BIOLOGICAL OPINION

for

Bureau of Land Management

for

The Northern Planning Areas of the National Petroleum Reserve-Alaska

July 2008

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1. INTRODUCTION

This document transmits the U.S. Fish and Wildlife Service's (Service) Biological Opinion (BO) in accordance with section 7 of the Endangered Species Act of 1973, as amended (ESA), on effects to Alaska-breeding Steller's (*Polysticta stelleri*) and spectacled (*Somateria fischeri*) eiders and polar bears (*Ursus maritimus*) of activities that may result from the Action described below. This document replaces the BOs for Northwest Planning Area of the National Petroleum Reserve-Alaska (NW NPR-A) signed on January 6, 2004, and Northeast Planning Area (NE NPR-A) signed on March 17, 1998, and the subsequent NE NPR-A BO signed on January 13, 2005 for the Bureau of Land Management's (BLM) Amended Integrated Activity Plan/Environmental Impact Statement (IAP/EIS).

Since the date of the Amended IAP/EIS for NE NPR-A, new information has become available regarding higher oil prices and corresponding greater estimates of economically recoverable oil in both the NE and NW NPR-A. In light of this new information, BLM has revised the reasonable foreseeable development scenarios (RFDs) for both NE and NW NPR-A, and has determined that a substantially greater amount of development, as described in the NE NPR-A IAP/SEIS, is likely to occur in both of these areas than previously projected. This greater amount of development may have effects on listed species in a manner, and to an extent, not previously considered. Since signature of the NW NPR-A ROD, and publication of the NE NPR-A IAP/SEIS, the polar bear has been listed as a threatened species. Accordingly, this BO evaluates the potential impacts of leasing, exploration, and oil and gas development in both NE NPR-A and NW NPR-A on Alaska-breeding Steller's and spectacled eiders and polar bears, which are listed as threatened under the ESA.

This document assesses potential impacts from oil and gas leasing, exploration, and development on listed species resulting from the implementation of Alternative D of the SEIS and the Action outlined in the NW NPR-A Record of Decision (ROD) in light of the new information described above (the Action). BLM and the Service believe that preparing a single BO for this Action will ensure a thorough and comprehensive analysis that accurately captures all potential effects on listed species that may result from the Action. This comprehensive analysis includes potential direct and indirect effects, cumulative effects, and effects of interrelated and interdependent activities on listed species based upon the constraints imposed by the required operating procedures (ROPs) and Stipulations (STIPs) that would govern management of exploration and development in NE and NW NPR-A. These potential impacts were added to the current status of the species and environmental baseline to provide an aggregative analysis of impacts to listed species.

NW and NE NPR-A contain 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. These species are not evenly distributed across the planning areas, but rather are found along the northern portion of the areas. While spectacled eiders are more abundant and broadly distributed across this area, Steller's eiders are less abundant and occur in greater density near Barrow. Polar bears, a marine mammal, make limited use of the coastal margins of the planning areas. A small number of females from both the Chukchi and Southern Beaufort Sea stocks establish maternity dens along coastal and river bluffs, and individual, non-denning polar bears also occur along the coasts of the planning areas, particularly in autumn.

Alternative D, the preferred alternative, of the NE NPR-A IAP/SEIS would make available 4.4 million acres of NE NPR-A for oil and gas leasing. The NW NPR-A ROD made all 8.8 million acres of BLM-administered lands in NW NPR-A available for oil and gas leasing, although leasing was deferred on approximately 17% of these lands. Any oil and gas activities and development that may result from lease sales in these areas will be governed by a series of performance based ROPs and STIPs. At the leasing stage, there is considerable uncertainty as to precisely where, how much, and in what manner subsequent development may occur, if it does occur. Therefore, in projecting future development and the impacts to listed species that may result, BLM has made reasonable assumptions in developing the RFDs. In addition, to avoid underestimating impacts to listed species, the Service has made certain reasonable, yet conservative assumptions about future development impacts. As such, the analysis in this BO is more likely to overestimate the impacts that may ultimately result to listed eiders than to underestimate them.

This BO is based on information provided in BLM's May 9, 2008 Biological Assessment (BA), the NE NPR-A IAP/SEIS, the NW NPR-A ROD, published literature, agency and consultant biological surveys and reports, and personal communications with species experts. Based on this information, the Service has determined that the Action is not likely to jeopardize the continued existence of species or result in the destruction or adverse modification of critical habitat. Section 7(a)(2) of the ESA states that Federal agencies must ensure that their activities are not likely to: 1) jeopardize the continued existence of any listed species, or 2) result in the destruction or adverse modification of designated critical habitat. Regulation adopted pursuant to section 7(a)(2) further clarify "jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR 402.02). To arrive at this "non-jeopardy" determination, we used a five-step approach for applying the section 7(a)(2) standards. The steps are as follows:

1. Define the biological requirements and current status of each listed species;
2. Evaluate the relevance of the environmental baseline to the species' current status;
3. Determine the effects of the proposed or continuing Action on listed species;
4. Determine whether the species can be expected to survive with an adequate potential for recovery under the effects of the Action when added to the environmental baseline, and any cumulative effects, and considering measures for survival and recovery specific to other life stages; and
5. Identify reasonable and prudent alternatives (RPAs) to a proposed and/or continuing Action when that Action is likely to jeopardize the continued existence of a listed

species. Thus, this step is relevant only when the conclusion of the previously described analysis for Step 4, above, is that the proposed Action would jeopardize listed species. The RPAs would have to reduce the impacts associated with the proposed Action to a level that does not jeopardize the species.

In applying this analysis to the Action here the Service did not reach this last step because the Action is not likely to jeopardize the continued existence of any listed species or result in adverse modification or destruction of critical habitat. However, adverse impacts to listed species are anticipated to result from the Action. The severity and magnitude of these impacts have been reduced by a number of ROPs and STIPs. For example, ROP E-17 precludes oil and gas development and gravel mining from portions of both planning areas that support high densities of spectacled eiders. This ROP will prevent impacts associated with habitat loss and disturbance in the most highly used spectacled eider breeding habitat in the planning areas. The STIP designating the Barrow triangle, (the area north of 70°50' and west of Dease Inlet), in NW NPR-A as restricted surface occupancy in future lease sales will protect breeding habitat for a significant proportion of the listed population of Steller's eiders. ROP E-11 will allow facilities to be sited on a local scale to further avoid listed eider habitat in both planning areas. Adverse impacts to polar bears are reduced by a number of ROPs including C-1 which protects denning females from disturbance resulting from winter activities.

The low numbers (thought to be several hundred birds) of the listed population of Steller's eiders, coupled with pressure from community growth, subsistence hunting, contamination of habitat by lead shot, as well as potential changes in marine wintering and molting habitat, is increasing the Service's concern about the status of the species (USFWS 2008b). Restricting oil and gas development activities in the Barrow triangle will minimize impacts from these activities in the core breeding area for Steller's eiders.

This BO provides incidental take authorization for listed eiders that may occur through habitat loss, disturbance, and collisions resulting from the Action. Although adverse effects to polar bears are anticipated, incidental take authorization is not provided in this BO because activities that may cause take must first be authorized under the Marine Mammal Protection Act (MMPA). Seismic, exploration, and some development activities that may occur in NPR-A have been reviewed under the MMPA through the current Chukchi and Beaufort Sea Incidental Take Regulations (ITRs), and authorization under the ESA for these activities described in these ITRs is provided in the intra-Service programmatic consultations on these ITRs.

