freezing conditions force them to move (USFWS 2002). Wintering Steller's eiders usually occur in waters less than 10 m deep, which are normally within 400 m of shore or at offshore shallows. The listed Alaska-breeding population is only a small proportion of the Pacific-wintering population of Steller's eiders, approximately 0.7%. This estimate is derived by taking the most recent North Slope breeding bird estimate of 576 birds (described below, Stehn and Platte 2009), adding 1 for the YKD population, and then dividing by the population estimate of Pacific-wintering Steller's eiders from 2009 (77,777; Larned and Bollinger 2009). Thus, 576 ÷ 77,777 = (0.00741 * 100) = 0.7% or rounded to 1%.

Prior to spring migration, thousands of Steller's eiders stage in estuaries along the north side of the Alaska Peninsula, including some molting lagoons, and at the Kuskokwim Shoals near the mouth of the Kuskokwim River in late May (Larned 2007, Martin et al. in prep.). Like other eiders, Steller's eider may use spring leads for feeding and resting, but there are few conclusive data about habitat use during spring migration. It seems likely Steller's eiders are also using the Chukchi lead system similarly to king eiders (Steffen Oppel, University of Alaska-Fairbanks, unpublished data).

During winter, Steller's eiders generally use and feed in shallower water than the other eider species, although they may also use deeper (20-30 m) habitats if feeding on water-column invertebrates (Philip Martin, USFWS, pers. comm.). They are likely associated with shallow spring leads, therefore, although they possibly also use leads in deeper water if an abundant and nutritious invertebrate community is present in the water column. Alaska-breeding Steller's eiders typically return to breeding areas near Barrow in early June (Rojek 2006).

Alaska-breeding Steller's eider population estimate

Stehn and Platte (2009) recently conducted a review of the distribution, abundance, and trend of the listed population of Steller's eiders on the ACP. Utilizing information from three aerial surveys, they assessed the population status and trend of the Steller's eider population nesting on tundra wetlands of northern Alaska. The three surveys are the ACP, the North Slope eider survey (NSE) and the Barrow Triangle survey (ABR). Data reported from these three surveys provide different estimates of average population size and trend. The 1989-2008 ACP survey (Mallek et al. 2007) estimated a total average population size of 866 birds with a declining growth rate of 0.778; the NSE are from 1992-2008 (Larned et al. 2009) averaged 162 birds with increasing growth rate of 1.059. The ABR survey from 1999-2007 (Obrishkewitsch et al. 2008) averaged 100 birds with a growth rate of 0.934. Average population size and trend can be biased by changes in observer, detection rates and survey timing. Survey timing was considered

especially important for species with male departure early in incubation, or other marked shifts in habitat use, movements, or flocking behavior (ground breeding surveys near Barrow indicate the best time for aerial surveys of breeding Steller's is about 12-20 June, after arrival of most breeding individuals but before most males depart). Using a subset of data least confounded by changes in survey timing and observer, the appropriately-timed NSE survey observations from 1993-2008 averaged 173 indicated total Steller's eiders (88-258, 90% confidence interval) with an estimated growth rate of 1.011 (0.857 – 1.193, 90% CI). The authors assumed a detection probability of 30% (based upon reasonable estimates with similar species and habitats), yielding a total estimated average population of Steller's eiders breeding in the ACP of about 576 (292-859, 90% CI) individuals (Stehn and Platte 2009).

Standardized ground surveys for eiders near Barrow have been conducted since 1999, and have found an average density near Barrow of 0.63 birds/ km^2 (Rojek 2008). The Barrow vicinity supports the largest known concentration of nesting Steller's eiders in North America. Steller's eiders are periodic breeders near Barrow, and have nested in only 10 of 18 years since 1991 (see Rojek 2008 for summary). The highest number of Steller's eiders observed during systematic surveys at Barrow occurred in 1999 with 135 males counted during ground surveys (36 nests found); in 2008, 120 male Steller's eiders were counted during ground surveys (28 nests found). Counts of males are the most reliable indicator of Steller's eider presences because females are cryptic and are often undercounted. Approximately 90% of all Steller's eiders nests found near Barrow since 1991 are within one mile of a road in the vicinity of Barrow (1991-2007 locations are summarized in Rojek 2008; 2008 locations are Service unpublished data).

Steller's eider recovery goals

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

Criteria to be used in determining when species are recovered are often based on historical abundance and distribution, or on the number needed to ensure the risk of extinction is tolerably low (with extinction risk estimated by population modeling). For Steller's eiders, information on historical abundance is lacking, and life history parameters needed for accurate population modeling are inadequately understood. Therefore, the Recovery Plan for Steller's eiders establishes interim recovery criteria based on extinction risk, with the assumption that numeric population goals will be developed as life history parameters become better understood. Under the Recovery Plan, the Alaska-breeding population will be considered for reclassification to endangered when the population has $\geq$ 20% probability of extinction in the next 100 years for 3 consecutive years, or the population has $\geq$ 20% probability of extinction in the next 100 years and is decreasing in abundance. The Alaska-breeding population will be considered for delisting from threatened status when it has $\leq$ 1% probability of extinction in the next 100 years, and each

of the northern and western subpopulations are stable or increasing and have ≤ 10% probability of extinction in 100 years.

Steller's eider critical habitat
In 2001, the Service designated 2,830 mi^2 (7,330 km^2) of critical habitat for the Alaska-breeding population of Steller's eiders at breeding areas on the YKD, a molting and spring-staging area in the Kuskokwim Shoals, and molting areas in marine waters at the Seal Islands, Nelson Lagoon, and Izembek Lagoon (Federal Register 2001b). No critical habitat for Steller's eiders has been designated on the ACP.

Spectacled eiders

Spectacled eider life history and distribution
Spectacled eiders are large sea ducks that inhabit the North Pacific. All spectacled eider breeding populations were listed as threatened on May 10, 1993 (Federal Register 1993) because of documented population declines. The YKD population declined 96% between the 1970s and early 1990s (Ely et al. 1994). Anecdotal information indicated that populations in the other two primary breeding areas, the Russian and Alaskan Arctic Coastal Plains (ACP), also declined, along with the much smaller breeding population on St. Lawrence Island in the Bering Sea (USFWS 1996).

Research and spring aerial surveys have provided data on spectacled eider populations on Alaska's ACP (the "North Slope" breeding population) since 1992. Breeding density varies across the North Slope (Larned et al. 2006; Figure 3). Breeding pair numbers peak in mid-June and the number of males declines 4-5 days later (Smith et al. 1994, Anderson and Cooper 1994, Anderson et al. 1995, Bart and Earnst 2005). Male spectacled eiders generally depart breeding areas when females begin incubation, usually in late June, and they apparently make little use of the Beaufort Sea en route to their molting locations (Petersen et al. 1999, TERA 2003).

North Slope spectacled eider clutch size averages 3.5 eggs/nest in the Prudhoe Bay region, with clutches of up to eight eggs reported (Petersen et al. 2000). On the Colville River Delta, in the vicinity of the proposed project, spectacled eider clutch size averages 4.32 eggs/nest (Bart and Earnst 2005). Incubation lasts 20-25 days (Kondratev and Zadorina 1992, Harwood and Moran 1993, Moran and Harwood 1994, Moran 1995) and hatching occurs from mid- to late July (Warnock and Troy 1992). On the nesting grounds, spectacled eiders feed on mollusks, insect larvae (craneflies and caddisflies), midges, small freshwater crustaceans, and plants and seeds (Kondratev and Zadorina 1992) in shallow freshwater or brackish ponds, or on flooded tundra. Young fledge approximately 50 days after hatch, and then females with broods move directly from freshwater to marine habitats.

Nest success is variable and greatly influenced by predators, including gulls (*Larus* spp.), jaegers (*Stercorarius* spp.), and red (*Vulpes vulpes*) and arctic (*Alopex lagopus*) foxes. In Arctic Russia, apparent nest success was calculated as <2% in 1994 and 27% in 1995; predation was believed to be the cause of high failure rates, with foxes, gulls and jaegers the suspected predators (Pearce et al. 1998). On Kigigak Island in the YKD, Mayfield (1975) nest success 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) and when foxes were eliminated from the island prior to the nesting season or years. Apparent nest success in 1991 and 1993-1995 in the Kuparuk and Prudhoe Bay oil fields on the North Slope varied from 25-40% (Warnock and Troy 1992, Anderson et al. 1998). On the Colville River Delta, in the vicinity of the proposed project, average Mayfield nest success from 1994-1999 was 31% (Bart and Earnst 2005). Duckling survival is also variable and influenced by predators. Radio telemetry studies of broods on the YKD have reported duckling survival to 30 days averaging 34-45% on the Kashunuk River (Flint and Grand 1997, Flint et al. 2006) and 67% at Kigigak Island (Flint et al. 2006).

