United States Department of the Interior
U.S. FISH AND WILDLIFE SERVICE
Fairbanks Fish and Wildlife Field Office
101 12th Avenue, Room 110
Fairbanks, Alaska 99701
June 15, 2011

MEMORANDUM

To: **Judy Jacobs, USFWS Region 7 Federal Grant Program Biologist**

From: **Ted Swem, USFWS Fairbanks Endangered Species Branch Chief** Ted Swem

Subject: **Biological Opinion: Section 10 Permit to Dr. M. Petersen and Dr. A. Powell, USGS, for Spectacled Eider Habitat Use in the Chukchi and Beaufort Seas Project Year 4**

This memorandum is in response to your request for formal consultation regarding effects of renewing the section 10 permit for the project entitled *Spectacled Eider Habitat Use in the Chukchi and Beaufort Seas, Project Year 4* on endangered and threatened species and critical habitats pursuant to Section 7 of the Endangered Species Act of 1973, as amended. Please find attached the Biological Opinion (BO) where we have concluded that the level of anticipated take is not likely to result in jeopardy of listed species or destruction or adverse modification of critical habitat. Reasonable and prudent measures, terms and conditions, and reporting requirements for this project are outlined within the BO.

If you have further questions, please call Denise Walther at 907-456-0277.

INTRA-SERVICE BIOLOGICAL OPINION

for

U.S. Fish & Wildlife Service's Issuance of a Section 10 Permit to Dr. M. Petersen and Dr. A. Powell, USGS

for

Spectacled Eider Habitat Use in the Bering, Chukchi, and Beaufort Seas

Project Year 4

North Slope Field Activities

May 15, 2011

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1. INTRODUCTION

This document is the U.S. Fish and Wildlife Service's (USFWS) Biological Opinion (BO) on the issuance of a Section 10 permit under the Endangered Species Act for the fourth year of a U.S. Geological Survey (USGS) proposal to study the spatial and temporal distribution of spectacled eiders (*Somateria fischeri*) in the Bering, Chukchi, and Beaufort seas through satellite telemetry and stable isotope analysis. The purpose of the permitted study is to evaluate similarities and differences in spectacled eider spatial and temporal distribution over the past decade, by comparing current telemetry data to that collected in the mid-1990s; to examine potential mechanisms through which spectacled eiders might become infected with highly pathogenic avian influenza, and the potential role of the species as a carrier in the distribution of the virus; and to investigate winter locations through stable isotope analysis. Biological Opinions describing the effects of permitted activities during three previous project years were completed in April 2008, April 2009, and May 2010.

This BO describes the effects to spectacled eiders from proposed research activities on the Arctic Coastal Plain (ACP; North Slope) in 2011. Draft permit conditions were received on 2 May 2011 and formal consultation began on that day. Additional project details and other supporting information were provided by Matt Sexson, USGS, during the period of 25 May and 9 June 2011. The complete administrative record of this consultation is on file at the Service's Fairbanks Field Office.

Proposed activities on the Arctic Coastal Plain include 1) capture and handling of up to 78 spectacled eiders (13 adult females and 65 associated juveniles); 2) collection of biological tissue samples; and 3) implantation (PTT) of transmitters in up to 35 spectacled eiders ($\leq$10 adult females and $\leq$ 25 juveniles). All field activities will occur during the brood rearing period. Researchers plan to capture all birds on the Colville River delta where work will be based out of permanent camp facilities at Helmericks Homestead. However, additional searches for spectacled eider broods may occur further west on the ACP, near Peard Bay, if researchers are not able to capture the target number of spectacled eider hens and broods on the Colville River delta. The scope of this BO is limited to effects from research activities on the Colville River delta because, based on discussions with the applicants, we expect the likelihood of additional research activities near Peard Bay to be very low. Researchers will contact the Fairbanks Fish and Wildlife Field Office as soon as possible to reinitiate consultation if they determine searches near Peard Bay are required.

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

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

Three species listed as threatened under the ESA occur in the action area: spectacled eiders (*Somateria fischeri*), Alaska-breeding Steller's eiders (*Polysticta stelleri*), and polar bears (*Ursus maritimus*). Proposed research activities will occur within designated

critical habitat polar bear and will not occur within designated critical habitat for listed eiders. We have reviewed the proposed research pursuant to section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.) to determine if it will adversely affect these listed species or polar bear critical habitat.

Polar Bears

Although we expect polar bears will rarely occur within the proposed search areas during spectacled eider brood rearing, there is the possibility of encountering a polar bear in those areas and such encounters pose a serious risk to humans and to polar bears. Accordingly, project participants will follow Polar Bear Interaction Guidelines (Appendix A) developed to ensure the permitted activities are conducted in a manner that avoids conflict between polar bears and humans. We expect that implementing these guidelines will minimize effects to polar bears to such an extent that take will not occur. We therefore conclude that adverse effects to polar bears will be insignificant and that the proposed action is *not likely to adversely affect polar bears*. There will be no further treatment of polar bears in this document.

Polar Bear Critical Habitat

Designated polar bear critical habitat in the vicinity of the Colville River delta is shown in Appendix B. Field activities are likely to occur in designated sea ice habitat and terrestrial denning habitat, and may occasionally occur within the no disturbance zones barrier island habitat. Because project activities will not alter the physical features of critical habitat and will result in only temporary and minor disturbances, we do not expect the project to compromise the function or the intended conservation role of polar bear critical habitat. We therefore conclude that adverse effects to polar bear critical habitat will be insignificant and that the proposed action is *not likely to adversely affect polar bear critical habitat*. There will be no further treatment of polar bear critical habitat in this document.

Steller's Eiders

In Alaska, Steller's eiders breed almost exclusively on the ACP. Nesting on the ACP is concentrated in tundra wetlands near Barrow, AK. Steller's eiders occur at very low densities on the ACP outside of the Barrow Triangle area. USFWS estimated the density of Steller's eiders breeding across the ACP in 2009 to be 0.002 birds/km^2 (Larned et al. 2010). Because available data indicate very low use of the proposed search area by breeding Steller's eiders, we expect the likelihood that field crews would encounter Steller's eiders to be extremely low. Consequently, we conclude that adverse effects to Steller's eiders will be discountable and that the proposed action is *not likely to adversely affect Steller's eiders*. Although the Environmental Baselines for Steller's eiders and spectacled eiders are considered together in the Section 4, there will be no additional analysis of effects to Steller's eiders in this document.

Spectacled Eiders

After reviewing the information provided, the status of the species, the environmental baseline, and cumulative effects, the Service concludes that the issuance of a section 10 permit for the proposed activities may adversely affect spectacled eiders but will not

jeopardize the continued existence of the species. The Service has determined that it is unlikely that the action will violate section 7(a)(2) of the Act. To arrive at this non-jeopardy determination, we used a four-step approach for applying section 7(a)(2) standards. These steps were:

1. Define the biological requirements and current status of spectacled eiders;
2. Evaluate the relevance of the environmental baseline to the current status of spectacled eider populations;
3. Determine the effects of the proposed or continuing action on the species; and
4. Determine whether the species can be expected to survive with an adequate potential for recovery under the effects of the proposed or continuing action, the effects of the environmental baseline, and any cumulative effects, and considering measures for survival and recovery specific to other life stages.

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

2. DESCRIPTION OF THE PROPOSED ACTION

2.1 Background

Section 7(a)(2) of Act requires that Federal agencies shall insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any threatened or endangered species, or result in the destruction or adverse modification of critical habitat. When the actions 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 Region 7 Fisheries and Ecological Services Office (Endangered Species Program) of the U.S. Fish and Wildlife Service. This office is issuing a section 10 permit to Dr. M. Petersen and Dr. A. Powell of the U.S. Geological Survey (USGS) to capture, band, and collect tissue samples from 78 spectacled eiders (65 juveniles with 13 associated hens), and surgically implant satellite transmitters in up to 35 of these (maximum 25 juveniles) on Alaska's Arctic Coastal Plain (North Slope). The permit issuance is the federal nexus for

consultation. This consultation is being conducted as an intra-service consultation with the Endangered Species Branch of the Fairbanks Fish and Wildlife Field Office.