Although the Service concludes the Action is not likely to jeopardize the continued existence of listed species, there is considerable uncertainty at the lease sale stage about the type, location, and magnitude of activities that may result from the Action. The no jeopardy conclusion assumes: 1) the RFDs accurately estimate the level of development which will actually occur; 2) the ROPs and STIPs will be fully implemented; and 3) other assumptions (see Appendix 1) used for the analysis in this BO remain valid. Changes to any of these three factors that suggest impacts to listed species have been underestimated may trigger the obligation to reinitiate section 7 consultation in accordance with 50 CFR 402.16.

A chronology of consultation actions is provided in Appendix 2. 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 contact Ted Swem, Endangered Species Branch Chief, Fairbanks Fish and Wildlife Field Office at (907)456-0441.

2. DESCRIPTION OF THE PROPOSED ACTION

2.1 Background

Section 7(a)(2) of the ESA requires Federal agencies to ensure 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 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) and/or the Service, depending upon the protected species that may be affected.

For the Action described in this document, the action agency is the BLM, and consultation is being conducted with the Service. This section of the BO describes the Action Area and activities that may occur as a result of oil and gas lease sales in this area.

2.2 Action Area

The Action Area is the area in which direct and indirect effects of the Action upon listed species may occur. The Action Area for this consultation is the 13.4 million acres of northern Alaska and its nearshore waters comprising NW and NE NPR-A (Figure 2.1), and Ledyard Bay Critical Habitat Unit (LBCHU) located in the Chukchi Sea adjacent to NPR-A.

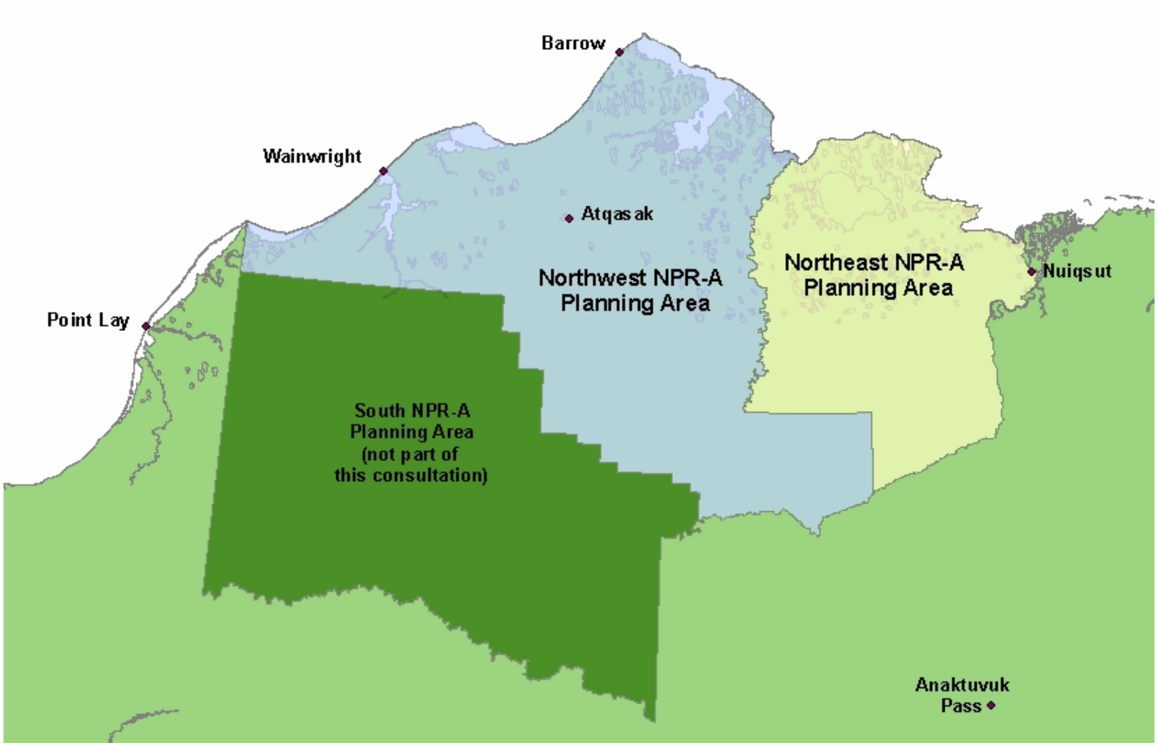

Figure 2 .1 – Map of the NPR-A Planning Areas

2.3 Areas Available for Oil and Gas Leasing

The NE NPR-A IAP/SEIS would make approximately 3.94 million acres of the planning area immediately available for oil and gas leasing. An additional 430,000 acres will be deferred from leasing for 10 years after signing of the ROD. Parts of the planning area, particularly in and around Teshekpuk Lake, have significant development restrictions that aim to protect goose molting habitat, caribou movement corridors, and caribou calving areas. There are several management designations in the planning area: 1) available for leasing, 2) unavailable for leasing (UL), and 3) restricted surface occupancy (RSO), where leases can be sold, development can occur, but surface structures are limited to pipelines and occasionally roads. Figure 2.2 illustrates the leasing constraints of lands in NE NPR-A, with the exception of ROP E-17.