As with other sea ducks, spectacled eiders spend the 8-10 month-long non-breeding season at sea, but until recently much about the species' life in the marine environment was unknown. Satellite telemetry and aerial surveys led to the discovery of spectacled eider migrating, molting, and wintering areas at sea. These studies are summarized in Petersen et al. (1995), Larned et al. (1995), and Petersen at al. (1999).

Male spectacled eiders begin to depart breeding areas during incubation, which is during late June on the North Slope. On the North Slope, pair numbers peak in mid-June and the number of males declines 4-5 days later (Smith et al. 1994, Anderson and Cooper 1994, Anderson et al. 1995). Following their late June departure from the nesting areas, males apparently make little use of the Beaufort before migrating to the Chukchi Sea. During late June the Beaufort Sea has little open water, hence males present at breeding grounds east of Barrow normally do not use marine habitats and may fly directly overland (most heading to a molting/staging area in Ledyard Bay; TERA 2003). Later in the season (late June through September), when females depart the North Slope, much more of the nearshore zone is ice-free. Open water in marine habitat allows for more extensive use of the western Beaufort Sea. Radio telemetry studies have shown that most female spectacled eiders that migrate west toward Barrow use the nearshore zone of the Beaufort Sea as they transit to their molting/staging areas. In 2000, 13 female spectacled eiders tracked via radio telemetry primarily used the western Beaufort (71% of all bird-days) while areas near Stockton Island were also extensively used (17% of all bird-days) (TERA 2003). The females remained in the Beaufort Sea nearshore zone for an average of about two weeks (range 6-30 days). After molting, spectacled eiders migrate offshore in the Chukchi and Bering Seas to a single wintering area in openings in pack ice of the central Bering Sea south/southwest of St. Lawrence Island (Petersen et al. 1999). Spectacled eiders in the marine environment feed predominately on clams, and small amounts of snails, amphipods, and other bivalves.

Spectacled eider abundance and trends

The most recent range-wide estimate of the total number of spectacled eiders was 363,000 (333,526-392,532 95% CI), obtained by aerial surveys of the known wintering area in the Bering Sea in late winter 1996-1997 (Petersen et al. 1999). For the North Slope breeding population, the most recent (2002-2006) population index[1] of 6458 (5471-7445 95% CI) was adjusted by a

[1] A standard index used to monitor waterfowl populations based on the number of birds seen during aerial surveys but adjusted for cryptic females that are presumably missed when single males are detected (USFWS and Canadian Wildlife Service 1987).

factor that accounts for the number of nests missed during aerial surveys[2] (developed on the YKD) and used to calculate a North Slope breeding spectacled eider population estimate of 12,916 (10,942-14,890 95% CI), 2002-2006 (Stehn et al. 2006). The ACP spectacled eider population size from 1993-2008 was stable, with an average (n=16) annual growth rate of 0.988 (0.972-1.004 90% CI), a number not significantly different from 1.0 (Larned et al. 2009).

Spectacled eider recovery goals and status

The Spectacled Eider Recovery Plan (USFWS 1996) presents research and management priorities with the objective of recovery and delisting so that protection under the Act is no longer required. Although cause of the spectacled eider population decline is not known, factors that affect adult survival may 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 YKD (Franson et al. 1995, Grand et al. 1998), and other factors such as habitat loss, increased nest predation, over harvest, and disturbance and collisions caused by human infrastructure (factors discussed in Section 4 – *Environmental Baseline*). Under the Recovery Plan, the species will be considered recovered when each of the three recognized populations (YKD, North Slope, 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.

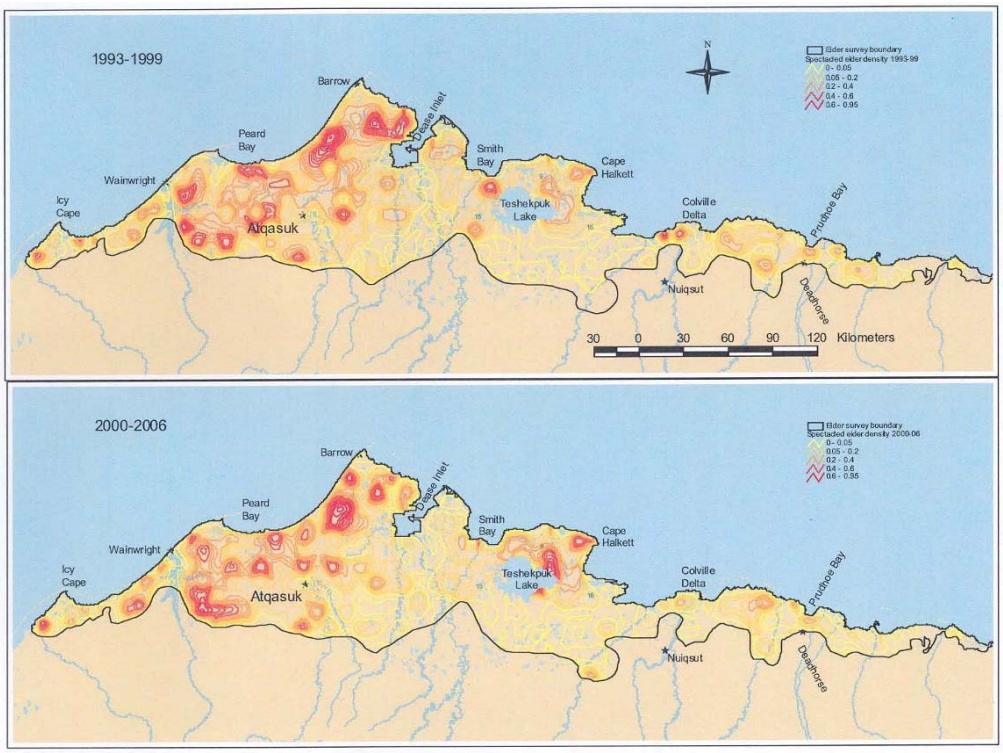

Figure 3. Spectacled eider density on the Alaska ACP from 1993-1999 (top) and 2000-2006 (bottom; Larned et al. 2006).

[2] The detection correction factor compares the number of eiders observed during aerial surveys with the number of nests located on ground surveys in order to presume actual population size from the number detected in aerial surveys.

Spectacled eider critical habitat
Critical habitat for molting spectacled eiders was designated in Norton Sound and Ledyard Bay on February 6, 2001, and nesting and wintering habitat in other locations (none on the North Slope; Federal Register 2001a). In accordance with section 3(5)(A)(i) of the Act and regulations in 50 C.F.R. 424.12, critical habitat for a species contains those physical or biological features that are essential for the conservation of the species and which may require special management considerations and protection. Under the Act these features are considered "primary constituent elements" of critical habitat, and include, but are not limited to: space for individual and population growth, and for normal behavior; food, water, air, light, minerals, or other nutritional or physiological requirements; cover or shelter; sites for breeding, reproduction, rearing of offspring, germination, or seed dispersal; and habitats that are protected from disturbance or are representative of the historical geographic and ecological distribution of a species.

ENVIRONMENTAL BASELINE

The environmental baseline provides an analysis of the effects of past and ongoing human and natural factors leading to the current status of the species, their habitat, and ecosystem in the action area.

Spectacled and Steller's eiders are present in the project action areas from late May through September. Both species have undergone significant, unexplained declines in their Alaska-breeding populations. Factors that may have contributed to the current status of spectacled and Steller's eiders are discussed below and include, but are not limited to, toxic contamination of habitat, increase in predation, over harvest, and habitat loss through development and disturbance. Recovery efforts for both species are underway in portions of the action area.

Toxic contamination of habitat
The deposit of lead shot in tundra or nearshore habitats used for foraging is a threat for spectacled and Steller's eiders. Lead poisoning of spectacled eiders has been documented on the YKD (Franson et al. 1995, Grand et al. 1998) and Steller's eiders on the Arctic Coastal Plain (Trust et al. 1997; Service unpublished data). Figure 4 indicates female Steller's eiders nesting at Barrow in 1999 had blood lead concentrations that reflected exposure to lead (>0.2 ppm lead), and six of the seven tested had blood lead concentrations that indicated poisoning (>0.6 ppm lead). Additional lead isotope tests confirmed the lead in the Steller's eider blood was of lead shot origin, not naturally occurring forms found in sediments where Steller's eiders occur (Angela Matz, USFWS, unpublished data).

Use of lead shot for hunting waterfowl is prohibited statewide, and for hunting all birds on the North Slope. Hunter outreach programs are being undertaken to reduce any lingering illicit use of lead shot that may be occurring on the North Slope.

Water birds in arctic regions are also exposed to global contamination, including radiation, industrial, and agricultural chemicals that can be transported by atmospheric and marine transport. Twenty male spectacled eiders wintering near St. Lawrence Island examined for the presence and effects of contaminants apparently were in good condition, but had high

concentrations of metals and subtle biochemical changes that may have long term effects (Trust et al. 2000).