2.2 Action Area

The action area is that area in which the direct and indirect effects of the proposed action may occur. For this consultation, the action area is the 872-km^2 (337-mi^2) spectacled eider study area located in the Colville River delta (Figure 1). Work will be based out of permanent camp facilities (Helmericks Homestead) located within the boundary of the study area.

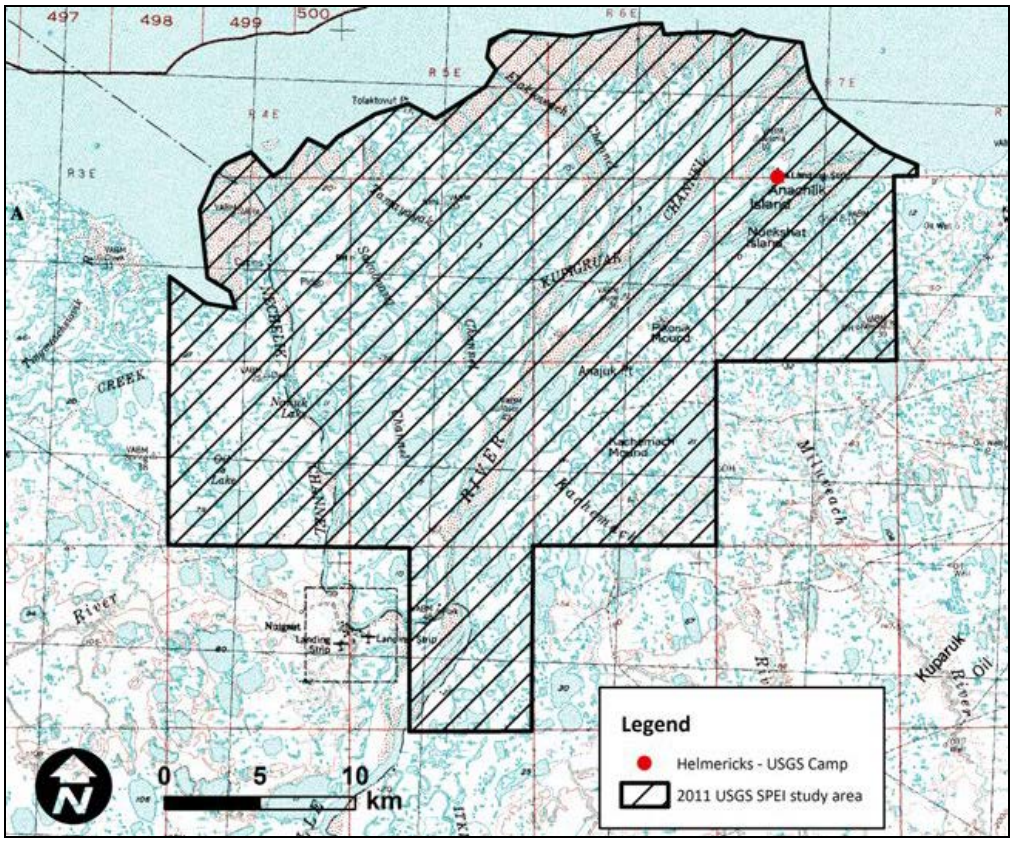


Figure 1. Proposed study area for spectacled eider research on the Colville River Delta, Alaska. Work will be based out of the USGS camp at Helmericks Homestead.

2.3 Project Action

The proposed action is to authorize, pursuant to Section 10 of the Endangered Species Act (ESA), the study of threatened spectacled eiders (*Somateria fischeri*) for scientific purposes, which may result in the unintentional taking of adults or ducklings. The duration of the permit will be one year.

The USGS proposes to use satellite telemetry to conduct scientific research and population monitoring activities important to the enhancement of propagation or survival

of spectacled eiders. The primary objectives are to 1) determine spatial distribution, timing of use, and resident times of spectacled eiders when at sea, and 2) determine and evaluate similarities and differences in spatial and temporal distribution over the last decade. These activities support actions specified in the Spectacled Eider Recovery Plan (U.S. Fish and Wildlife Service 1996) and will contribute to the recovery of these listed eiders.

The USGS proposes to capture up to 13 spectacled eider adult females and their broods (approximately 65 ducklings total) on ponds in the Colville River delta study area during 18–27 August 2011. Researchers will locate spectacled eider broods within the study area using a helicopter. Once a target brood has been identified, the helicopter will land near the brood pond, drop off 1-2 field crew members and equipment, and return to the Helmericks camp to transport an additional 1-2 crew members to the site. Once the full crew is onsite, 3-4 people will herd the hen and her brood into a mist net set extending across the pond below and above the water surface. Juveniles that escape from the mist net will be captured by dip net. Captured eiders will not be removed from the pond unless the hen and entire brood is captured so that all juveniles will be released together with the hen to increase their chances of survival. Hens and broods will be placed in commercial animal carriers and transported via helicopter to the USGS surgery site at the Helmericks camp for collection of tissue samples and implantation of the satellite transmitters**.**

Up to 35 spectacled eiders will be implanted with a Microwave Telemetry 750 hour, 38 g, PTT 100. Each transmitter will be programmed to collect at least two years of individual-specific location data. Satellite transmitters will be implanted by intra-abdominal surgery in up to 10 hens and up to 25 juveniles. Crews will continue capture activities until the target number of 10 adult females and 25 juveniles have been marked with a satellite transmitter; not exceeding a total of 13 adult females and their associated broods (approximately 65 juveniles) captured. Broods associated with adult females will be held as a group until they can be released together following post-surgical recovery of the adult hen.

Two wildlife veterinarians will be present at the surgery site to monitor the condition of the captured hen and brood as described in USGS Standard Operating Procedures protocol. Eiders not meeting requirements for surgery will be held until they can be released at the site with the entire brood. Juveniles weighing <900 g will not be implanted with transmitters. Surgical procedures will be conducted by trained wildlife veterinarians (2), following USGS Standard Operating Procedures, in a climate controlled, well lit work area at the Helmericks facility. The surgical implant procedure takes no more than 1 hour for each bird. Gaseous anesthesia will be used to provide greater control of anesthesia delivery and deliver supplemental oxygen. During surgery, a sample of subcutaneous adipose tissue (<1 g) will be collected from the incision site. Following surgery, blood (<7 mL) will be collected through venipuncture for physiological, genetic, contaminant, stable isotope, and fatty acid analysis; and feathers (head, breast, secondary, and tail covert) and claw samples will be collected for use in stable isotope analysis. All hens and juveniles will be banded. Tissue samples may also

be collected from eiders that are not implanted with transmitters. Each eider will then be returned to a separate carrier and monitored throughout recovery.

Hens and their broods will be returned to the site of capture via helicopter and released as a group. If a hen dies during capture or surgery, USGS will continue to process the juveniles and attempt to release marked juveniles in a pond with another brood or crèche (group composed of multiple broods).

3. STATUS OF THE SPECIES AND CRITICAL HABITAT

3.1 Spectacled Eider

Physical Appearance

Spectacled eiders are large sea ducks. Males in breeding plumage have a white back, black breast, and pale green head with large white "spectacles" around the eyes. In late summer and autumn males molt into a mottled brown plumage that lasts until late fall, when they re-acquire breeding plumage. Females are mottled brown year round, with pale tan spectacles. Juveniles attain breeding plumage in their second (female) or third (male) year; until then they are mottled brown (Petersen et al. 2000). Both males and females have long sloped bills, giving them a characteristic profile (Figure 2).

Figure 2 - Male and female spectacled eiders in breeding plumage.