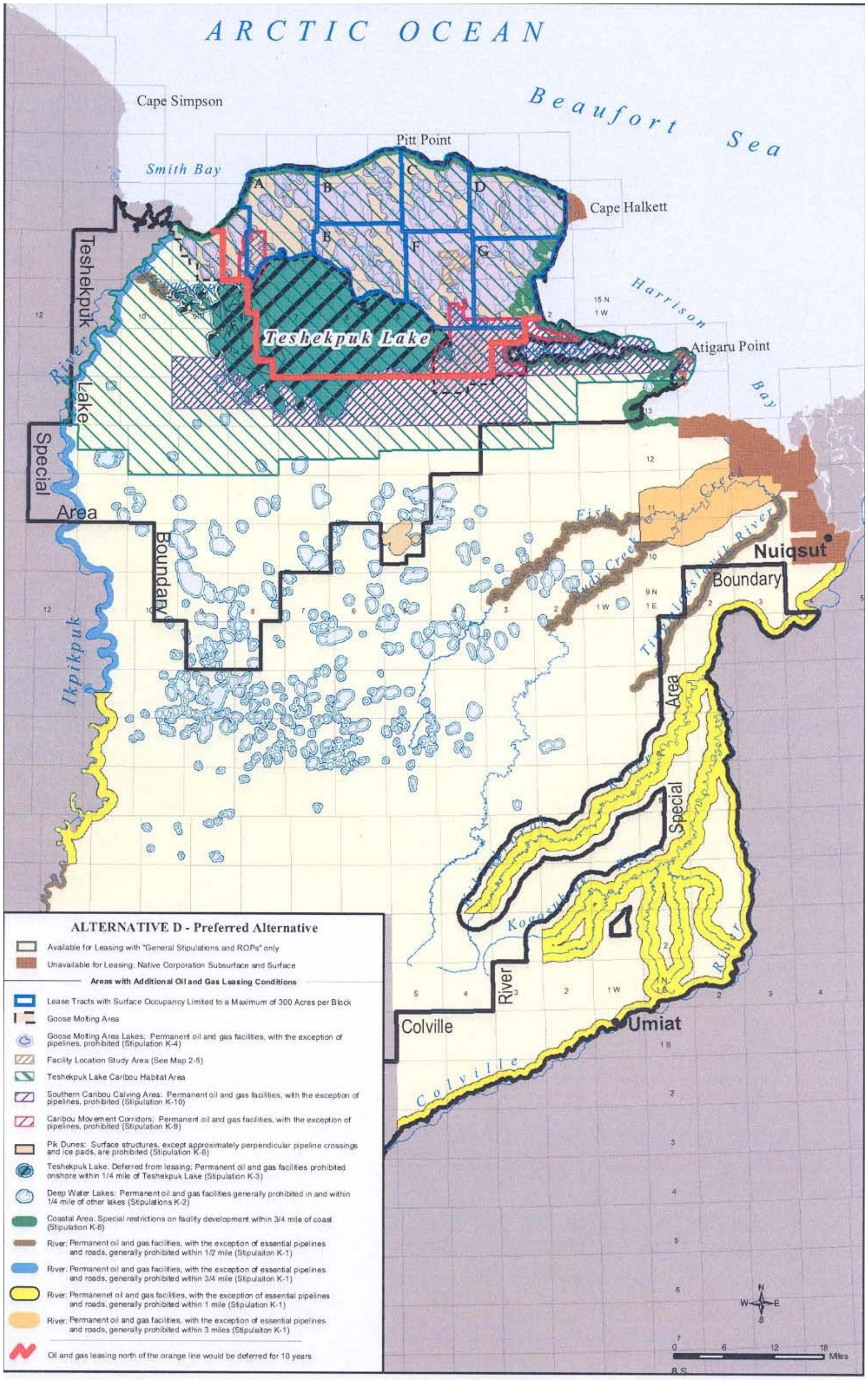

Figure 2.2 – Map illustrating the lease status of lands in the NE NPR-A

The 2004 NW NPR-A ROD made available all 8.8 million acres of BLM-owned lands for oil and gas leasing. These lands include areas where BLM manages only subsurface mineral resources, as well areas where BLM manages the surface and subsurface estate. The ROD deferred leasing for 10 years on a 1,570,000-acre area near Wainwright, and an additional 1,151,000 acres were designated as RSO (described as No Surface Occupancy (NSO) in the ROD). Figure 2.3 illustrates the lease status of lands in NW NPR-A with the exception of the Barrow triangle restrictions.

2.4 Reasonable and Foreseeable Development Scenarios

While leasing of land for oil and gas development has no direct impacts, it sets the stage for future authorization of a series of activities in NE and NW NPR-A from exploration through construction, production, and abandonment of oil and gas facilities. The potential impacts of these activities on listed species are evaluated in this BO. The amount and methodology of exploration and development that may result from the Action is based on a set of informed assumptions. These were used by BLM to develop RFDs, which in conjunction with the ROPs and STIPs, guide oil and gas development and provide a framework against which analysis of potential impacts was conducted.

For a complete description of the RFDs readers are referred to the Final Biological Assessment (BLM 2008) and the NE NPR-A IAP/SEIS (BLM 2007). BLM estimates that without management constraints there are 4.3 billion barrels (bbl) of economically recoverable oil in NE NPR-A and 3.7 billion barrels in NW NPR-A. These estimates are based on the assumption that oil prices above $50/bbl will not increase the amount of economically recoverable oil, and hence development, in the Action Area.

To construct the RFDs for these resources, BLM made a series of assumptions based on:

1. Knowledge of the largely unexplored oil endowment of the Action Area;
2. Current industry practices; and
3. Best professional judgment.

A list of assumptions that underpin the RFDs and subsequent analysis is provided in Appendix 1.

BLM anticipates individual development projects will be similar to ConocoPhillips's Alpine field, where each field has one central processing facility (CPF) linked with up to 10 satellite facilities. An airstrip will be constructed at the CPF, and satellite facilities will be connected to the CPF by road and pipelines.