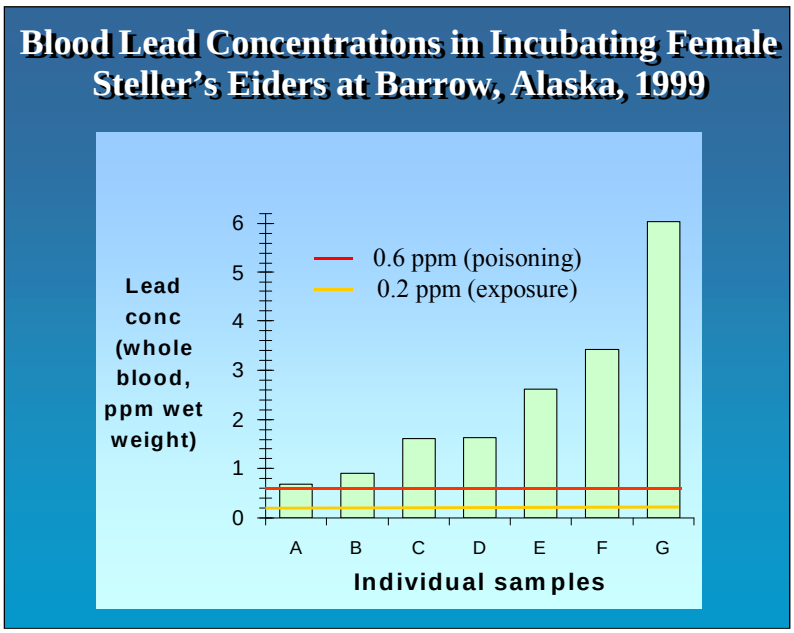

Figure 4. Blood lead concentrations in incubating female Steller's eiders at Barrow, 1999 (USFWS data)

Increase in predator populations

It has been speculated that anthropogenic influences on predator populations or predation rates may have affected eider populations, but this has not been substantiated. Steller's eider studies at Barrow suggest that high predation rates explain poor breeding success (Quakenbush et al. 1995, Obritschkewitsch et al. 2001). Researchers have proposed that reduced fox trapping, anthropogenic food sources in villages and oil fields, and nesting sites on human-built structures have increased fox, gull, and raven numbers (R. Suydam and D. Troy pers. comm., Day 1998), but the connection between these factors and increased predation rates has not been proven.

Overharvest

Hunting for spectacled and Steller's eiders was closed in 1991 by Alaska State regulations and Service policy. Outreach efforts have been conducted by the North Slope Borough, BLM, and Service to encourage compliance. However, harvest data collected from the spring/summer subsistence hunts suggests that both Steller's and spectacled eiders are being taken during this hunt on the North Slope (Service data). Measures are being implemented to avoid and minimize the lethal take of listed eiders on the North Slope during the 2008 and subsequent spring/summer subsistence hunts.

Habitat loss through development and disturbance

With the exception of contamination by lead shot, destruction or modification of nesting habitat is not thought to have played a major role in the decline of spectacled or Steller's eiders. Until recently eider breeding habitat on the ACP was largely unaltered by humans, but now limited portions of each species' breeding habitat has been altered by fill of wetlands, the presence of

infrastructure that presents collision risk, and other types of human activity that may disturb birds or increase populations of nest predators.

The population of communities such as Barrow has been increasing, and BLM (2007) expects growth to continue at approximately 2% per annum until at least the middle of this century. Assuming community infrastructure and footprint grow at roughly the same pace as population, BLM (2007) estimates that community footprint could cover 3,600 acres by the 2040s. Oil and gas development has steadily moved westward across the ACP towards NPR-A since the initial discovery and development of oil on the North Slope. Given industries interest in NPR-A, as expressed in lease sales, seismic surveys, and drilling of exploratory wells, the westward expansion of industrial development is likely to continue. Scientific, field-based research is also increasing on the ACP as interest in climate change and impacts to high latitude areas continues.

Climate change

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

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

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

Changes in precipitation patterns, air and soil temperature, and water chemistry are also affecting tundra vegetation communities (Hinzman et al. 2005, Prowse et al. 2006, Chapin et al. 1995), and boreal species are expanding their range into tundra areas (Callaghan et al. 2004). Changes in the distribution of predators, parasites, and disease causing agents resulting from climate

change may have significant effects on listed species and other arctic fauna and flora. Climate change may also result in mismatched timing of migration and the development of food in Arctic ponds (Callaghan et al. 2004), and changes in the population cycles of small mammals such as lemmings to which many other species, including nesting Steller's eiders (Quakenbush and Suydam 1999), are linked (Callaghan et al. 2004).

While the impacts of climate change on listed species in both the action area and marine environment that comprises the rest of their range are unclear, species with small populations are vulnerable to environmental change (Crick 2004). Some species will increase in abundance and range with climate change, while others will suffer from reduced population size and range. The ultimate effects of climate change on listed eiders are undetermined at present.

EFFECTS OF THE ACTION

"Effects of the action" refers to the direct and indirect effects of the action on the species or its critical habitat. The effects of the action will be evaluated together with the effects of other activities that are interrelated or interdependent with the action. These effects will then be added to the environmental baseline in determining the proposed action's effects to the species or its critical habitat (50 CFR Part 402.02). Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur.

Beneficial effects

Beneficial effects are those effects of an action that are wholly positive, without any adverse effects, on a listed species or designated critical habitat. This project will have beneficial effects for the species, in that it will provide FFWFO with information that will better enable us to determine causes of population decline and management actions to aid recovery. Additionally, trapping foxes, potential Steller's eider predators, may also benefit the species by reducing predation pressure on nests.

Direct effects

Investigator and trapping disturbance/capture

This project will likely affect nesting Steller's and spectacled eiders through investigator disturbance of pairs, disturbance of incubating hens, capture of hens, handling of eggs, and capturing of broods and their associated hen. Fox trappers may also disturb Steller's eiders pairs and incubating hens as the walk across the study area to check fox traps. The disturbance to pairs may occur through interruption of normal behavior via flushing. We expect this disturbance to be temporary and not adversely affect either eider species because eiders typically resume normal behavior soon after a disturbance event. The disturbance to nesting eiders that will occur during potentially viable but abandoned egg collection, capture, and transmitter attachment efforts is not expected to rise to the level of lethal take because the field crew is experienced at handling waterfowl. We also expect the capture and banding of broods to have non-lethal take in the form of harassment/capture because of the field crew's experience.

It is generally recognized among researchers that investigator disturbance and capture can have a negative impact on nesting success. However, this effect is usually assumed to be minimal in magnitude and unavoidable. Few quantitative estimates of the extent of detrimental effects of investigator disturbance to nesting waterfowl exist for tundra environments. Some studies demonstrate negative effects of investigator disturbance on waterfowl nesting success, whereas others show little or no effect. Infrequently, waterfowl will permanently abandon nests after they are disturbed. On the YKD, investigators estimated that nest trapping resulted in a loss of 5% of cackling goose eggs due to desertion (Mickelson 1975). A single search of study plots for an investigator disturbance study done for spectacled eiders on the YKD caused the loss of 0.08% of eggs production (Bowman and Sten 2003). Gulls were attracted to, and more nests were destroyed at, eider nesting islands after disturbance (Ahlund and Gotmark 1989). However, in 1997 investigators marked and visited spectacled eider nests at varying schedules and found no difference in survival rates due to observer impact (Grand and Flint 1997).

Steller's eiders behavior appears to change with changing environmental conditions. At times, they have been observed foraging near to human made structures such as the Barrow Airport (Service unpublished). They have also been observed foraging and resting adjacent to docks along the Alaska Peninsula (Service unpublished). However, researchers have observed that they move and maintain a distance of at least 100 meters from humans and vessels. As such, researchers do not anticipate total abandonment of areas due to investigator activity (assessment of nesting pairs), but anticipate some level of disturbance due to the presence of the investigators.

Direct effects anticipated due to investigator activities include handling eggs and disturbance to adult birds during the capture process. One-time disturbance of birds not captured is not considered to rise to the level of take. Mist nets will be constantly monitored and never be left unattended, and every effort will be made to remove captured birds from nets as quickly as possible. Examples of impacts which may occur to Steller's and spectacled eiders due to these research activities include accidental breakage of toe nails, wings, and legs, mortality due to infection from radio transmitter prong insertion, and the accidental damaging of eggs.

Investigator and fox trapping activities could also adversely impact Steller's and spectacled eiders by: 1) displacing adults and/or broods from preferred habitats during pre-nesting, nesting, brood rearing and migration; 2) displacing females from nests, exposing eggs or small young to inclement weather or predators; and 3) reducing foraging efficiency and feeding time. The behavioral response of eiders to nesting disturbance is unknown. Some Steller's eiders nest and rear broods near the Barrow Airport, indicating that some individuals may tolerate frequent aircraft noise. However, individual tolerances are likely to vary and the intensity of disturbance associated with the proposed action would, in most cases, be greater than that experienced by birds near the airport. Some birds may be displaced with unknown physiological and reproductive consequences. The number of Steller's eiders that would be exposed to investigator activity is variable, however.