Status and Distribution

Spectacled eiders inhabit the North Pacific. There are three primary breeding populations; those on Alaska's North Slope, the Y-K Delta, and northern Russia. Historically, spectacled eiders nested in Alaska discontinuously from the Nushagak Peninsula north to Barrow, and east nearly to Canada's Yukon Territory (Phillips 1922-1926, Bent 1925,

Bailey 1948, Dau and Kistchinski 1977, Derksen et al. 1981, Garner and Reynolds 1986, Johnson and Herter 1989). The entire species was listed throughout its range as threatened on May 10, 1993 (USFWS 1993) because of documented population declines. The Y-K Delta population had declined 96% between the 1970s and early 1990s (Stehn et al. 1993, Ely et al. 1994), and anecdotal information indicated that populations in the other two primary breeding areas had also declined (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. On the North Slope, spectacled eiders breed north of a line connecting the mouth of the Utukok River to a point on the Shaviovik River about 24 km (~15 miles) inland from its mouth. Breeding density varies across the North Slope (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).

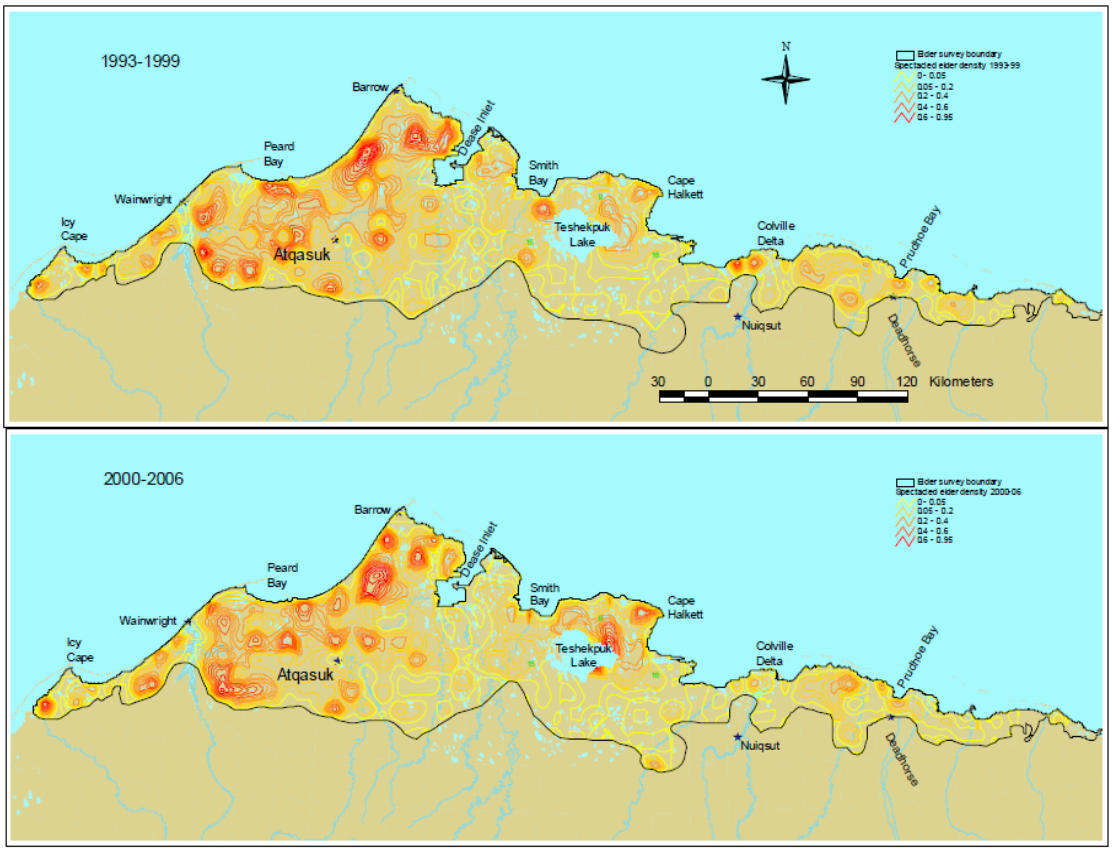


Figure 3 – Mean spectacled eider breeding density across Alaska's Arctic Coastal Plain 1993-1999 above and 2000–2006 below (from Larned et al. 2006).

North Slope spectacled eider clutch size averages 3.2-3.8, with clutches of up to eight eggs reported (Quakenbush et al. 1995). 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.

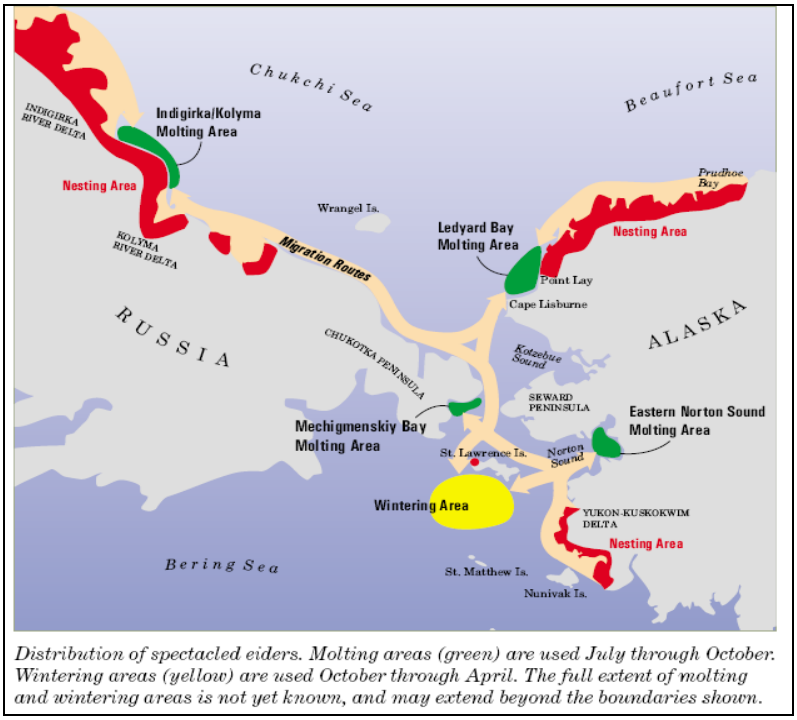
Nest success is highly variable and greatly influenced by predators, including gulls (*Larus* spp.), jaegers (*Stercorarius* spp.), and red (*Vulpes vulpes*) and arctic (*Alopex lagopus*) foxes. In Arctic Russia, apparent nest success was calculated as <2% in 1994 and 27% in 1995; predation was believed 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 Y-K Delta, Mayfield 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 Y-K Delta 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).

Spectacled eiders molt in several discrete areas (Figure 4), with birds from the different populations and genders apparently favoring different molting areas (Petersen et al. 1999). After molting, spectacled eiders migrate to openings in pack ice of the central Bering Sea south/southwest of St. Lawrence Island (Petersen et al. 1999; Figure 4), where they remain until March and April (Lovvorn et al. 2003).

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 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 extensive use of the western Beaufort Sea. Radio telemetry studies have shown that most female spectacled

eiders that migrate west toward Barrow use the near shore 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 near shore 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.



Distribution of spectacled eiders. Molting areas (green) are used July through October. Wintering areas (yellow) are used October through April. The full extent of molting and wintering areas is not yet known, and may extend beyond the boundaries shown.

Figure 4 - Distribution of spectacled eiders.

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). Winter/Spring aerial surveys were repeated in 2009 and 2010. Preliminary results from 2009 indicate an estimate of 301,812 spectacled eiders, but this value will be updated when surveys from both years are analyzed (Larned et al. 2009).

No population estimates for the North Slope breeding population are available before 1993. At Prudhoe Bay, within the North Slope breeding area, Warnock and Troy (1992) documented an 80% decline in spectacled eider abundance from 1981 until 1991. For the North Slope breeding population, ground-plot surveys have not been conducted. The

2009 population index based on aerial surveys was 5,018 birds (3343-6692, 90% CI; Larned et al. 2010). The North Slope spectacled eider population from 1993-2009 was slightly decreasing, with an average (n = 17 years) population growth rate of 0.985 (0.971, 0.999, 90% CI; Larned et al. 2010). The North Slope breeding population estimate for 2007-2009 (adjusted for detection probability = 46%) was 12,506 (9,365–15,646, 90% C.I.)