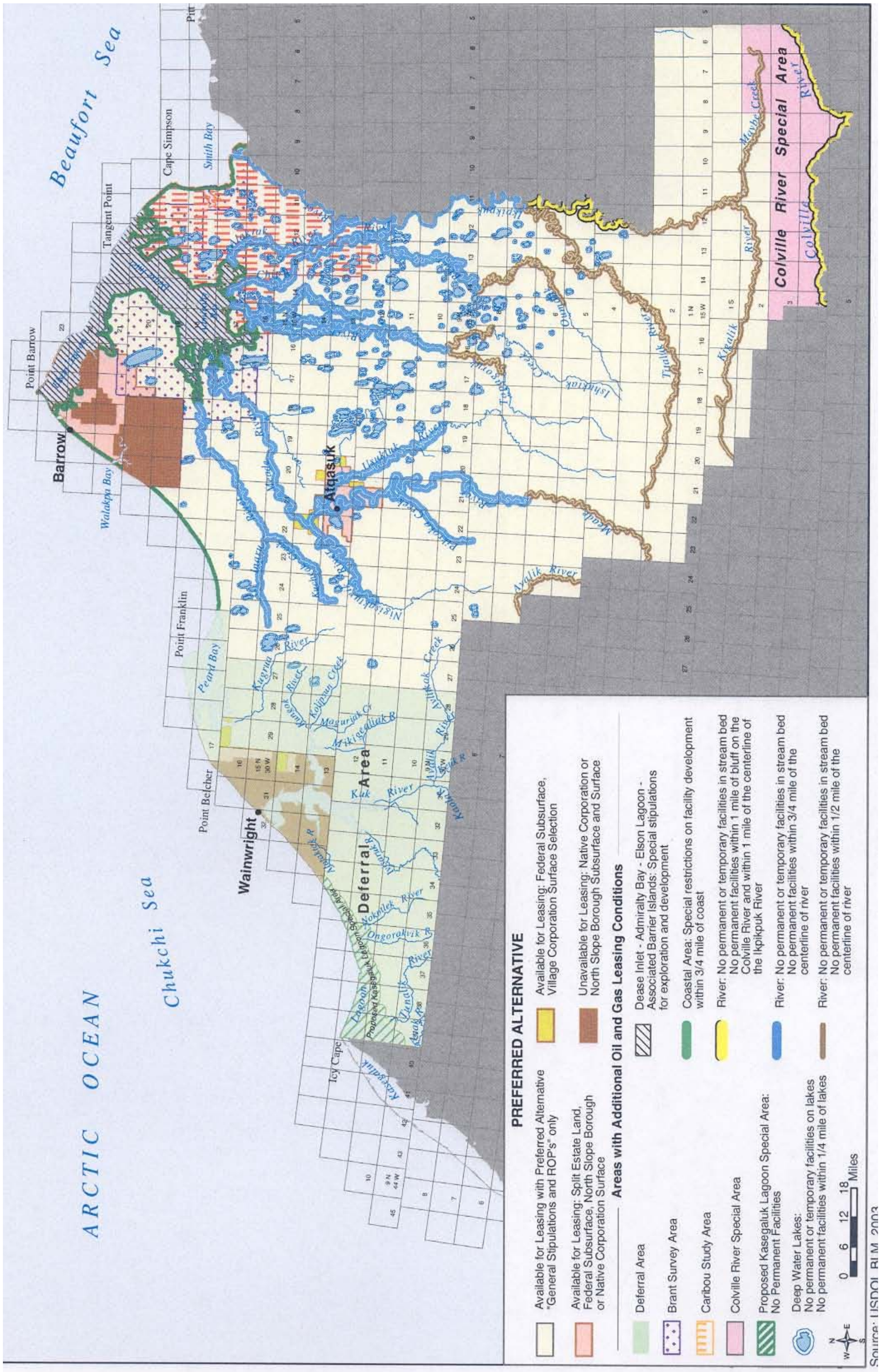

Figure 2.3 – Map illustrating the lease sale status of lands in the NW NPR-A

BLM estimates that a maximum of 6 CPFs and 32 satellites would be developed in NE NPR-A, and 6 CPFs and 30 satellites in NW NPR-A. From the CPF, oil would be transported along pipelines to the Trans-Alaska Pipeline System (TAPS), or a TAPS tie-in location such as Alpine. While this development scenario focuses on oil, BLM anticipates that very little additional infrastructure (1 gas compressor station in NE and 1 in NW NPR-A) would be required to develop commercial gas. Gas pipelines would likely be buried and run adjacent to oil pipelines. Table 2.1 provides an estimate of the amount of exploration and development that would occur under the RFDs.

2.5 Stages of Development

The RFDs assume development in NE and NW NPR-A will take many decades, and result from numerous lease sales. Multiple projects could occur simultaneously in different areas. There are four stages in each project developed:

(a) Exploration;
(b) Construction and well drilling;
(c) Production; and
(d) Abandonment.

BLM anticipates the following progression of activities for each field:

- Exploration = 10 years
- Construction of CPF = 4 years
- Construction of individual satellites = 2 years
- CPF production = 50 years
- Satellite production = 25-33 years (29 year average)
- Abandonment = 5 years

The activities anticipated in each project stage are summarized below. For a more complete description, the reader is referred to BLM's BA and IAP/SEIS.

2.6 Activities during each Project Stage

Exploration – Seismic Surveys

The majority of the Action Area has been mapped by 2-dimensional (2-D) seismic surveys and it is likely that any additional seismic work would involve more intensive 3-dimensional (3-D) surveys. 3-D surveys require a dense grid of seismic lines to provide a more detailed image of the area's subsurface. Surveys are carried out in winter using all-terrain vehicles. Vibroseis and airguns generate and direct energy into the ground, while instruments record the returning seismic waves.

Following the end of each winter seismic season, equipment is moved to a staging area for storage and maintenance. In summer, crews fly to these staging areas via fixed-wing planes or helicopters to carry out equipment repairs and maintenance before the equipment is cold stacked until winter.

Table 2.1 – Estimated surface disturbance for oil and gas related activities that may result from the Action

(Table footnotes are provided on the following page)

Type of Action	Alternative D			NW Selected Alternative			Action (both Alternatives)		
	No.	Short Term Disturbance (acres)	Long Term Disturbance (acres)	No.	Short Term Disturbance (acres)	Long Term Disturbance (acres)	No.	Short Term Disturbance (acres)	Long Term Disturbance (acres)
Oil Exploration Wells[1] (6 acres each)	110	660	–	94	564	–	204	1224	0
Oil Delineation Wells[2] (6 Acres Each)	83	540	–	71	426	–	154	966	0
Exploration/Delineation Drilling Rigs	7	–	–	6	–	–	7	–	–
Central Processing Facility[3] (90 acres each)	6	540	540	6	540	540	12	1080	1080
Gravel Production Pads[3] (10 acres each)	32	320	320	31	310	310	63	630	630
Gravel Runway[4] (11 acres each)	6	66	66	6	66	66	12	132	132
Ice Runway[5] (11 acres each)	30	330	–	30	330	–	60	660	–
Ice Roads[6] (miles)	6162	18672	–	6800	20600	–	12962	39272	–
In-field Gravel Roads[7] (miles/7.75 acres/mile)	320	2480	2480	310	2400	2400	630	4880	4880
Production Drilling Rigs	2	–	–	2	–	–	4	–	–
Three-phase Produced Fluids (oil, gas, water) Gathering Lines[8] (miles)	320	972	1	300	912	1	620	1884	2
Sales Oil Pipelines[9] (miles)	162	491	1	295	893	1	367	1113	2
Pump Stations[10] (20 acres each)	6	120	120	6	120	120	12	240	240
Gas Compressor Stations (20 acres Each)	1	20	20	1	20	20	1	20	40
Staging bases[11] (50 acres each)	3	150	150	3	150	150	6	300	300
Gravel pits[12] (50 acres each)	14	700	700	13	650	650	27	1350	1350
Total Acres of Disturbance		**26061**	**4398**		**27981**	**4258**		**53751**	**8656**

* These figures provide realistic estimates for impact analysis purposes that make it very unlikely that this Supplemental IAP/EIS will underestimate impacts. For seismic survey potential disturbance area, see NE SEIS Table 4.2-F.

[1] Ratio between the oil resource estimates from Table 4-4 and the conventionally recoverable oil resource estimate (4,300 MMbbl) x conventionally recoverable exploration well count (128 wells; NE SEIS Table 4.2-E). Using Alternative D as an example: 3,700 MMbbl/4,300 MMbbl x 128 exploration wells = 110 exploration wells (high end). Long-term acreage disturbance not calculated but assumed to be negligible

[2] Assume delineation well count (by Alternative) is 75% of exploration well count. Alternative D = (0.75 x 110 exploration wells) = 83 delineation wells (high end). Long-term acreage disturbance not calculated but assumed to be negligible

[3] Number of CPFs estimate based on volumes from Resource Estimates by Alternative (NE SEIS Table 4.2-D). As assumed in this analysis, one CPF represents 350 MMbbl of recoverable oil. See Table 4.2-E for assumptions and calculations regarding the number of CPFs. Acreage does not include gravel runway.

[4] Assume each CPF has one gravel runway 100 ft wide x 5,000 ft long = 11 acres.

[5] Assume the number of ice runways ranges from 1 to 4 (Alternative dependent) per year during the 10-year exploration phase (NE SEIS Table 4.2-B). Ice runway = 100 ft wide x 5,000 ft long = 11 acres. Long-term acreage disturbance not calculated but assumed to be negligible

[6] Assume: (50 miles of ice road x 10 yrs of exploration x #CPFs) + (50 miles of ice road x 10 yrs of main field and satellite development x #CPFs) + (# of pipeline miles per alternative). For example: Alternative A = (50 miles x 10 yrs exploration x 5 CPFs) + (50 miles x 10 yrs development x 5 CPFs) + (162 miles of pipeline) = 5,162 miles total. Long-term acreage disturbance not calculated but assumed to be negligible.

[7] Assume 10 miles of gravel roads per satellite production pad. Typical Alpine field gravel road = 64 feet wide (measured from the base) x 1 mile x 5,280 ft/mi = 7.75 acres/mile of road.