In conclusion, activities covered under Recovery Permit #TE043136-0 could adversely affect individual Steller's and spectacled eiders; however, their low nesting densities combined with the minimal number of nests to be studied suggest that few individuals would likely be impacted.

Additionally, the experience of the crew and the precautions that they typically take during capture efforts for VHF transmitter attachment assure us that FFWFO should not expect any incidental mortality during capture efforts. Likewise, the wide range of tolerances found in individual birds to this type of potential disturbance makes it difficult to predict whether adverse impacts would actually occur.

Indirect effects

Indirect effects are those effects that are caused by or will result from the proposed action and are later in time, but are still reasonably certain to occur. Indirect effects that may result from this project include accidental mortality during capture. However, because of the experience level of the crews and the precautions that will be taken, we do not expect that any such take will occur.

Interrelated and interdependent actions

Interdependent actions are defined as "actions having no independent utility apart for the proposed action," while interrelated actions are defined as "actions that are part of a larger action and depend upon the larger action for their justification" (50 CFR §402.02). The Service has not identified any interdependent or interrelated actions that may result from the issuance of the proposed permit or activities authorized by it that could result in impacts to listed eiders.

Cumulative effects

Under the Act, cumulative effects are the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this BO. Future Federal actions that are unrelated to the proposed action are not considered because they require separate consultation under the Act.

CONCLUSION

After reviewing the proposed action, the current status of Steller's and spectacled eiders, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that actions outlined within the Recovery Permit # TE043136-0 and associated activities, as proposed, are not likely to jeopardize the continued existence of the Steller's and spectacled eiders, nor is it likely to adversely modify or destroy Steller's or spectacled eider critical habitat. There is no designated or proposed critical habitat on the North Slope for Steller's eiders.

The regulations (51 FR 19958) that implement section 7(a)(2) of the Act 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." We have concluded that the proposed action is not likely to jeopardize the continued existence of the

Alaska breeding population of Steller's eiders or the global population of spectacled eiders or adversely modify or destroy their critical habitat.

The following information led us to the conclusion that this action, as proposed, is not likely to jeopardize the continued existence of these species:

1) effects due to disturbance for nest investigations and trapping is not likely to rise to the level of take; adverse effects to Steller's and spectacled eiders due to permitted activities are temporary and should be offset by the net benefit of the research to recovery of the species;
2) the experience of the crew and the precautions taken during capture efforts for banding, biological samples, and VHF transmitter attachment cause us not to expect incidental mortality during capture efforts; and
3) FFWFO plans to monitor all activities conducted pursuant to this biological opinion to guide the development/refinement of measures designed to avoid/reduce impacts to Steller's and spectacled eiders due to research activities.

The number of Steller's or spectacled eiders expected to be harmed or harassed as a result of the proposed research and renewal of Permit # TE043136-0 is not expected to have a significant adverse effect on the species' overall numbers, distribution, or reproductive potential. Therefore, we do not expect the loss of listed birds resulting from this action to cause jeopardy.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, 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 which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement. In addition, because the proposed action is the issuance of permits per section 10(a)1(A) of the Act, direct take is permitted per the statute and implementing regulations.

The measures described below are non-discretionary, and must be undertaken by FFWFO so that they become binding conditions of any grant or permit issued to an applicant, as appropriate, for the exemption in section 7(o)(2) to apply. FFWFO has a continuing duty to regulate the activity covered by this Incidental Take Statement. If FFWFO (1) fails to assume and implement the terms and conditions or (2) fails to require any applicant to adhere to the terms and conditions of

the Incidental Take Statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the FFWFO or any applicant must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR 402.14(i)(3)].

As described in the *Effects of the Action* section, the activities described and assessed in this BO may adversely affect Steller's and spectacled eiders through investigator and trapper disturbance during field work (i.e. flushing pairs and females from nests), nest capture and handling of adult females with mist-nets and bow traps, the prong and glue VHF transmitter attachment procedure on adult females, and capture and handling of ~30 day old ducklings. For the revised permit, the researchers may:

A. Measure and candle eggs at up to 30 Steller's and spectacled eider nests;
B. monitor with video or digital cameras up to 20 active nests, or if Steller's eiders are unavailable monitor with video or digital cameras up to 20 active spectacled eider nests (up to 20 nests monitored);
C. nest-capture, weigh, measure, band up to 20 Steller's eider females during incubation, remove 1 primary and 1 head feather, and fit up to 10 of these females with VHF transmitters;
D. collect blood samples from up to 20 adult Steller's eider females, approx. 3 ml, not to exceed 1% of body weight and collect fecal samples and cloacal swabs;
E. collect contour feathers from Steller's and spectacled eider nest linings;
F. remove up to 20 potentially viable Steller's eider eggs from abandoned nests, to be transported to the Alaska SeaLife Center, and captive-reared under Permit #TE065912; and
G. salvage up to 20 inviable eggs from inactive Steller's and spectacled eider nests.

Depending on Steller's eider availability, similar work may be conducted on spectacled eiders, as follows:

A. Nest-capture, weigh, measure, band up to 20 spectacled eider females during incubation; remove 1 primary and 1 head feather, and fit up to 10 of these females with VHF transmitters;
B. capture and weigh up to 10 radio-marked spectacled eider females during brood rearing (associated with duckling capture activities); and
C. collect blood samples from up to 20 adult spectacled eider females approx. 3 ml, not to exceed 1 % of body weight, and collect fecal samples and cloacal swabs.

For all activities described above the maximum lethal incidental take authorized is:

A. no more than 1 clutch of Steller's eider and spectacled eider eggs abandoned, depredated or crushed due to video monitoring activity; and
B. no more than 2 clutches of Steller's and spectacled eider eggs abandoned, depredated or crushed due to research activities other than video monitoring; and

C. no more than 1 adult Steller's or spectacled eider killed due to capture or handling during any permitted activity; no more than 7 Steller's or spectacled eider ducklings killed (directly from trapping or handling, or indirectly by exposure to predators, energetic costs, etc.).

The following non-lethal incidental take is also authorized:

A. disturbance of up to 90 Steller's eider pairs and up to 60 spectacled eider pairs during pre-nesting monitoring activities and trapping of foxes;
B. disturbance of up to 60 Steller's eider hens and up to 60 spectacled eider hens on nests during nest monitoring activities and trapping of foxes;
C. capture, handling, sample collection and tagging of up to 30 Steller's eider or spectacled eider hens;
D. attachment of VHS radio transmitters on up to 10 Steller's and/or spectacled eider hens;
E. capture, handling, and banding of up to 40 Steller's eider or spectacled eider ducklings; and
F. collection of blood samples from up to 40 spectacled eider ducklings approx. 2 ml, not to exceed 1 % of body weight and collect fecal samples and cloacal swabs.

In the accompanying BO, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat when both the releasable and prudent alternatives are implemented.

REASONABLE AND PRUDENT MEASURES

The Service believes that the following reasonable and prudent measures are necessary and appropriate to minimize take of Steller's eiders:

1. To minimize the likelihood that nest investigation work will increase predation rates and reduce nesting and fledgling success of Steller's and spectacled eiders in the Barrow area, FFWFO shall ensure that only qualified individuals are permitted to work directly with Steller's and spectacled eiders and their eggs.

2. Direct and indirect impacts to nesting Steller's and spectacled eiders and eggs due to research activities shall be minimized through the incorporation of appropriate special *Terms and Conditions* for each permitted activity.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of Section 9 of the Act, FFWFO must comply with the following terms and conditions, which implement the reasonable and prudent measures (RPMs) described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1. The following terms and conditions shall implement RPM #1.

    A. Only qualified personnel with an appropriate level of experience/training shall be authorized to conduct scientific research and/or population census activities on the Steller's and spectacled eider. Experienced personnel, for the purposes of this term and condition, shall be those with at least one prior season of experience conducting such activities.

    B. Prior to approaching nests, the surrounding area shall be visually checked for predators. If a predator is spotted in close proximity (i.e., would be able to locate nest through movement of female eider), the nest shall not be approached. Predators, for the purposes of this term and condition, shall include fox, ravens, gulls and jaegers.

2. The following terms and conditions shall implement RPM #2.

    A. Capturing of adults shall only occur through the use of mist nets and bow nets while they are in late incubation (e.g. within ~4 days of predicted hatch date). Other methods of capture must be pre-approved by the Fairbanks Fish and Wildlife Field Office.

    B. During research activities, eggs remaining in nests shall be immediately recovered with down. In addition, eggs being handled shall be shielded from direct exposure to the breeze/wind (i.e. they will be protected from rapid cooling).