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 the cause or causes of the spectacled eider population decline is not known, factors that affect adult survival are likely to be the most influential on population growth rate. These include lead poisoning from ingested spent shotgun pellets, which may have contributed to the rapid decline observed in the Y-K Delta (Franson et al 1995, Grand et al. 1998), and other factors such as habitat loss, increased nest predation, over harvest, and disturbance and collisions caused by human infrastructure (factors discussed in Section 4 – *Environmental Baseline*). Under the Recovery Plan, the species will be considered recovered when each of the three recognized populations (Y-K Delta, North Slope of Alaska, and Arctic Russia): 1) is stable or increasing over 10 or more years and the minimum estimated population size is at least 6,000 breeding pairs, or 2) number at least 10,000 breeding pairs over 3 or more years, or 3) number at least 25,000 breeding pairs in one year. Spectacled eiders do not currently meet these recovery criteria.

Spectacled Eider Critical Habitat
Critical habitat for molting spectacled eiders was designated in Norton Sound and Ledyard Bay molting areas, nesting areas on the Y-K Delta, and the wintering area southwest of St. Lawrence Island (critical habitat was not designated on the ACP; 66 CFR 9146 [February 6, 2001]) .

4. ENVIRONMENTAL BASELINE

The environmental baseline, as described in section 7 regulations (50 CFR §402.02) includes the past and present impacts of all Federal, State, or private actions and other human activities in the Action Area, the anticipated impacts of all proposed Federal projects in the Action Area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. The environmental baseline provides the context within which the effects of the Action will be analyzed and evaluated.

4.1 Steller's and Spectacled Eiders
Status in the Action Area
The North Slope breeding population of spectacled eiders (approximately 12,506 birds) and Alaska-breeding Steller's eiders (approximately 576 breeding birds) occupy

terrestrial and marine portions of the North Slope for significant portions of their life history.

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, increased predator populations, harvest, and impacts of development, science impacts, and climate change. Factors that affect adult survival may be the most influential on population growth rates. Recovery efforts for both species are underway in portions of the North Slope.

Data from annual ACP aerial surveys adjusted by a surrogate visual correction factor estimates the North Slope-breeding population of spectacled eiders is approximately 12,506 individuals. The highest densities of spectacled eiders are consistently found in the Barrow Triangle (defined as the area north of 70° 50' N, between Dease Inlet and the Chukchi Sea), the area near Peard Bay, southeast of Wainwright, and northeast of Teshekpuk Lake.

As discussed in *Section 3 – Status of the Species*, it is difficult to determine the number of Steller's eiders that breed on the North Slope. However, annual aerial eider surveys show Steller's eiders are not evenly distributed across the ACP, with highest densities occurring in the Barrow Triangle. This area accounts for only 4.8% of the survey area, but contained 40% of all Steller's eider observations in the aerial surveys. This is likely an underestimate of the proportion of Steller's eiders in this area because: 1) the scale of the concentration is too small to be adequately represented in the sampling regime; and 2) a portion of the concentration area is excluded because the area near the Barrow airport cannot be surveyed due to aviation safety concerns. 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, increased predator populations, harvest, and impacts of development, science impacts, and climate change.

Increased Predator Populations

There is some evidence that predator and scavenger populations may be increasing on the North Slope near sites of human habitation, such as villages and industrial infrastructure (Eberhardt et al. 1983, Day 1998, Powell and Bakensto 2009). Researchers have proposed that reduced fox trapping, anthropogenic food sources in villages and oil fields, and nesting/denning sites on human-built structures have resulted in increased fox, gull, and raven numbers (R. Suydam and D. Troy pers. comm., Day 1998). These anthropogenic influences on predator populations and predation rates may have affected eider populations, but this has not been substantiated. However, increasing predator populations are a concern, and Steller's eider studies at Barrow attributed poor breeding success to high predation rates (Obritschkewitsch et al. 2001), and in years where arctic fox removal was conducted at Barrow prior to and during Steller's eider nesting, nest success appears to have increased significantly (Rojek 2008).

Habitat Loss through Development and Disturbance - With the exception of contamination by lead shot, destruction or modification of North Slope nesting habitat of listed eiders has been limited to date, and is not thought to have played a major role in population declines of spectacled or Steller's eiders. Until recently eider breeding habitat on the ACP was largely unaltered by humans, but limited portions of each species' breeding habitat have been impacted 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. These impacts have resulted from the gradual expansion of villages, coupled with cold war era military developments such as the Distant Early Warning (DEW) Line sites at Cape Lonely and Cape Simpson (*circa* 1957), and more recently, the initiation and expansion of oil development since construction of the Prudhoe Bay field and Trans Alaska Pipeline System (TAPS) in the 1970s.

The population of communities such as Barrow has been increasing, and the U.S. Bureau of Land Management (BLM) (2007) predicts 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. Major community development projects such as the new hospital, landfill, and water treatment plant at Barrow, airport improvements and development of science support facilities in the area, have all undergone formal section 7 consultations.

There are currently few permanent structures associated with the oil and gas industry in National Petroleum Reserve-Alaska (NPR-A), a vast area that contains virtually all currently occupied nesting habitat for the listed population of Steller's eiders, and almost 90% of the North Slope breeding habitat of spectacled eiders (USFWS 2008). However, development has steadily moved westward towards NPR-A since the initial discovery and development of oil on the North Slope. Given industry's interest in NPR-A as expressed by lease sales, seismic surveys, drilling of exploratory wells, and the construction of the Alpine field, industrial development is likely to continue in NE and NW NPR-A. Development in NPR-A may also facilitate development in more remote, currently undeveloped areas such as the Chukchi Sea or areas of the Beaufort Sea, and vice versa. Formal section 7 consultations were conducted for MMS's Lease Sale 193 in the Chukchi Sea, and Lease Sales 185, 196, and 202 in the Beaufort Sea. Consultation on these areas will continue if development proceeds past the exploration phase under the incremental step consultation authority granted to Outer Continental Shelf (OCS) activities (50 CFR § 402.14(k)).

Incidental Take

Recent activities across the North Slope that required formal section 7 consultation, and the estimated incidental take of listed eiders, is presented in Table 1. These actions were considered in the final jeopardy analysis of this biological opinion. It should be noted that incidental take is estimated prior to the implementation of reasonable and prudent measures and associated terms and conditions which serve to reduce the levels of incidental take. Further, in some cases included in this table, estimated take is likely to

occur over the life of the project (often 30–50 years) rather than annually or during single years reducing the severity of the impact to the population. There are also important differences in the type of incidental take. The majority of the incidental take estimated is a loss of eggs/ducklings, which is of much lower significance for survival and recovery of the species than the death of an adult bird. For example, spectacled eider nest success recorded on the Y-K Delta ranged from 18-73% (Grand and Flint 1997), and average clutch size was 5 eggs (Petersen et al. 1999). From the nests that survived to hatch, spectacled eider duckling survival to 30-days ranged from 25-47% on the Y-K Delta (Flint et al. 2000). Over-winter survival of one-year old spectacled eiders was estimated at 25% (P. Flint pers. comm.), with annual adult survival of 2-year old birds (that may enter the breeding population) of 80% (Grand et al. 1998). Using these data (in a very simplistic scenario) we estimate for every 100 spectacled eider nests on the Y-K Delta, less than 2–17 adult females would be expected to survive and enter (recruit) into the breeding population. Similarly, we expect that only a small proportion of spectacled and Steller's eider eggs or ducklings on the North Slope would eventually survive to recruit into the breeding population.