[8] Assume 10 miles of in-field gathering lines per satellite production pad. VSM diameter of 12 in (area = πr^2 = 3.14 x 36 sq in = 113 sq in = 0.785 sq ft). Short-term disturbance per satellite production pad = (25 ft-wide ice road x 5,280 ft/mi x 10 mi) + (0.785 sq ft x 150 VSMs/mi x 10 mi) = 30.4 acres/satellite production pad. Long-term disturbance per satellite production pad = (0.785 sq ft x 150 VSMs/mile x 10 miles) = 0.028 acres/satellite production pad.

[9] Assume 72 to 182 miles of transmission pipeline based solely on geologic play potential, Figure 4-2 represents speculative pipeline corridors in the NPR-A. No implications regarding specific hydrocarbon prospect location is intended. VSM diameter of 12 in (area = πr^2 = 3.14 x 36 sq in = 113 sq in = 0.785 sq ft). Short-term disturbance per 72 miles of pipeline = (25 ft-wide ice road x 5,280 ft/mi x 72 mi) + (0.785 sq ft x 81VSMs/mi x 72 mi) = 218 acres. Long-term disturbance per 72 miles = (0.785 sq ft x 81 VSMs/mile x 72 miles) = 0.11 acres.

[10] Assume each CPF has one 20-acre pump station.

[11] Assume 1 to 4 staging bases of 50 acres each to be used during 10 year exploratory phase (NE SEIS Table 4.2-B).

[12] A 50-acre borrow pit 20 feet deep = 1.6 million cu. yds. Alternative A requires 18 million cu. yds. of gravel (10,000 cu. yds. x 90 acres x 5 CPFs = 4.5 million cu yds.; 10,000 cu. yds. x 10 acres x 23 pads = 2.3 million cu yds.; 10,000 cu. yds. x 11 acres x 5 airstrips = 0.55 million cu yds.; 10,000 cu. yds. x 50 acres x 2 staging area = 1million cu yds.; 41,000 cu. yds. x 10 acres x 28 in-field roads = 9.4 million cu yds.); 18 million cu. yds/1.6 million cu. yds. = 11 gravel pits.

Exploration – Exploratory Drilling

Exploratory drilling would take place in winter. Access to drill sites is via ice roads constructed by spreading water and ice chips from lakes along the route. Ice pads are then constructed using similar methods, and serve as a platform for drill rigs, equipment storage, and camps. Ice airstrips may also be constructed near drill sites to allow transportation of supplies, equipment, and personnel to and from the site. Drilling materials (mud and cuttings) would be reinjected into dry drill holes. If drilling is successful the well would be temporarily capped, and mud and cuttings removed from the site to an approved disposal facility.

At the end of the exploration season, ice pads and drill equipment may be over-summered *in situ*, or equipment may be moved to a staging area. As with seismic surveys, crews would fly to staging areas/summer pads via fixed wing or helicopters and carry out equipment repairs and maintenance. The ice road right-of-way and ice pad locations are surveyed the summer before construction, and clean up crews remove all debris and garbage along the routes with the aid of helicopters the summer after construction.

Construction and Well Drilling

A company may move to the construction phase if exploration results in the discovery of an economically viable field. The RFDs assume larger fields would be developed first, and would serve as CPFs, with subsequent smaller satellite fields connecting to a CPF. The CPF is a stand-alone facility that can separate oil from water and gas, handle wastes, and transport oil and through pipelines to TAPS or another tie-in facility. Each CPF would consist of an 11-acre gravel airstrip and a 90-acre gravel pad supporting wells, processing and camp facilities, tanks for fuel and water, maintenance equipment, generators, storage, and a communications center including a 60-foot tall communications tower with marked guy wires.

Satellite fields each comprise a 10-acre gravel pad supporting production wells, and will likely be connected to a CPF via a gravel road. Engineering constraints require that satellite fields are located within 20 miles of a CPF. However, they may be significantly closer, and BLM has assumed an average distance of 10 miles between a satellite and CPF.

Construction of gravel pads, roads, and airstrips will take place in winter using ice roads to haul gravel from material sites to project locations. BLM estimates that 14 50-acre material sites would be developed in NE NPR-A and 13 in NW NPR-A. Equipment and materials for the project will likely be barged to a suitable staging area on the North Slope before winter transport to the project site. BLM estimates that each CPF may require two sealifts of materials each comprising of 20-50 barges. Once the gravel is laid and materials are onsite, construction will continue year-round.

Pipeline construction is also expected to occur in winter. Oil pipelines would be aboveground, mounted on vertical support members (VSMs) placed a minimum of 7 feet above the ground surface. BLM anticipates any commercial gas pipelines would be buried and follow the route of oil pipelines. BLM estimates 162 miles of oil sales pipeline and 320 miles of gathering lines would be constructed in NE NPR-A, and 295 miles of sales pipeline and 300 miles of gathering pipeline in NW NPR-A. If development occurs in both areas, an estimated 90 miles of sales pipeline would be shared, reducing total pipeline miles.

Development drilling will begin once initial facilities are in place. Only one drillrig can operate on each pad, and BLM anticipates it could take three or four years for well drilling on a CPF to be complete and production to commence. Aircraft operations at a CPF are anticipated to be at their highest during the construction and development drilling phase (BLM 2008, Table 1).

Production

BLM anticipates aircraft and vehicle traffic will be lower during production than during construction and development drilling. Activities would be centered at CPFs. Planned pipeline maintenance would take place in winter when they are accessible by ice road or hardened snow trail. Weekly inspection overflights would occur throughout the year. Oil spill response training involving up to 40 personnel, aircraft, and possibly boats would occur. The duration and frequency of these training events is uncertain, but BLM estimates they would take place over two days each summer. No solid or liquid wastes would be disposed of at a CPF or satellite facility; they will be transported to a permitted landfill, and organic wastes may be incinerated. During construction and production phases, compliance inspections by BLM and other resource agencies may occur.

Abandonment

Abandonment and reclamation of satellite fields would likely coincide with abandonment and reclamation of corresponding CPFs. All oil and gas facilities and equipment will be removed via winter ice road. Well casings will be cut a minimum of 3-feet below ground surface and wells plugged. Lease ROP G-1 requires sites to be rehabilitated to as near original condition as practicable subject to review by BLM's Authorizing Officer (AO). Post abandonment monitoring, consisting of a one-day site visit via helicopter, would take place for 10 years after abandonment.

2.7 Location of Development

At the leasing stage it is difficult to predict where development will occur, should it actually occur. Geological mapping of the Action Area suggests the northern third of NE NPR-A has a high potential for the occurrence of petroleum resources. BLM describes NW NPR-A as having a much lower economic potential on a per-acre basis than NE NPR-A, and no high potential areas have been defined.

Lease sales were held in NE NPR-A in 1999 and 2002, and in 2004 and 2006 in NW NPR-A. Some of the sold lease blocks have subsequently been relinquished (Figure 2.4). Lease sales suggest industry interest in the northern portions of each planning area and to the south near Umiat (Figures 2.4). Although the Action allows development in the immediate offshore area and areas such as Dease Inlet, Admiralty Bay, and Elson Lagoon, the RFDs do not predict any offshore production facilities. As described above in *Section 2.3* and illustrated in Figures 2.2 and 2.3, development cannot occur on lands unavailable for leasing, and may be limited by surface occupancy restrictions.