    C. Only veterinarians, others trained/supervised by veterinarians, or those with extensive experience collecting blood samples from waterfowl shall collect blood or other tissue samples from living Steller's and spectacled eiders.

The Service believes that no more than one adult, seven ducklings, and three clutches (1 from video monitoring + 2 from other activities) of both spectacled and Steller's eiders will be incidentally taken during the life of the revised permit. The RPMs, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measure provided. The Federal action agency must immediately provide an explanation of the causes of the take and review with the Service the need for possible modification of the reasonable and prudent measure. If Steller's or spectacled eiders are encountered injured or killed as a result of permitted activities, please contact the Fairbanks Fish and Wildlife Field Office, Endangered Species Branch, Fairbanks, Alaska at (907) 456-0441 for instruction on the handling and disposal of the injured or dead bird.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act 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. No conservation recommendations have been developed for this project.

REINITIATION NOTICE

This concludes formal consultation on the actions outlined in FFWFO's internal email circulated May 20, 2003. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: 1) the amount or extent of incidental take is exceeded; 2) new information reveals effects of the action agency that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; 3) the agency action is subsequently modified in a manner that causes an effect to listed or critical habitat not considered in this opinion; or 4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation. FFWFO must also reinitiate consultation if it becomes evident that any activity that may impact directly or indirectly Steller's or spectacled eiders resulting from the revised permit may take place without separate consultation on that action.

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

Thank you for your concern for endangered species and for your cooperation in the development of this biological opinion. If you have any comments or require additional information, please contact Ted Swem at (907) 456-0441 with the Fairbanks Fish and Wildlife Field Office, Endangered Species Branch, Fairbanks, Alaska.

LITERATURE CITED

Ahlund, M. and Gotmark, F., 1989. Gull predation on eider ducklings *Somateria mollissima*: affects of human disturbance. Biological Conservation 48(2):115-127.

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

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

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

Bacon, B. R. and J. O. Evrard. 1990. Horizontal mist net for capturing upland nesting ducks. North American Bird Bander 15(1):18-19.

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

Bowman, T. and Stehn, R. 2003. Impact of investigator disturbance on spectacled eiders and cackling Canada geese nesting on the Yukon-Kuskokwim Delta. Unpubl. Rep. Prepared by U.S. Fish and Wildlife Service, Anchorage, AK.

Brooks, W. 1915. Notes on birds from east Siberia and Arctic Alaska. Bulletin of the Museum of Comparative Zoology 59:359-413.

Bunnell, F., Maclean, S., Brown, J. 1975. Structure and function of tundra ecosystems. Ecol. Bull. Stockholm, 20:73-124.

Bureau of Land Management (BLM). 2007. Northeast National Petroleum Reserve-Alaska, Draft Supplemental Integrated Activity Plan/Environmental Impact Statement. USDOI, BLM – Alaska. 908 pages + Appendices.

Callaghan, T.V., L.O. Björn, Y. Chernov, T. Chapain, T.R. Christensen, B. Huntley, R.A. Ims, M. Johansson, D. Jolly, S. Jonasson, N. Matveyeva, N. Panikov, W. Oechel, G. Shaver, J. Elster, H. Henttonen, K. Laine, K. Taulavuori, E. Taulavuori, and C. Zöckler. 2004. Biodiversity, distributions and adaptations of Arctic species in the context of environmental change. Ambio 33(7):404-417.Chapin, F. S., G.R. Shaver, A.E. Giblin, K.J. Nadelhoffer, and J.A. Laundre. 1995. Responses of Arctic tundra to experimental and observed changes in climate. Ecology 76(3): 694-711.

Chapin, F. S., G.R. Shaver, A.E. Giblin, K.J. Nadelhoffer, and J.A. Laundre. 1995. Responses of Arctic tundra to experimental and observed changes in climate. Ecology 76(3): 694-711.

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

Crick, H.Q. P. 2004. The impact of climate change on birds. Ibis 146(1):48-56.

Dau, C. P. 1976. Capturing and marking spectacled eiders in Alaska. Bird-Banding 47: 273.

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

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

Federal Register. 1993. Threatened status for the Alaska breeding population of the spectacled eider; final rule. Federal Register 58(88): 27474-27480.

Federal Register. 1997. Threatened Status for the Alaska breeding population of the Steller's Eider. Federal Register 62(112): 31748- 31757.

Federal Register. 2001b. Final determination of critical habitat for the Alaska-breeding population of Steller's eider. Federal Register 66(23): 8850-8884.

Federal Register. 2001a. Final determination of critical habitat for the spectacled eider. Federal Register 66(25): 9146-9185.

Flint, P.L., and J.B. Grand. 1997. Survival of Spectacled Eider adult females and ducklings during brood rearing. J. Wildl. Manage. 61: 218-222.

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

Flint, P.L., J.A. Morse, J.B. Grand, and C.L. Moran. 2006. Correlated growth and survival of juvenile spectacled eiders: evidence of habitat limitation? The Condor 108:901-911.

Flint, P., Petersen, M., and Grand, J. 1997. Exposure of spectacled eiders and other diving ducks to lead in western Alaska. Canadian Journal of Zoology 75:439-443.

Flint, P.L. and M.P. Herzog. 1999. Breeding of Steller's Eiders, *Polysticta stelleri*, on the Yukon-Kuskokwim Delta, Alaska. Can. Field-Nat. 113: 1-3.

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

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

Gill, R.E., M.R. Petersen, and P.D. Jorgensen. 1981. Birds of Northcentral Alaska Peninsula, 1978-80. Arctic 34:286-306.

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

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

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

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

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

Lake, B.C. 2007. Nesting ecology of spectacled and common eiders on Kigigak Island, Yukon Delta NWR, Alaska, 2007. Unpublished report, U.S. Fish and Wildlife Service, Yukon Delta National Wildlife Refuge, Bethel, AK. 18 pp.

Larned, W., R. Stehn, and R. Platte. 2006. Eider breeding population survey Arctic Coastal Plain, Alaska, 2006. Unpublished Report, U.S. Fish and Wildlife Service, Anchorage, AK. 53pp.

Larned, W. 2007. Steller's eider spring migration surveys southwest Alaska, 2007. Unpublished report, U.S. Fish & Wildlife Service, Anchorage, AK. 25 pp.

Larned, W., R. Stehn, and R. Platte. 2009. Waterfowl breeding population survey Arctic Coastal Plain, Alaska 2008. Unpub. Rep. U.S. Fish and Wildlife Service, Anchorage, AK. 42 pp.

Larned, W and K.S. Bollinger. 2009. Steller's eider spring migration surveys southwest Alaska, 2009. Unpublished report, U.S. Fish & Wildlife Service, Anchorage, AK. 21 pp.

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

Mallek, E. J., R. Platte, and R. Stehn. 2007. Aerial breeding pair surveys of the Arctic Coastal Plain, Alaska, 2007. Unpub. Rep. U.S. Fish and Wildlife Service, Anchorage, AK 25 pp.

Mauser, D. M. and R. L. Jarvis. 1991. Attaching radio transmitters to 1-day-old Mallard ducklings. Journal of Wildlife Management 55:488–491.

Mayfield, H. 1975. Suggestions for calculating nest success. Wilson Bull. 87:456-466.

Martin, P.D., T. Obritschkewitsch, and D.C. Douglas. *In prep.* Distribution and movements of Steller's eiders in the non-breeding period.

Metzner, K.A. 1993. Ecological strategies of wintering Steller's eiders on Izembeck Lagoon and Cold Bay, Alaska. M.S. Thesis, University of Missouri, Columbia, MO. 193 pp.

Mickelson, G. 1975. Breeding biology of cackling geese and associated species on the Yukon-Kuskokwim Delta, Alaska. Wildlife Monographs 45.

Moran, T. 1995. Nesting ecology of spectacled eiders on Kigigak Island, Yukon Delta NWR, Alaska, 1994. Unpubl. Rep. prepared for U.S. Fish and Wildlife Service, Bethel, Alaska.

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

Obritschkewitsch, T., Martin, P., and Suydam, R. 2001. Breeding biology of Steller's eiders nesting near Barrow, Alaska, 1999-2000. Ecological Services Fairbanks, AK, U.S. Fish and Wildlife Service, Technical Report NAES-TR-01-04. 113 pp.

Obritschkewitsch, T., R. Ritchie, and J. King. 2008. Steller's eider surveys near Barrow, Alaska, 2007. Final Report. ABR, Inc. - Environmental Research and Services, Fairbanks, AK. 17pp.

Oechel, W.C., G.L. Vourlitis, S.J. Hastings, and S.A. Bochkarev. 1995. Change in Arctic CO_2 flux over two decades: Effects of climate change at Barrow, Alaska. Ecological Adaptations 5(3):846-855.

Pearce, J., Esler, D., and Degtyarev, A. 1998. Nesting ecology of spectacled eiders on the Indigirka River Delta, Russia. Wildfowl 49:110-123.