Table 1 illustrates the number and diversity of actions that required consultation in Alaska. We believe these estimates have overestimated, possibly significantly, actual take. Actual take is likely reduced by the implementation of terms and conditions in each biological opinion, is spread over the life-span of a project (often 50 years), and is dominated by the *potential* loss of eggs/ducklings which, as described above, is of less significance than adult mortality for survival and recovery of these K-selected species. Also, it remains unknown to what degree spectacled and Steller's eiders potentially affected by disturbance can reproduce in disturbed areas or move to other less disturbed areas to reproduce. If either or both occur, these factors also serve to reduce actual impacts from the maximal potential impacts.

Table 1. Activities in Alaska that required formal section 7 consultation and the amount of incidental take provided.

Project Name	Impact Type	Estimated Incidental Take
False Pass Harbor (2001)	Contaminants	4 adult Steller's eiders
NPDES-GP (2001)	Collisions	1 adult Steller's eider
Chignik Lagoon Tank Farm (2001)	Contaminants	14 adult Steller's eiders
Chignik Dock (2002)	Contaminants	4 adult Steller's eiders
Chignik Bay Tank Farm (2002)	Contaminants	5 adult Steller's eiders
Sandpoint Harbor (2002)	Contaminants Collisions Habitat loss	13 adult Steller's eiders
Beaufort Sea Planning Area Lease Sale 186, 195, & 202 (2002)	Collisions	5 adult spectacled eiders 1 adult Steller's eider
Fairweather Seismic (2003)	Disturbance	66 adult Steller's eiders
Nelson Lagoon Tank Farm (2003)	Contaminants Collisions	21 adult Steller's eiders
Akutan Mooring Basin (2003)	Contaminants Collisions	10 adult Steller's eiders
Alpine Development Project (2004)	Habitat loss	4 spectacled eider eggs/ducklings

	Collisions	3 adult spectacled eiders
Barrow Airport Expansion (2006)	Habitat loss	14 spectacled eider eggs/ducklings 29 Steller's eider eggs/ducklings
Barrow Hospital (2004 & 2007)	Habitat loss	2 spectacled eider eggs/ducklings 17 Steller's eider eggs/ducklings
Barrow Landfill (2003)	Habitat loss	1 spectacled eider nest/ year 1 Steller's eider nest/year
Barrow Artificial Egg Incubation	Removal of eggs for captive breeding program	Maximum of 24 Steller's eider eggs
Barrow Tundra Manipulation Experiment (2005)	Habitat loss Collisions	2 spectacled eider eggs/ducklings 1 Steller's eider eggs/ducklings 2 adult spectacled eiders 2 adult Steller's eiders
Barrow Global Climate Change Research Facility, Phase I & II (2005 & 2007)	Habitat loss Collisions	6 spectacled eider eggs/ducklings 25 Steller's eider eggs/ducklings 1 adult spectacled eider 1 adult Steller's eider
Barrow Wastewater Treatment Facility (2005)	Habitat loss	3 Steller's eider eggs/ducklings 3 spectacled eider eggs/ducklings
Savoonga Wind Turbine (2005)	Collisions	1 adult spectacled eider
Chukchi Sea Lease Sale 193 (2007)	Collisions	3 adult spectacled eiders 1 adult Steller's eider
ABR Avian Research/USFWS Intra-Service Consultation	Disturbance	5 spectacled eider eggs/ducklings
Pioneer's Oooguruk Project	Habitat loss Collisions	3 spectacled eider eggs/ducklings 3 adult spectacled eiders
BP's 69Kv Powerline	Collisions	10 adult spectacled eiders over 50 years
BP's Liberty Project	Habitat loss Collisions	2 spectacled eider eggs/ducklings 1 adult spectacled eider
Intra-service on Subsistence Hunting Regulations 2007	No estimate of incidental take provided	
BP Alaska's Northstar Project	Collisions	$\leq$ 2 adult spectacled eiders/year $\leq$ 1 adult Steller's eider/year
KMG Nikaitchuq Project	Habitat loss Collisions	2 spectacled eiders/year 7 adult spectacled eiders over 30 years
Akutan Transportation (2007)	Disturbance	20 adult Steller's eiders
Unalaska Harbor (2007)	Contaminants Collisions Habitat loss	3 adult Steller's eiders
Intra-Service Consultation 2007 on MBM Avian Influenza Sampling	Disturbance	6 spectacled eider eggs/ducklings
BLM 2007 Programmatic on Summer Activities in NPR-A	Disturbance	21 spectacled eider eggs/ducklings
Goodnews Bay Processor (2008)	Disturbance	28 adult Steller's eiders
Intra-service on Subsistence Hunting Regulations 2008	No estimate of incidental take provided	
BLM 2008 Programmatic on Summer Activities in NPR-A	Disturbance	56 spectacled eider eggs/ducklings
BLM 2009 Programmatic on Summer Activities in NPR-A	Disturbance	49 spectacled eider eggs/ducklings
BLM Northern Planning Areas of NPR-A (2008)	Disturbance Collision	87 spectacled eider eggs/ducklings/year 12 Steller's eider eggs/ducklings/year

		< 7 adult spectacled eiders < 1 adult Steller's eider
MBM/USFWS Intra-Service Consultation 2008	Disturbance	21 spectacled eider eggs/ducklings
NOAA National Weather Service Office in Barrow	Habitat loss Disturbance Collision	< 4 spectacled eider eggs/ducklings < 10 Steller's eider eggs/ducklings 1 adult Steller's eider
Intra-service on Subsistence Hunting Regulations 2009	No estimate of incidental take provided	
Intra-Service on Section 10 permit for USGS 2009 telemetry study	Loss of Production Capture/surgery	130 spectacled eider eggs/ducklings 4 adult spectacled eiders
MMS Beaufort and Chukchi Sea Program Area Lease Sales (2009)	Collision	12 adult spectacled eiders <1 adult Steller's eider
Intra-Service, Migratory Bird 2010 Subsistence Hunting Regulations	No estimate of incidental take provided	
Intra-Service, Section 10 permit for USGS telemetry research on spectacled eider use of the the Chukchi and Beaufort Seas (2010)	Loss of Production Capture/handling/ surgery	130 spectacled eider eggs/ducklings 7 adult/juvenile spectacled eiders (lethal take) 108 adult/juvenile spectacled eiders (non-lethal take)
BLM programmatic for activities between June 5 and Oct 31, 2010	Disturbance	32 Spectacled eider eggs
Intra-Service, Migratory Bird Management goose banding on the North Slope of Alaska (2010)	Disturbance	4 spectacled eider eggs/ducklings
Intra-Service, Section 10 permit for USFWS eider survey work at Barrow (2010)	Disturbance Capture/handling	3 Steller's eider or spectacled eider clutches 90 pairs + 60 hens, Steller's eider 60 pairs + 60 hens, spectacled eider 1 Steller's eider or spectacled eider adult (lethal take) 7 ducklings Steller's eider or spectacled eider (lethal take) 30 Steller's eider or spectacled eider hens (nonlethal take) 40 Steller's eider or spectacled eider ducklings (nonlethal take)
Intra-Service, Section 10 permit for ABR Inc.'s eider survey work on the North Slope and at Cook Inlet (2010)	Disturbance	35 spectacled eider eggs/ducklings
Intra-Service, Migratory Bird 2011 Subsistence Hunting Regulations	Shooting	400 adult Steller's eiders (lethal take) 4 adult spectacled eiders (lethal take)
Intra-Service, Migratory Bird Management Greater White-fronted Goose Banding, North Slope of Alaska, 2011	Disturbance	8 spectacled eider eggs/ducklings
Barrow Gas Fields Well Drilling Program, 2011	Loss of production	20 spectacled eider eggs/ducklings 22 Steller's eider eggs/ducklings
Olgoonik gravel pad and access road, Wainwright, Alaska, 2011	Loss of production	23 spectacled eider eggs/ducklings
Intra-Service, Section 10 permit for ABR Inc.'s eider survey work on the North Slope and at Cook Inlet (2011)	Disturbance	20 spectacled eider eggs/ducklings

Research
Scientific, field-based research is also increasing on the ACP as interest in climate change and its effects on high latitude areas continues. While many of these activities have no impacts on listed eiders as they occur in seasons when eiders are absent from the area, or use remote sensing tools, on-the-ground activities and tundra aircraft landings likely disturb a small number of listed eiders each year. Many of these activities are considered in intra-Service consultations, or under a programmatic consultation with BLM for summer activities in NPR-A.