In summary, because there is uncertainty at the lease sale stage as to how much, and specifically where development will actually occur, the Service has made certain conservative assumptions about the locations of development activities so as to ensure that impacts to listed species are not underestimated. These assumptions include: 1) that all development will occur in the portion of the Action Area that supports breeding listed eiders; and 2) will not occur in areas that have been designated as UL or RSO.

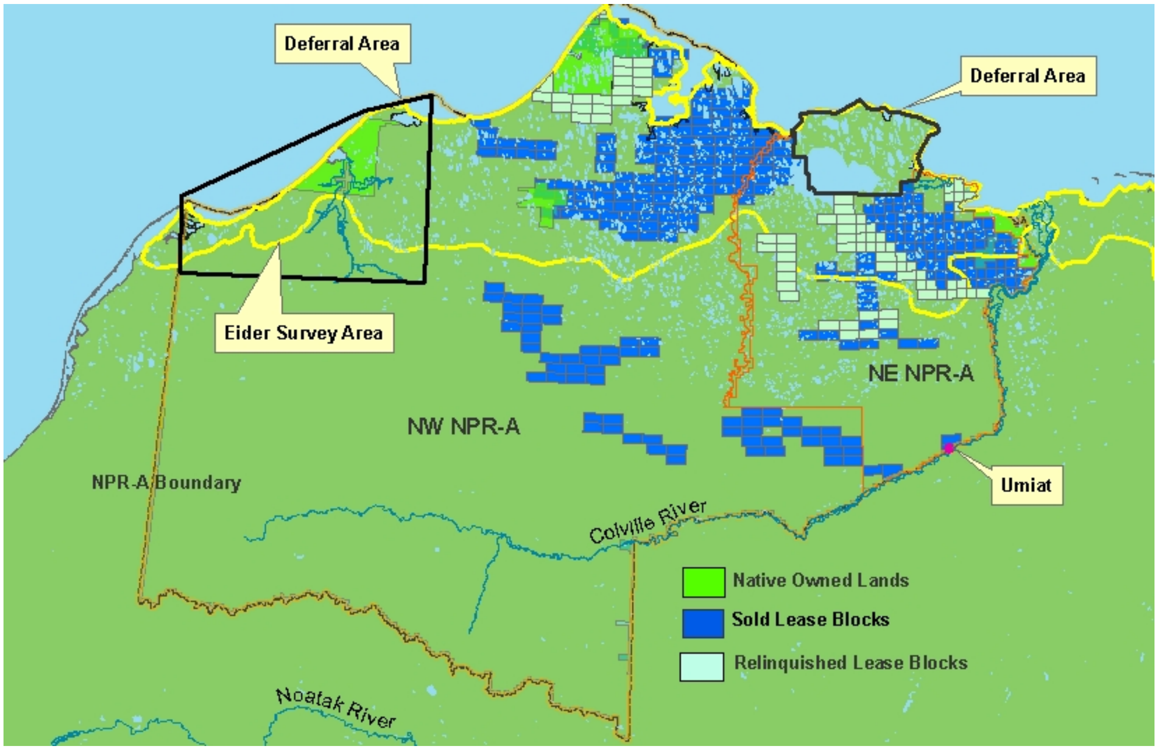

Figure 2.4 – Location of Sold and Relinquished Lease Blocks in NPR-A

3. STATUS OF SPECIES

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

Spectacled Eider

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 3.1).

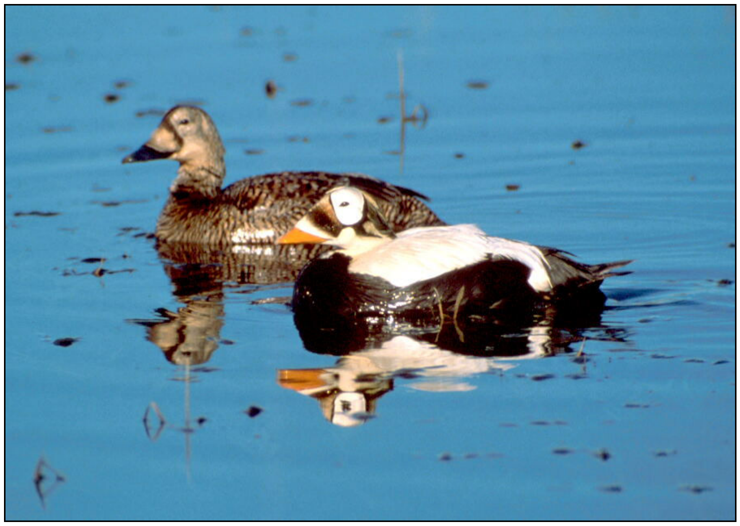

Figure 3.1 - Male and female spectacled eiders in breeding plumage.

Distribution and Status

Spectacled eiders inhabit the North Pacific. There are three primary breeding populations; those on Alaska's North Slope, the Yukon-Kuskokwim Delta (Y-K Delta), and northern Russia. The entire species was listed throughout its range as threatened on May 10, 1993 (Federal Register 58(88):27474-27480) 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). 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). Although a modeling exercise estimated the global population could theoretically be as high as 612,120 (Stehn et al. 2006).

Spectacled eiders molt in several discrete areas (Figure 3.2), 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 3.2), where they remain until March and April (Lovvorn et al. 2003).

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 3.2 - Distribution of spectacled eiders (USFWS 2002a).

North Slope Breeding Population

Spectacled eiders arrive on their North Slope breeding grounds in late May and early June. Although migratory movements between the wintering area and the North Slope are poorly understood, it is likely that spectacled eiders follow open water in order to rest and feed en route. Recent information about spectacled and other eiders indicates that they probably make extensive use of the eastern Chukchi spring lead system. Limited spring aerial observations in the eastern Chukchi have documented dozens to several hundred common (*Somateria mollissima*) and spectacled eiders in spring leads and several miles offshore in relatively small openings in rotting sea ice (William Larned, USFWS; James Lovvorn, University of Wyoming, pers. comm.). Woodby and Divoky (1982) documented large numbers of king (*Somateria spectabilis*) and common eiders using the eastern Chukchi lead system, advancing in pulses during days of favorable following winds, and concluded that an open lead is probably requisite for the spring eider passage in this region. From the Chukchi Sea the route of spectacled eider spring migration is not well understood. Based on the lack of observations of spectacled eiders at Barrow, Woodby and Divoky (1982) suggested they may migrate overland south of Point Barrow. Based on their radar studies at Oliktok Point on the coast of northern Alaska, Richardson and Johnson (1981) suggest that migration occurs over a broad front. A relatively even density of eiders moving east was observed 25 km offshore to 25 km onshore (the limits of the radar view). The near complete ice cover of the Beaufort Sea makes the coastline indistinguishable from the flat, snow covered ACP, and affords no resting or feeding areas. This compares to the Chukchi Sea where spectacled and other eiders are thought to concentrate in the lead system.

Nest initiation is thought to occur in the third week of June on the North Slope (Petersen et al. 2000). 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). Ducklings leave the nest 1-2 days after hatching (Petersen et al. 2000).

On the nesting grounds, spectacled eiders feed on mollusks, insect larvae, 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, when females with broods move from freshwater to marine habitats.