Petersen, M. 1980. Observations of wing-feather molt and summer feeding ecology of Steller's eiders at Nelson Lagoon, Alaska. Wildfowl 31:99-106.

Petersen, M. 1981. Populations, feeding ecology and molt of Steller's eiders. Condor 83:256-262.

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

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

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

Prowse, T.D., F.J. Wrona, J.D. Reist, J.E. Hobbie, L.M.J. Lévesque, and W.F. Vincent. 2006. General features of the Arctic relevant to climate change in freshwater ecosystems. Ambio 35(7): 330-338.

Quakenbush, L., and Suydam, R. 1999. Periodic non-breeding of Steller's Eiders (*Polysticta stelleri*) near Barrow, Alaska, with speculation on possible causes. Pages 34-40 in I.R. Goudie, M.R. Petersen, and G.J. Robertson, eds. Behavior and ecology of sea ducks. Proceedings of the Sea Duck Symposium, 23rd Annual Pacific Seabird Group Meeting.

Quakenbush, L., Suydam, R., Fluetsch, K., and Donaldson, C. 1995. Breeding biology of Steller's eiders nesting near Barrow, Alaska, 1991-1994. Technical Report, U.S. Fish and Wildlife Service and North Slope Borough, Department of Wildlife Management.

Quakenbush, L., Suydam, R., Fluetsch, K., and Obritschkewitsch, T. 1998. Breeding habitat use by Steller's eiders near Barrow, Alaska, 1991-1996. Unpublished. draft report. U.S. Fish and Wildlife Service, Fairbanks, AK. 19 pp.

Quakenbush, L., R. Suydam, T. Obritschkewitsch, and M. Deering. 2004. Breeding biology of Steller's eiders (*Polysticta stelleri*) near Barrow, Alaska, 1991-99. Arctic 57(2):166-182.

Quinlan, R., M.V. Douglas, and J.P. Smol. 2005. Food web changes in arctic ecosystems related to climate warming. Global Change Biology 11:1381-1386.

Rojek, N. A. 2006. Breeding biology of Steller's eiders nesting near Barrow, Alaska, 2005. U.S. Fish and Wildlife Service, Fairbanks Fish and Wildlife Field Office, Fairbanks, Alaska. Technical Report. 53 pp.

Rojek, N. A. 2007. Breeding biology of Steller's eiders nesting near Barrow, Alaska, 2006. U.S. Fish and Wildlife Service, Fairbanks Fish and Wildlife Field Office, Fairbanks, Alaska. Technical Report. 53 pp.

Rojek, N. A. 2008. Breeding biology of Steller's eiders nesting near Barrow, Alaska, 2007. U.S. Fish and Wildlife Service, Fairbanks Fish and Wildlife Field Office, Fairbanks, Alaska. Technical Report. 45 pp.

Rotella, J. J., D. W. Howerter, T. P. Sankowski, and J. H. Devries. 1993. Nesting effort by wild Mallards with 3 types of transmitters. Journal of Wildlife Management 57:690–695.

Sayler, J. W. 1962. A bow-net trap for ducks. Journal of Wildlife Management 26: 219-221.

Schindler, D.W., and J.P. Smol. 2006. Cumulative effects of climate warming and other human activities on freshwaters of arctic and subarctic North America. Ambio 35(4):160-168.

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

Smol, J.P. and M.S.V. Douglas. 2007. Crossing the final ecological threshold in high Arctic ponds. Proceedings of the National Academy of Sciences 104(30):12395-12397.

Smol, J.P., A.P. Wolfe, H.J.B. Birks, M.S.V. Douglas, V.J. Jones, A. Korhola, R. Pienitzi, K. Rühland, S. Sorvari, D. Antoniades, S.J. Brooks, M.A. Fallu, M. Hughes, B.E. Keatley, T.E. Laing, N. Michelutti, L. Nazarova, M. Nyman, A.M. Patterson, B. Perren, R. Quinlan, M. Rautio, E. Saulier-Talbot, S. Siitonen, N. Solovieva, and J. Weckström. 2005. Climate-driven regime shifts in the biological communities of arctic lakes. Proceedings of the National Academy of Science 102(12):4397-4402.

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

Stehn, R. and R. Platte. 2009. Steller's eider distribution, abundance, and trend on the Arctic Coastal Plain, Alaska, 1989-2008. Unpubl. Rep. U.S. Fish and Wildlife Service, Anchorage, AK. 36 pp.

Troy Ecological Research Associates (TERA). 2003. Molt migration of spectacled eiders in the Beaufort Sea: Distribution and timing of use. Unpublished report prepared for BP Exploration (Alaska) Inc., Anchorage, AK.

Trust, K., Cochrane, J., and Stout, J. 1997. Environmental contaminants in three eider species from Alaska and Arctic Russia. Technical Report WAES-TR-97-03. U.S. Fish and wildlife Service, Anchorage, AK. 44 pp.

USGS. 2006. Biological response to ecological change along the Arctic Coastal Plain. Progress Report, August 2006, Alaska Science Center, Anchorage, United States Geological Survey. 10pp.

U.S. Fish and Wildlife Service (USFWS). 2002. Steller's Eider Recovery Plan. Fairbanks, Alaska. 27 pp.

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

USFWS and Canadian Wildlife Service. 1987. Standard operating procedures for aerial waterfowl breeding ground population and habitat surveys. Unpublished Manual. U.S. Fish and Wildlife Service, Migratory Bird Management, Washington D.C. 98pp.

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

APPENDIX A

POLAR BEAR INTERACTION GUIDELINES

These Polar Bear Interaction Guidelines (Guidelines) were developed to ensure that activities are conducted in a manner that avoids conflicts between polar bears and humans. Polar bears are protected under the Marine Mammal Protection Act (MMPA), and were listed as a threatened species under the Endangered Species Act (ESA) in 2008. These acts both prohibit the "take" of polar bears without authorization. Take includes harassment, as well as physical injury and killing of individuals.

In addition to sea ice, polar bears use marine waters and lands in northern Alaska for resting, feeding, denning, and seasonal movements. They are most likely to be encountered within 25 miles of the coastline, especially along barrier islands during July-October. Polar bears may also be encountered farther inland, especially females during the denning period (October-April). Polar bears may react differently to noise and human presence. The general methods for minimizing bear-human conflicts are to: 1) avoid detection and close encounters; 2) minimize attractants; and 3) recognize and respond appropriately to polar bear behaviors. These Guidelines provide information for avoiding conflicts with polar bears during air, land, or water-based activities.

Unusual sightings or questions/concerns can be referred to: Susanne Miller or Craig Perham, Marine Mammals Management Office (MMM Office), 1-800-362-5148; or to Shannon Torrence (907) 455--1871 or Jewel Bennett (907) 456-0239 of the Fairbanks Fish & Wildlife Field Office (FFWFO).

When operating aircraft:

- If a polar bear(s) is encountered, divert flight path to a minimum of 2,000 feet above ground level or ½ mile horizontal distance away from observed bear(s) whenever possible.

When traveling on land or water:

- Avoid surprising a bear. Be vigilant—especially on barrier islands, in river drainages, along bluff habitat, near whale or other marine mammal carcasses, or in the vicinity of fresh tracks.

- Between October and April special care is needed to avoid disturbance of denning bears. If activities are to take place in that time period the MMM Office should be contacted to determine if any additional mitigation is required. In general, activities are not permitted within one mile of known den sites.
- Avoid carrying bear attractants (such as strongly scented snacks, fish, meat, or dog food) while away from camp; if you must carry attractants away from camp, store foods in air-tight containers or bags to minimize odor transmission until you return them to "bear-resistant" containers.*

- If a polar bear(s) is encountered, remain calm and avoid making sudden movements. Stay downwind if possible to avoid allowing the bear to smell you. Do not approach polar bears. Allow bears to continue what they were doing before you encountered them. Slowly leave the vicinity if you see signs that you've been detected. Be aware that safe viewing distances will vary with each bear and individual situation. Remember that the closer you are to the animal, the more likely you are to disturb it.

- If a bear detects you, observe its behavior and react appropriately. Polar bears that stop what they are doing to turn their head or sniff the air in your direction have likely become aware of your presence. These animals may exhibit various behaviors:

    - *Curious* polar bears typically move slowly, stopping frequently to sniff the air, moving their heads around to catch a scent, or holding their heads high with ears forward. They may also stand up.

    - *A threatened or agitated* polar bear may huff, snap its jaws together, stare at you (or the object of threat) and lower its head to below shoulder level, pressing its ears back and swaying from side to side. These are signals for you to begin immediate withdrawal by backing away from the bear and avoiding eye contact. If this behavior is ignored, the polar bear may charge. Threatened animals may also retreat.

    - In rare instances you may encounter an *aggressive bear*. It may sneak or crawl up on an object it considers prey. It may also approach in a straight line at constant speed without exhibiting curious or threatened behavior. This behavior suggests the bear is about to attack. Bears may approach in such a manner and charge a short distance (3-6 ft). Standing still, grouping together, shouting, and waving your hands will likely halt the bear's approach.