The FWS has issued permits under Section 10 of the ESA to authorize take of endangered or threatened species for purposes of propagation, enhancement, or survival. Annual reporting requirements associated with §10 permits for both spectacled and Steller's eiders indicate 14 spectacled eider adults and 5 eggs have reportedly died as an indirect result of research activities since 1993 (due to the numerous amended actions and permits, and because of the variation and inconsistencies in reporting, accomplishing a precise tally of incidental take proved difficult).

From 1997 to present, the Service estimates approximately 1 Steller's eiders from the listed Alaska-breeding population has died incidental to research activities (based on a total of 37 Steller's eiders reportedly taken from the non-listed Pacific-wintering population, incidental to research activities, and the estimate that approximately 1% of the Pacific-wintering population are Alaska-breeding Steller's eiders). Since listing, there likely have been no listed Steller's eider adults intentionally taken (from a probabilistic standpoint), though there have been 16 permitted and 16 actual, direct and intentional takings of non-listed Steller's eider adults. Additionally, permits have been issued to salvage and opportunistically collect up to 68 Steller's eider eggs from the Alaska-breeding population for a captive breeding program at the Alaska Sea Life Center (ASLC). To date, 31 eggs have been taken. The eiders taken in these research programs have provided biological information and the eggs have been used to establish a captive breeding population of the species to ultimately improve our understanding of their reproduction in the wild and help future efforts to recover the species.

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 arctic water bodies are draining and drying out during summer as the underlying permafrost thaws (Smith et al. 2005, Oechel et al. 1995). Further, many are losing water

through increased evaporation and evapotranspiration resulting from longer ice-free periods, warmer temperatures, and longer growing seasons (Schindler and Smol 2006, Smol and Douglas 2007). Productivity of lakes and ponds appears to be increasing as a result of nutrient inputs from thawing soil and an increase in degree days (Quinlan et al. 2005, Smol et al. 2005, Hinzman et al. 2005, and Chapin et al. 1995). Changes in water chemistry and temperature are also resulting in changes in the algal and invertebrate communities that form the basis of the food web in these areas (Smol et al. 2005, Quinlan et al. 2005).

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

Changes in precipitation patterns, air and soil temperature, and water chemistry are also affecting tundra vegetation communities (Hinzman et al. 2005, Prowse et al. 2006, Chapin et al. 1995), and boreal species are expanding their ranges into tundra areas (Callaghan et al. 2004). Changes in the distribution of predators, parasites, and disease-causing agents resulting from climate change may have significant effects on listed species and other arctic fauna and flora. Climate change may also result in mismatched timing of migration and development of food in arctic ponds (Callaghan et al. 2004), and changes in the population cycles of small mammals such as lemmings to which many other species, including nesting Steller's eiders (Quakenbush and Suydam 1999), are linked (Callaghan et al. 2004).

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

5. EFFECTS OF THE ACTION ON LISTED SPECIES

This section of the biological opinion provides an analysis of the effects of the Action on listed species, and on critical habitat. Both direct effects (those immediately attributable to the Action), and indirect effects (those caused by the Action, but which will occur later in time, and are reasonably certain to occur) are considered. Finally, the effects from interrelated and interdependent activities are also considered. 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).

5.1 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 the USFWS and Eider Recovery Team with information that will better enable us to develop management actions to aid recovery. This project addresses high priority recovery actions as determined by the recovery team.

5.2 Direct Effects
Issuance of the section 10 permit would allow activities that may adversely affect spectacled eiders through disturbance, capture, and surgical procedures.

Helicopter operations
Helicopter landing and investigator activity on the tundra may adversely affect spectacled eiders through disturbance. Search and capture activities will be conducted in the middle of the brood rearing period when juveniles are conservatively ≥ 20 days old. We anticipate that each targeted brood will experience two helicopter landings and one take-off near their location before capture and a single take-off following capture.

Because the helicopter will be landing at a distance from these birds to avoid flushing them from the site, we do not anticipate disturbance from helicopter operations to result in significant disruptions in the behavior of the female and her brood.

For this project, it is estimated that up to 13 adult females and approximately 65 juveniles may experience disturbance from helicopter operations related to the location and capture of spectacled eiders within the Colville River Delta study area. No additional spectacled eider hens with broods are anticipated to be disturbed.

To summarize, no incidental take of spectacled eiders is anticipated due to helicopter operations.

Capture
Direct effects anticipated due to this activity include disturbance to hen and juveniles during the capture process. Spectacled eiders could be injured during the capture process, as no capture activity is without risk. Rarely, a bird may die during capture procedures or a bird may need to be euthanized. From 1992–1999, over 1,900 spectacled eiders were captured for various research studies using the similar techniques and 2 (0.1%) birds died (2008 proposed project study plan), thus we expect mortality to be extremely low. No injuries occurred in 2010 when USGS used similar procedures to capture 5 broods (19 juveniles). However, for the purpose of this BO, we estimate that no more than two spectacled eiders may be lethally taken as a result of capture activities. This is likely an overestimate, but there is the potential for injury during capture of the

brood in the mist net and dip-netting of juveniles, and it is possible injured birds would have to be euthanized.

To summarize, a total incidental take of 2 spectacled eiders (adults and juveniles combined) may be caused by capture activities.

Surgical Procedures

Last August (2010) was the first attempt to mark juvenile spectacled eiders with satellite transmitters. Three juvenile eiders died during or immediately following surgery, meeting the limit of mortalities on the 2010 Section 10 permit. USGS identified several factors that might have independently or collectively contributed to the mortalities including low body temperatures, sensitivity to intravenous anesthetic, and sub-optimal surgery conditions including low room temperatures, limited lighting, and condensation within the surgery tent. Protocols were adjusted in the field in 2010, after which there were no additional mortalities. USGS will implement revised surgery protocols in 2011 to further minimize surgery risks (see Section 2.3). However, the juvenile mortalities in 2010 might still be an indicator that there are age-specific responses to capture or surgery that are difficult to identify or measure (M. Sexson, USGS, pers. comm., 9 June 2011). Thus we will estimate incidental take of juveniles and adults separately.

Juveniles – There were 3 mortalities among 19 juvenile spectacled eider surgeries in 2010, resulting in a pre-release mortality rate (15.8%). Applying this rate to the proposed number of juveniles to be implanted with transmitters in 2011, we estimate incidental lethal take of 4 juvenile spectacled eiders ($25 \times 0.158 = 3.95$ juveniles eiders, rounded up to the nearest whole number).

Adult females – Using improved surgery techniques reduced surgical (1.3% of 230) and post-surgical (3.1% of 227) mortality from eider studies in 2000–2007 compared to previous years (2008 proposed project study plan). There were 0 pre-release mortalities among 82 adult SPEI surgeries in 2008–2010 (M. Sexson, USGS, pers. comm., 9 June 2011). For the purposes of this BO, we will use a pre-release (surgical) mortality rate derived from mortality data from 2000–2007 and 2008–2010 (previous years of the current study). Combined, there were 3 pre-release mortalities out of 312 adult surgeries (2000–2010; 0.96%). Applying this rate to the proposed number of adults to be implanted with transmitters in 2011, we estimate incidental lethal take of 1 adult spectacled eider ($10 \times 0.0096 = 0.1$ adult eiders, rounded up to the nearest whole number).

To summarize, a total lethal incidental take of 1 adult and 4 juvenile spectacled eiders may be caused by surgery.