Abundance and Distribution on the North Slope

Spectacled eider density varies across the North Slope (Figure 3.3). Aerial surveys targeting eiders have been conducted annually by the Service since 1992. These surveys suggest the population was relatively stable between 1993 and 2007, with an average (n=15) annual growth rate of 0.987 (0.969-1.005 90% C.I.).

The most recent (2002-2006) population index[1] for North Slope breeding spectacled eiders is 6,458 (5,471-7,445 95% CI). This index was adjusted by a factor that accounts for the number of nests missed during aerial surveys[2] (developed for the Y-K Delta) and used to calculate a North Slope breeding spectacled eider population estimate of 12,916 (10,942-14,890 95% CI) (Stehn et al. 2006).

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

[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.

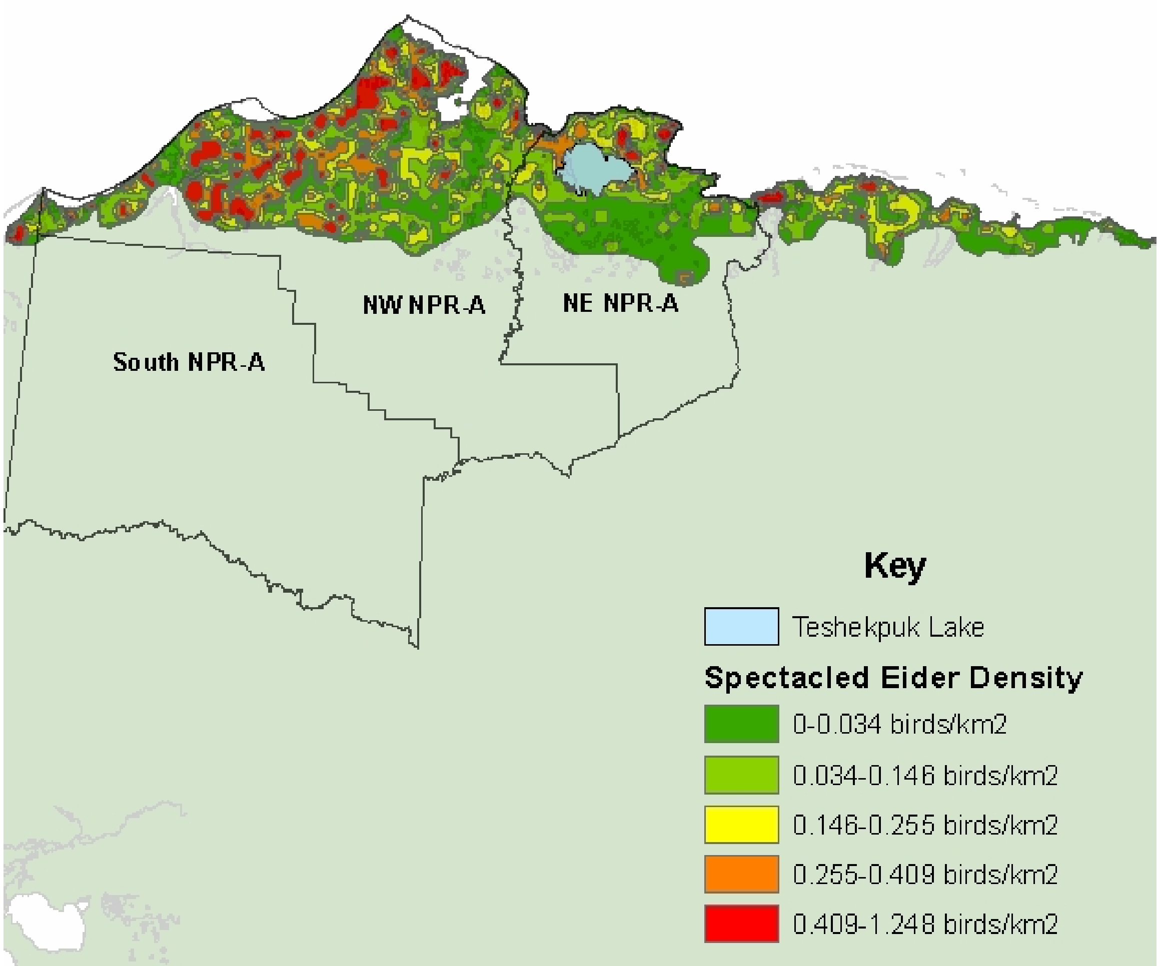

Figure 3.3 - Spectacled eider density on Alaska's North Slope from 1993-2005 (Service Data).

Molt Migration

Males generally depart breeding areas when the females begin incubation in late June (Anderson and Cooper 1994, Bart and Earnst 2005). Use of the Beaufort Sea by departing males is variable. Some appear to move directly to the Chukchi Sea over land, while the majority moved rapidly (average travel of 1.75 days), over nearshore waters from breeding grounds to the Chukchi Sea (TERA 2002). Of 14 males implanted with satellite transmitters, only four spent an extended period of time (11–30 days), in the Beaufort Sea (TERA 2002). Preferred areas for males appeared to be near large river deltas such as the Colville River where open water is more prevalent in early summer when much of the Beaufort Sea is still frozen.

Females generally depart the breeding grounds later, when much more of the Beaufort Sea is ice-free, allowing for more extensive use of the area. Females spent an average of two weeks in the Beaufort Sea (range 6-30 days) with the western Beaufort Sea the most heavily used (TERA 2002). Females also appeared to migrate through the Beaufort Sea an average of 10 km further offshore than the males (Peterson et al. 1999). Moving further offshore and the greater use of the Beaufort Sea by females were attributed to the greater availability of open water when females depart the area (Peterson et al. 1999, TERA 2002).

Critical Habitat

Critical habitat has been designated for spectacled eiders. Two units on the Y-K Delta were designated to protect breeding areas, the Ledyard Bay and Norton Sound units protect molting areas, and the final unit, south of St. Lawrence Island, comprises the wintering area for the species.

Causes of Population Decline

Although causes of spectacled eider population decline are unknown, 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 Y-K Delta (Franson et al. 1995, Grand et al. 1998), and other factors such as over harvest, disturbance, and collisions with human-built structures. Productivity may also be impaired by habitat loss and increased nest predation.

Steller's Eider

Physical Appearance

The Steller's eider is the smallest of the four eider species. From early winter until mid-summer males are in breeding plumage - black back, white shoulders and sides, chestnut breast, white head with black eye patches and a greenish tuft (Figure 3.4). During late summer and fall, males molt to dark brown with a white-bordered blue wing speculum; this plumage is replaced during the autumn molt when males re-acquire breeding plumage, which lasts through the next summer. Females are dark mottled brown with a blue wing speculum year round. Juveniles are dark mottled brown until the fall of their second year, when they acquire breeding plumage (Fredrickson 2001).

Figure 3.4 - Male and female Steller's eider in breeding plumage.