- If a polar bear approaches and you are in the bear's path—or between a mother and her cubs—get out of the way (without running). If the animal continues to approach, stand your ground. Gather people together in a group and/or hold a jacket over your head to look bigger. Shout or make noise to discourage the approach.

- If a single polar bear attacks, defend yourself by hitting or kicking. If the attack is by a female defending her cubs, remove yourself as a threat to the cubs by attempting to leave the area.

When camping:

- Avoid camping or lingering in bear high-use areas such as river drainages, coastal bluffs and barrier islands.

- Store food and other attractants in "bear-resistant" containers*. Consider the use of an electric fence as additional protection. Do not allow the bear to receive food as a reward in your camp. A food-rewarded bear is likely to become a problem bear for you or someone else in the future.

- Maintain a clean camp. Plan carefully to: minimize excess food; fly unnecessary attractants out on a regular basis (i.e. garbage, animal carcasses, excess anti-freeze or petroleum products); locate latrines at least ¼ mile from camp; and wash kitchen equipment after every use.

- If a polar bear approaches you in camp, defend your space by gathering people into a large group, making noise and waving jackets or tarps. Continue to discourage the bear until it moves off. Have people watch the surrounding area in case it returns later, keeping in mind that polar bears are known to be more active at night. Additional measures to protect your camp, such as electric fences or motion sensors can be used.

Harassment of polar bears is not permissible, unless such taking (as defined under the MMPA) is imminently necessary in defense of life, and such taking is reported to FWS within 48 hours.

*Containers must be approved and certified by the Interagency Grizzly Bear Committee as "bear-resistant." Information about certified containers can be found at http://www.igbconline.org/html/container.html.

FOR DEPARTMENT OF INTERIOR EMPLOYEES ONLY

Use of Deterrents

In addition to following the Guidelines above, all Department of Interior (DOI) employees must have completed the DOI's Bear and Firearm Safety Training course and be current in certification before engaging in field activities. DOI staff must practice with and know how to use deterrents prior to conducting field work. If working in bear habitat, DOI staff must anticipate and plan for possible scenarios of encountering polar bears, and identify appropriate responses, prior to initiating field work. Use of non-lethal polar bear deterrents by DOI staff is only permissible if it is done in a humane manner and is for the purposes of protection or welfare of the bear or the public. DOI staff has the right to use lethal methods to protect the public from polar bears in defense of life situations, and may do so when all reasonable steps to avoid killing the bear(s) have been taken.

Notification of Use of Deterrents

The DOI Bear Incident Report Form will be used to record and report polar bear-human interactions *that require use of deterrents*. These incidents will be reported to the MMM Office. This information will be used to track interactions over time and improve polar bear conservation and management.

APPENDIX B

Operational Plan to Take, Capture, Mark, or Collar Wildlife

1. Project Title: **Arctic and Red Fox Control in the Barrow Steller's Eider Conservation Planning Area near Barrow, Alaska**

2. Goal for species and number: **Up to 120 Arctic Fox; up to 15 Red Fox**

3. Dates that work will be performed: **May 23 to July 31, 2010**

4. Service Office/Field Station performing work: **Endangered Species Program of the Fairbanks Fish and Wildlife Field Office (FFWFO), Division of Fisheries and Ecological Services, U. S. Fish & Wildlife Service (USFWS)**

5. Responsible person/party for the project: **Ted Swem (Branch Chief, Endangered Species Program, FFWFO, USFWS; Terry Smith (Alaska District Supervisor, USDA APHIS Wildlife Services (USDA WS))**

6. Names of all subpermittees (other individuals who will work on the project): **USDA WS employees will conduct the project in coordination with USFWS. All field staff that may take part in fox control activities include: Garrett Savory and two other temporary hires (USDA WS); David Safine, Nicholas Docken, Lyn Snoddy, and 6 volunteer hires (USFWS); Yet unnamed local trapper (hired through Barrow Arctic Science Consortium). USDA will contact the permit office when other collectors are known.**

7. Who are the partners (names, titles, agencies/organizations): **Ted Swem, FFWFO, USFWS; Terry Smith, USDA WS; Robert Suydam, Wildlife Biologist, North Slope Borough Department of Wildlife Management (NSBDWM).**

8. Where will animals be taken or captured (include clear reference to USGS map grid, GPS locator coordinates, or other reliable means for locating work area)? **In the Barrow Steller's Eider Conservation Planning Area (see Figure 1). This includes all land within approximately 5 miles from the road system south and east of Barrow. Central coordinates of planning area approximately N 71˚18' W 156˚40'.**

9. Will animals be taken or captured on non-refuge lands? If yes, describe situation: **Yes. This is not a refuge related project. Foxes will be taken near Barrow, Alaska, entirely off refuge lands, because this is the only known concentration of nesting Steller's eiders, listed as threatened under the Endangered Species Act. The work will take place on land owned by ANCSA Barrow village corporation (Ukpeagvik Inupiat Corporation).**

10. Methods to be employed (if drugs are to be used, list specific type(s)):

USDA WS may use the following control methods in the removal of fox and/or other nest predators: leg-hold traps, cage traps, conibear traps, collarum neck snares, conventional snares, firearms, and possibly others. USDA WS will remove all control tools from the field at the culmination of the project.

11. Is the project to be coordinated with local Fish and Wildlife Protection Officer and the Alaska Dept. of Fish & Game Biologist? If yes, list any special provisions that have been established.

Geoff Carrol, the Alaska Fish and Game biologist stationed in Barrow, is apprised of our activities. No special provisions have been established.

12. Describe how collected specimens will be utilized and what their final disposition will be. (Provide justification if disposition does not follow the State salvage policy - Salvage3.wpd).

Dead foxes will be donated to the NSBDWM in Barrow, Alaska to be used in a collaborative project studying rabies with the NSBDWM and the Department of Wildlife Biology at the University of Alaska, Fairbanks.

Project Description

Purpose and Need for Fox Control:

The listed Alaska-breeding population of Steller's eiders (*Polysticta stelleri*) nests primarily near Barrow on the Arctic Coastal Plain, where they appear to breed only intermittently. Nests were found in only 11 of the last 19 years near Barrow. Of 100 nests monitored in nesting years from 1991-2004 (prior to fox control), nest success based on the Mayfield method was 16%. Although the causes of Steller's eider decline in Alaska are unknown, increased predation pressure may have contributed to the near disappearance of Steller's eiders from the Yukon-Kuskokwim Delta. Predation is known to be a critical threat to many threatened, endangered and locally rare species and management actions to reduce predation may be vital for maintenance or recovery of some species. The Steller's eider is a migratory bird which is listed as threatened under the U.S. Endangered Species Act.

Potential nest predators in the Barrow area include arctic fox (*Alopex lagopus*), red fox (*Vulpes vulpes*), weasel (*Mustela spp.*), common raven (*Corvus corax*), jaegers (*Stercorarius* spp.), and glaucous gull (*Larus hyperboreus*). Arctic foxes are major nest predators; they occur in high density near Barrow, where their numbers may have increased as a result of anthropogenic food sources. In addition, arctic foxes are considered to be the principal predators of waterfowl in the arctic region, with eggs and young being particularly vulnerable. The use of digital cameras on some Steller's eiders nests near Barrow indicated the primary nest predator was arctic fox. Red fox are not considered common in the area, but are now sighted or caught near Barrow in this project.

In light of the Steller's eider's intermittent breeding, poor reproductive performance, and band data showing an ageing population, a 2004 population viability analysis estimated extinction probabilities approaching 100% just 10 years into the future. At this time it is unknown whether the Alaska-breeding population is augmented with individuals from the larger, non-listed Russian population. If the listed Alaska-breeding population is largely or entirely dependent on local recruitment, a significant and immediate reduction in predation is likely needed to prevent extinction. For this reason, reduced nest predation is considered an important component of Steller's eider recovery (per USFWS 2002 Steller's Eider Recovery Plan). Fox control has been conducted near Barrow from 2005-2009, with an apparent increase in Steller's eider nest success. Nest success was 21% in 2005, 88% in 2006, 47% in 2007, and 58% in 2008. Steller's eiders were not found to nest in 2009.

Steller's eider brood survival rates are more difficult to estimate, because radio telemetry is required and only small numbers of broods can be monitored. We do have data to suggest brood survival was significantly enhanced in 2005, 2006, and 2008 when broods were monitored (no broods monitored in 2007). Only one of 14 monitored broods fledged ducklings prior to fox control, whereas 6 of 10 fledged in 2005 and 2006 and 4 of 7 apparently fledged in 2008 with fox control in effect (Rojek 2006, 2007, USFWS unpublished data). Several other large unmarked broods with fledging-size ducklings were also observed in 2006 and 2008, indicating that nests not included in our study sample also presumably benefited from fox control efforts.