Tissue Sample Collection

Multiple tissue samples will be collected from up to 78 captured eiders (following surgery for implanted birds), including blood (via venipuncture), feather, and claw samples using established techniques. Captured birds will be banded as well. The collection of samples and banding procedures are likely to result in harm to spectacled

eiders, but this harm is not likely to affect post-surgery recovery or fitness of the birds. Therefore, we do not anticipate incidental take related to these permitted activities.

To summarize, no incidental take of spectacled eiders is anticipated due to collection of tissue samples or banding procedures.

Orphaned broods

If a hen dies during capture activities or surgery, the survival of the orphaned juveniles may be compromised. However, juveniles that will be captured during the proposed action are expected to be approximately 5–6 weeks old, fully feathered, and within 1–2 weeks of flight. *Somateria* eiders typically abandon their broods around fledging at 6–7 weeks of age, and it doesn't appear that hens migrate to molting or wintering areas with their broods. Preliminary results from the fall 2010 telemetry data suggested that adult females did not migrate at the same time as their young (M. Sexson, USGS, pers. comm., 9 June 2011). Because captured juveniles will be close to fledging and maternal care is expected to be limited at this stage, we do not expect the loss of a hen to appreciably reduce survival of the orphaned juveniles.

Somateria eiders are known to form creches composed of multiple broods. There is evidence that the probability of survival is higher for eider ducklings in creches (Ost et al. 2008). Accordingly, USGS will attempt to release orphaned juveniles in a pond with another brood or creche to further improve their chance of survival.

To summarize, no incidental take of juvenile spectacled eiders is anticipated to result from lethal incidental take of a spectacled eider hen during capture or surgery.

Conclusion

Activities covered for the fourth year of the spectacled eider satellite telemetry study included in Recovery Permit # TE012158-0 could adversely affect spectacled eiders through disturbance (= harass), capture (harass, harm), tissue sample collection/banding (harass, harm) and PTT implantation (lethally harm). The experience of the crew and the precautions that they take during capture efforts minimize the probability of incidental mortality during disturbance, capture, and tissue sample collection. However, limited mortality during and post-surgery may occur.

5.3 Indirect Effects

Indirect effects of the action are defined as "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" (50 CFR §402.02). While the activities that may be authorized could lead to additional research in the future, they cannot be said to be reasonably expected to occur. Therefore, no indirect effects to listed eiders are anticipated to result from the proposed activities.

5.4 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.

6. 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.

7. CONCLUSION

After reviewing the current status of spectacled and Steller's eiders, the environmental baseline, effects of the proposed activities, and cumulative effects, it is the Service's biological opinion that the issuance of a section 10 permit to authorize the proposed activities is not likely to jeopardize the continued existence of spectacled eiders, and is not likely to result in destruction or adverse modification of designated critical habitat.

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 spectacled eiders.

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) Disturbance, capture, banding, and tissue sampling effects to the listed population of 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 that they typically take during mist-netting and capture efforts assure us that we should not expect any, or very low, incidental mortality of spectacled eiders during capture efforts. The mortality of an estimated one spectacled eider (see incidental take statement below) in association with the mist-netting and capture components of this study is believed to be an overestimate and will only occur in the highly unlikely scenario of injuries requiring euthanasia.

3) The mortality of an estimated 1 adult and 4 juvenile spectacled eiders in association with the telemetry aspect of this study is believed acceptable to the population (see

incidental take statement below). Additionally, the value of the information to be gained on timing of migration, seasonal movements, and, potentially, sex and age structure of molting and wintering flocks, offsets the costs of this activity.

4) Plans to monitor all activities conducted pursuant to this biological opinion will guide the development/refinement of measures designed to avoid/reduce impacts to spectacled eiders due to research activities.

Therefore, we do not expect the take of listed birds resulting from this action to cause jeopardy to either eider species.

The Eider Recovery Team has discussed this project and unanimously agrees that the telemetry information to be obtained will further recovery efforts for the spectacled eider and is considered to be of high priority. The study will identify the current distribution and movement patterns of listed spectacled eiders. This information is necessary to identify key areas within critical habitat used during the non-breeding season and will identify unknown areas used during spring staging. Information on molting, wintering, and spring staging locations is vital for understanding current and future threats to spectacled eiders, including threats related to climate change, commercial fishing, and oil and gas development. In view of this unanimous expert opinion and importance of the project findings, we conclude that this project will provide information that will actually promote recovery of this threatened species.

8. 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 U.S. Geological Survey (USGS), 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. The Service has a continuing duty to regulate the activity covered by this Incidental Take Statement. If the Service fails to assume and implement the terms and conditions, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the researchers 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 spectacled eiders through investigator disturbance during field work, mist-netting and capture, and surgery and may adversely affect Steller's eiders through investigator disturbance. The researchers may capture, surgical implant transmitters, and collect tissue samples from up to 45 spectacled eiders, which would constitute potential harassment/non-lethal harm. Additionally, up to 30 spectacled eider nests may be disturbed in association with field activities, which could result in egg loss. Estimating take of spectacled eiders from the proposed project activities is difficult, but information does exist from similar studies of spectacled eiders and other waterfowl, using similar techniques. Methods used to estimate incidental take for each of these are described in the *Effects of the Action on Listed Species* section. Table 2 provides a summary of the Service's incidental take estimates for spectacled eiders. Total lethal take of ≤7 individuals is estimated to occur from all project activities.

Table 2. The Service's estimates of non-lethal and lethal incidental take of spectacled eiders for the 2011 USGS telemetry study on the Arctic Coastal Plain.

	Juvenile		Adult	
Mechanism	non-lethal	lethal	non-lethal	lethal
Capture (harm)	65	2[a]	13	2[a]
Surgery (harm)	25	4[b]	10	1[b]

[a] lethal take for capture is not additive and will not exceed 2 spectacled eiders overall
[b] lethal take for surgery will not exceed 4 juvenile or 1 adult spectacled eiders

The population of North Slope-breeding spectacled eiders is estimated at 12,916 (10,942–14,890 95% CI; Stehn et al. 2006). Lethal incidental take estimates for the proposed action (7 spectacled eiders) would represent approximately 0.05% of the North Slope-breeding spectacled eider population. Accordingly, the Service believes that the estimated level of incidental take will not significantly affect the likelihood of survival and recovery of spectacled eiders and would not result in jeopardy to the species. The predicted level of incidental take may be reduced further by implementing the terms and conditions of this BO. However, the estimates of incidental take are based on limited data and consultation may need to be reinitiated, and the BO amended, if incidental take is higher than that predicted and authorized.

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

9. REASONABLE AND PRUDENT MEASURES

The Service believes that the following reasonable and prudent measures are necessary and appropriate to minimize impacts of incidental take of spectacled eiders:

1. All surgical procedures will be performed as outlined in the USGS standard protocol for coelomic implantation of satellite transmitters into birds (USGS 2006b).

2. All personnel working in the crew directly involved with capture, handling, and transmitter attachment will have previous experience with eider work, as indicated in the 2008 proposed project study plan and endangered species permit application.

10. TERMS AND CONDITIONS

In order to be exempt from the prohibitions of Section 9 of the Act, USGS must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions assume that the project implementation schedule follows that outlined in the *Description of the Proposed Action* section of this BO. These terms and conditions are non-discretionary:

1. At least 2 people will monitor the mist net during the entire time it is deployed.

2. All birds must be declared in good health and the veterinary surgeons will make the final decisions regarding implanting all individuals.

3. USGS standard operating procedures for coelomic implantation of satellite transmitters will be followed (USGS 2006b).

A report for all activities conducted under authority of this permit must be submitted to the Endangered Species Coordinator, Regional Office, by 31 December 2011. The report shall include the following sections: introduction, objectives, methods, results, conclusions, and recommendation for species recovery. Periodic (e.g. monthly) updates

on the locations of the transmitter-tagged birds should be made available to the Service, via e-mail, website access, or other means.

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 permittee 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 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) 456-0276 for instruction on the handling and disposal of the injured or dead bird.
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.