While sample size of monitored Steller's eider nests and broods is small due to their rarity, concurrent shorebird nesting studies have been conducted since 2003 within our study area with much larger sample sizes. Shorebird nest success in 2003 and 2004 (no fox control) was 49% and 15% respectively, while success was 87%, 77%, 84%, and 69% in 2005-2008 (with fox control), respectively (Richard Lanctot, pers. comm.). These data provide further support that ground-nesting birds benefit from fox control in this area.

Management Objective:
The main objective is to reduce nest predation losses to Steller's eiders by reducing the number of foxes in the nesting area near Barrow. The Steller's eider is a migratory bird which is listed as threatened under the U.S. Endangered Species Act.

Benefit to Migratory Birds:
Steller's eiders are migratory birds, and as described above, fox control from 2005 to 2008 is believed to have benefited this species. Shorebird researcher Richard Lanctot reported that fox control appeared to benefit shorebirds nesting in the vicinity of the Steller's eider nesting area. He observed higher shorebird nesting success, and lower predation rates, than in previous years in which foxes were not controlled.

Methods:
This project will begin about May 23, 2010 and end about July 31, 2010, and will likely be conducted in future years. If Steller's eiders are not found nesting at Barrow in 2010, which will be known by the last week in June, the USFWS will terminate fox control operations for the year.

Up to 120 arctic and up to 15 red fox may be taken within the Barrow Steller's Eider Conservation Planning Area (Figure 1). Specific zones of control activity within the Planning Area shall be identified in consultation with USFWS personnel. Land use permits will be obtained from landowners.

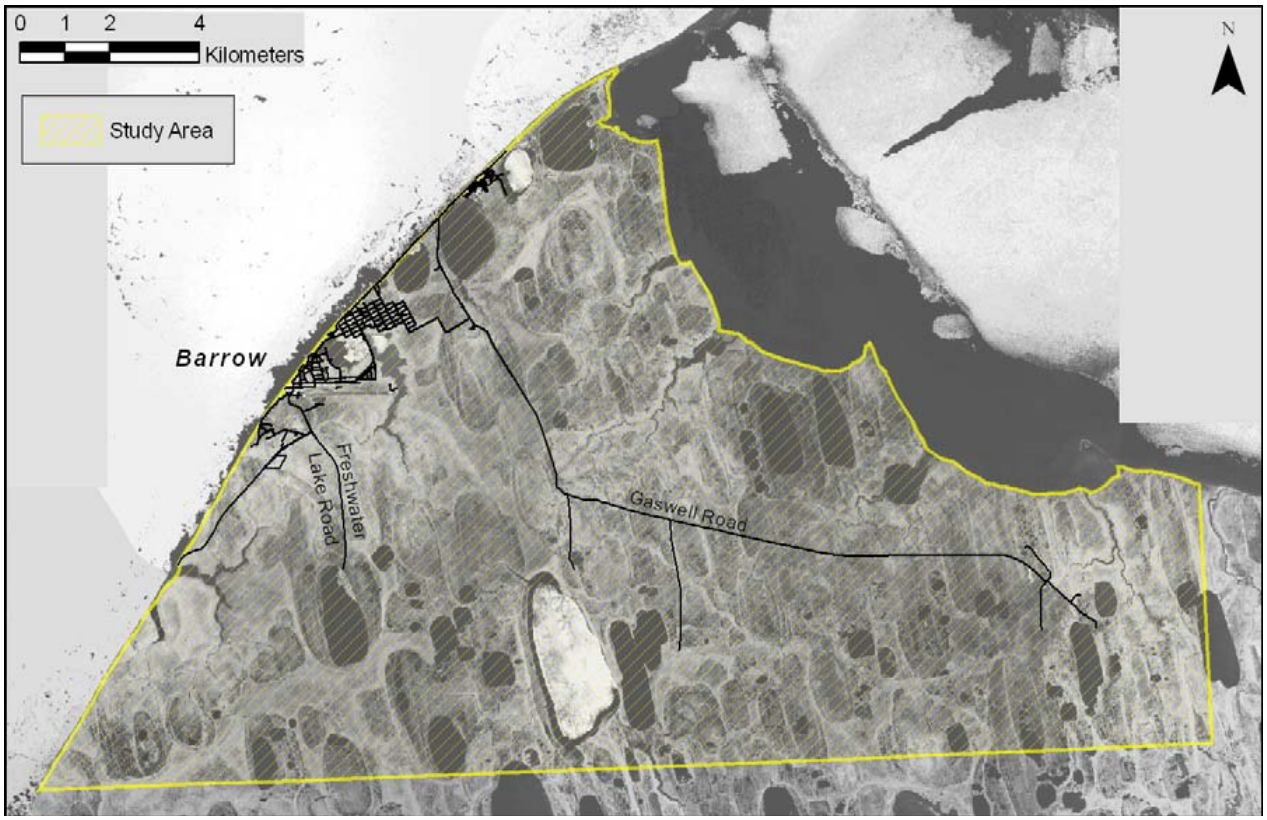

Figure 1. Map of the Barrow Steller's Eider Conservation Planning Area

Field personnel from USDA WS and USFWS will work collaboratively on this project. USDA WS will provide three Wildlife Specialists to conduct the fox trapping/removal effort. USFWS will provide information to USDA WS on locations to focus predator trapping/removal efforts on and current year Steller's eider nesting locations that need protection.

USDA WS may use the following control methods in the removal of fox: leg-hold traps, cage traps, conibear traps, neck snares, collarum neck snares, firearms, and possibly others. USDA WS will remove all control tools from the field at the culmination of the project.

During 2010, we will continue to employ the methods used in 2009 to attempt to eliminate incidental catch and reduce the trap check interval for non-lethal traps. In previous years incidental catch has included mainly snowy owls (*Nyctea scandiaca*), glaucous gulls, jaegers, and white-fronted geese (*Anser albifrons*). The following protocols will be followed to reduce incidental take:

1) Using collarums, a canid-specific neck snare device, near mounds that may be attractive to snowy owls and other bird species. Because collarums are only activated when the trigger is pulled upward, an incidental bird catch is much less likely than a conventional leg-hold trap.

2) Keep trap sets off the top and sides of tundra mounds. Most trap sets will still need to be located near mounds because they are heavily used by foxes and are often the only dry ground available to make a set.

3) Avoid setting on tundra mounds with evidence of predatory bird use (owl pellets, etc…).

4) Use no visual attractants such as bones and feathers at trap sets. Visual attractants can lure avian species such as raptors into trap sets.

5) Strive to keep leg-hold traps covered; the shiny metal may attract some avian species such as raptors and gulls.

6) Investigate all sets with incidental take and collect additional information. Information collected will improve knowledge on how to reduce incidental take in the future.

7) Improve field communication regarding incidental take. Develop a standardized release protocol that can be shared with other parties.

Any traps that are not specifically set to kill canids (e.g. leg-hold and cage) will be checked at least every 48 hours to reduce suffering of target and non-target animals and the chance of injury or debilitation to any incidental catch.

USFWS Institutional Animal Care and Use Committee (IACUC) review of the fox control project will be conducted in 2010 to assure methods employed humanely capture fox and reduce incidental catch. The USFWS intends to increase our agency involvement in trap setting to ensure that measures to reduce incidental catch are fully implemented.

Need for Lethal versus Non-lethal Control:
We have considered two avenues for decreasing fox predation on eiders without killing foxes, and we are taking action on both of them. First, foxes may be present in unnaturally high densities near Barrow because of availability of human-generated food sources. To address this problem, the North Slope Borough and USFWS are working cooperatively to reduce human food sources that may attract foxes to the Barrow area. For example, the design of the new landfill makes it more difficult for foxes to gain access to potential food sources. Second, we are taking action to directly protect eider eggs from predation. We have conducted experiments with the Alaska SeaLife Center to artificially incubate Steller's eider eggs and return them to nests at hatch to minimize nest predation. This activity, done in past years, is not currently capable of providing benefits at a large scale. We know of no means to non-lethally reduce the predation of ducklings.

We believe these non-lethal actions are important, but insufficient to reduce predation to the point that production of young is adequate to conserve the eider population. Given the likelihood

of extinction of the local eider population, lethal methods are needed in concert with non-lethal methods.

Plan for Monitoring Effectiveness of Fox Control:
As stated above, USFWS will terminate fox control if Steller's eiders are not nesting by the last week in June. Employees of both USFWS and USDA WS will monitor the study area for presence of foxes to gauge the success of the operation. Because Steller's eider breeding success at Barrow is highly variable among years, to determine whether fox control is increasing nesting success will require multiple years of action. USFWS has an ongoing study of Steller's eiders nesting at Barrow, and will monitor nesting success concurrently with fox control. Annual reports for this larger study are available upon request.

Literature Cited:

See LITERATURE CITED for the Biological Opinion.