11. 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.

Conservation recommendations have not been developed prior to the initiation of this project. However, we expect that the researchers will employ “adaptive management” methods (Appendix C), to ensure that future research is conducted in a manner that will minimize harm to the birds and refine data collection and analysis methodologies, to improve the quality and value of future research.

12. REINITIATION NOTICE

This concludes formal consultation on the Arctic Coastal Plain spectacled eider telemetry study included in Recovery Permit # TE012158-0. 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 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.

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.

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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 humans and polar bears. 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. The MMPA and ESA both prohibit the "take" of polar bears without authorization. Take includes disturbance/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 human-bear 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 Sarah Conn (907) 456-0499 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. If this behavior is ignored, the polar bear may charge. Threatened animals may also retreat.

    - In rare instances you may encounter a *predatory* 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. Standing your ground, grouping together, shouting, and waving your hands may 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 using any deterrents available. If the attack is by a surprised female defending her cubs, remove yourself as a threat to the cubs.

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 U.S. Fish and Wildlife Service (Service) employees must have completed the Department of the Interior's (DOI) Bear and Firearm Safety Training course and be current in certification before engaging in field activities. Service staff must practice with and know how to use deterrents prior to conducting field work. If working in bear habitat, Service 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 Service 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. Service 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 Department of the Interior 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.

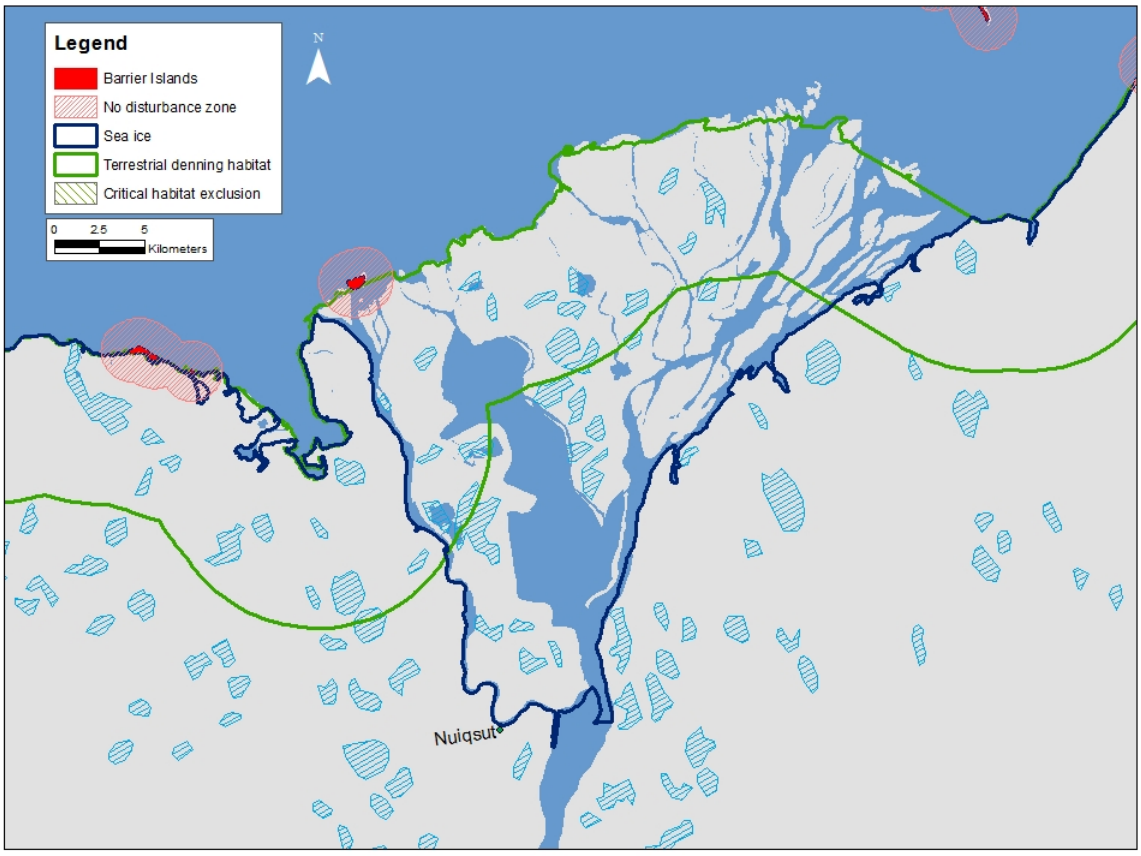


Figure A.1. Map showing designated polar bear critical habitat in the vicinity of the Colville River delta.

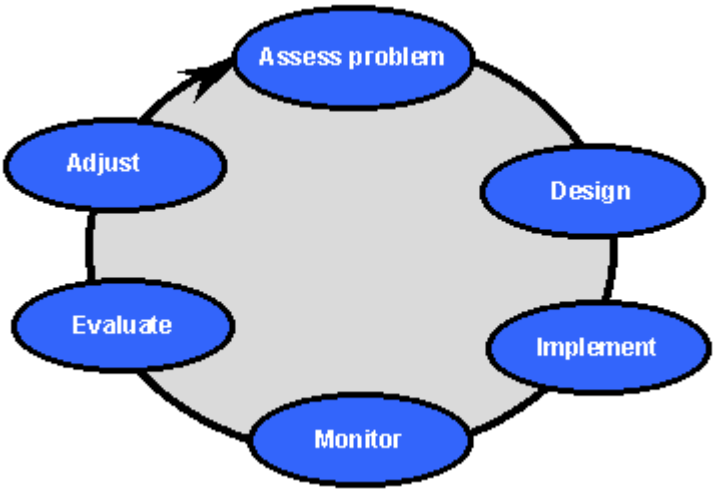
Appendix C.

DEFINITIONS OF ADAPTIVE MANAGEMENT

Adaptive management has been defined in various ways since its development in the early 1970s. We recognize that different people and organizations continue to have somewhat differing views of the best definition for their purposes. In order to bring some consistency and clarity to what we in the BC Forest Service mean when we say "adaptive management", we have decided to use a standard working definition for the term, as follows:

Adaptive management is a systematic process for continually improving management policies and practices by learning from the outcomes of operational programs. Its most effective form–"active" adaptive management–employs management programs that are designed to experimentally compare selected policies or practices, by evaluating alternative hypotheses about the system being managed.

We often portray the adaptive management process a six-step cycle, and emphasize that successful adaptive management requires managers to complete all six steps:



Some of the differentiating characteristics of adaptive management are:

1. acknowledgement of uncertainty about what policy or practice is "best" for the particular management issue,
2. thoughtful selection of the policies or practices to be applied (the assessment and design stages of the cycle),
3. careful implementation of a plan of action designed to reveal the critical knowledge that is currently lacking,
4. monitoring of key response indicators,
5. analysis of the management outcomes in consideration of the original objectives, and
6. incorporation of the results into future decisions.

Some other definitions

Bormann et al. 1994, p. 1: "...is 'learning to manage by managing to learn'..."

Halbert, C.L. 1993, p. 261-262: "...is an innovative technique that uses scientific information to help formulate management strategies in order to 'learn' from programs so that subsequent improvements can be made in formulating both successful policy and improved management programs."

Lee, K.N., 1993, p. 9: AM..."...embodies a simple imperative: policies are experiments; *learn from them*." (italics are the author's).

Lee K. N. and J. Lawrence, 1986, p 435: "...is a policy framework that recognizes biological uncertainty, while accepting the congressional mandate to proceed on the basis of the 'best *available* scientific knowledge'. An adaptive policy treats the program as a set of experiments designed to test and extend the scientific basis of fish and wildlife management."

Scientific Panel for Sustainable Forest Practices in Clayoquot Sound, 1995, p. 271: "The rigorous combination of management, research, and monitoring so that credible information is gained and management activities can be modified by experience. Adaptive policy acknowledges institutional barriers to change and designs means to overcome them."

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