Distribution and Status

Steller's eiders are a circumpolar sea duck with both Atlantic and Pacific populations. The Pacific population is further divided into the Russian-breeding population and the Alaska-breeding population. On June 11, 1997, the Alaska-breeding population of

Steller's eiders was listed as threatened based on a substantial decrease in this population's breeding range and the increased vulnerability of the remaining Alaska-breeding population to extirpation (Federal Register 62(112):31748-31757). Although population size estimates for the Alaska-breeding population were imprecise, it was clear Steller's eiders had essentially disappeared as a breeding species from the Y-K Delta, where they had historically occurred in significant numbers, and that their Arctic Coastal Plain (North Slope) breeding range was much reduced. On the North Slope they historically occurred east to the Canada border (Brooks 1915), but have not been observed on the eastern North Slope in recent decades (USFWS 2002b). The Alaska-breeding population of Steller's eiders now nests primarily on the North Slope, particularly around Barrow and at very low densities from Wainwright to at least as far east as Prudhoe Bay (Figure 3.5). A few pairs remain on the Y-K Delta, with 9 nests found in the last 14 years (Service, unpublished data).

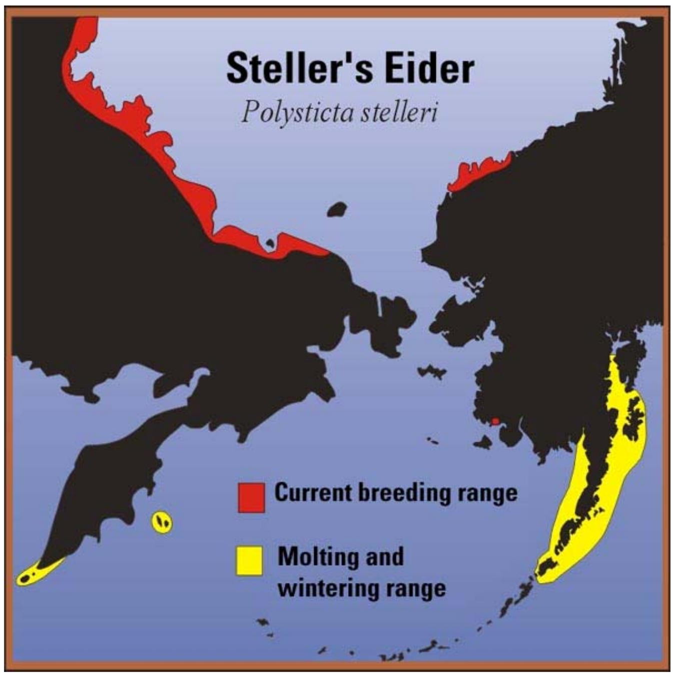

Figure 3.5 - Steller's eider distribution in the Bering and Chukchi Seas (USFWS 2002).

After the breeding season, Steller's eiders move to marine waters where they undergo a complete flightless molt for about 3 weeks. The combined Pacific wintering population (which includes populations that breed in eastern Russia and Alaska) 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). After molting, many of the Pacific-wintering population of Steller's eiders disperse to the eastern Aleutian Islands, the south side of the Alaska Peninsula, and as far east as Cook Inlet, although tens of thousands may remain in lagoons used for molt unless or until freezing conditions force them to move (USFWS 2002b). Prior to spring migration, tens of 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 2005, Martin et al. *in prep*.).

North Slope Breeding Population

Steller's eiders arrive in pairs on Alaska's North Slope in early June. There are few conclusive data about habitat use during spring migration. Like other eiders, Steller's eiders may use spring leads for feeding and resting, and extensive use of the Kuskokwim Shoals near the mouth of the Kuskokwim River occurs annually (Larned 2005, Martin et al. *in prep*.). Steller's eiders appear to be episodic breeders; since 1991, Steller's eiders near Barrow apparently nested in 10 years but did not nest in 7 years (Rojek 2008). Non-breeding years are common in long-lived eider species and are typically related to inadequate body condition (Coulson 1984), but reasons for Steller's eiders non-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 mammalian predators are less likely to prey-switch to eider eggs and young, or because avian predators such as pomarine jaegers (*Stercorarius pomarinus*) and snowy owls (*Nyctea scandiaca*) that nest abundantly in high lemming years may protect eider nests from mammalian predators such as arctic fox (Quakenbush and Suydam 1999, and summarized by Rojek 2006).

Nest initiation dates for Steller's eiders at Barrow between 1991 and 2007 ranged from June 6 to June 28 (Rojek and Martin 2003, Rojek 2005, Rojek 2006, Rojek 2008). Male Steller's eiders typically leave the breeding grounds once females begin incubating. Incubation lasts between 24 (USFWS et al. 2002c) and 27 days (Fredrickson 2001), with hatching occurring from July 7 to August 3 (Quakenbush et al. 1998).

Hens move their broods to ponds with emergent vegetation, particularly *Carex* spp. (Rojek 2005) and *Arctophila fulva* (Quakenbush et al. 1998) soon after hatching. Here they feed on insect larvae and other wetland invertebrates. Fledging occurs 32-37 days after hatching (Obritschkewitsch et al. 2001, Rojek 2005). Females and fledged young depart the breeding grounds in early to mid-September.

Abundance and Distribution on the North Slope

Aerial surveys indicate that Steller's eiders occur at extremely low densities across most of the North Slope (Larned et al. 2008), with the highest densities occurring near Barrow (Figure 3.6). Because Alaska-breeding Steller's eiders occur at very low densities, there is insufficient information to estimate population size or detect population trends. The mean 1992-2006 aerial-survey generated population index[3] was 116 (n=15, standard deviation [sd] = 204), but indices in these years ranged from 20 (calculated when no birds were seen) to 785 (Larned et al. 2006). The most recent index (2002-2006) was 112 (n=5, sd=98). However, aerial surveys likely undercount Steller's eiders for several reasons. An unknown number are simply missed when observers count from aircraft; this proportion varies by species and is unknown for Steller's eiders. Additionally, because

[3] We present only an index (no population abundance estimate, as with spectacled eiders) because no aerial survey-ground survey correction factor has been created for Steller's eiders on the North Slope.

observations at Barrow indicate that many Steller's eiders vacate nesting habitat early in non-nesting years, it is possible that aerial surveys fail to detect some individuals that were present early in the season, at least in some years. Further, the concentration near Barrow, which contains a significant proportion of Steller's eiders detected on the entire North Slope in most years, may be under-sampled 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 from surveys because the area near the Barrow airport cannot be flown due to aviation safety concerns. Due to these biases, we cannot precisely estimate Steller's eider abundance on the North Slope, but the best available information leads the Service to estimate that roughly several hundred Steller's eiders occupy the North Slope in most years.

The status of the Alaska-breeding population of Steller's eiders is becoming of increasing concern. Re-analysis and application of a Steller's eider population viability model (Runge 2004) was conducted during a workshop held in January 2008 to evaluate the potential for reintroduction as a recovery tool for this species. Based on best current estimates of population size, survival, and reproductive rates, the model predicts with certainty (100% probability) that the Alaska-breeding population will be extirpated within ~10 years (USFWS 2008b). This prediction is predicated upon the unproven assumption that there is no immigration from the Russian-Pacific population subsidizing the Alaska-breeding population. Thus, long-term survival of the Alaska-breeding population requires that current estimates of survival and/or reproduction are biased significantly low, or that substantial, successful management efforts are implemented immediately to reduce mortality and increase reproduction (USFWS 2008b). As a result, management efforts to reduce hunting/shooting, control nest predators in breeding habitat during summer, and protect nesting habitat and reduce disturbance during nesting are needed and are being pursued aggressively.

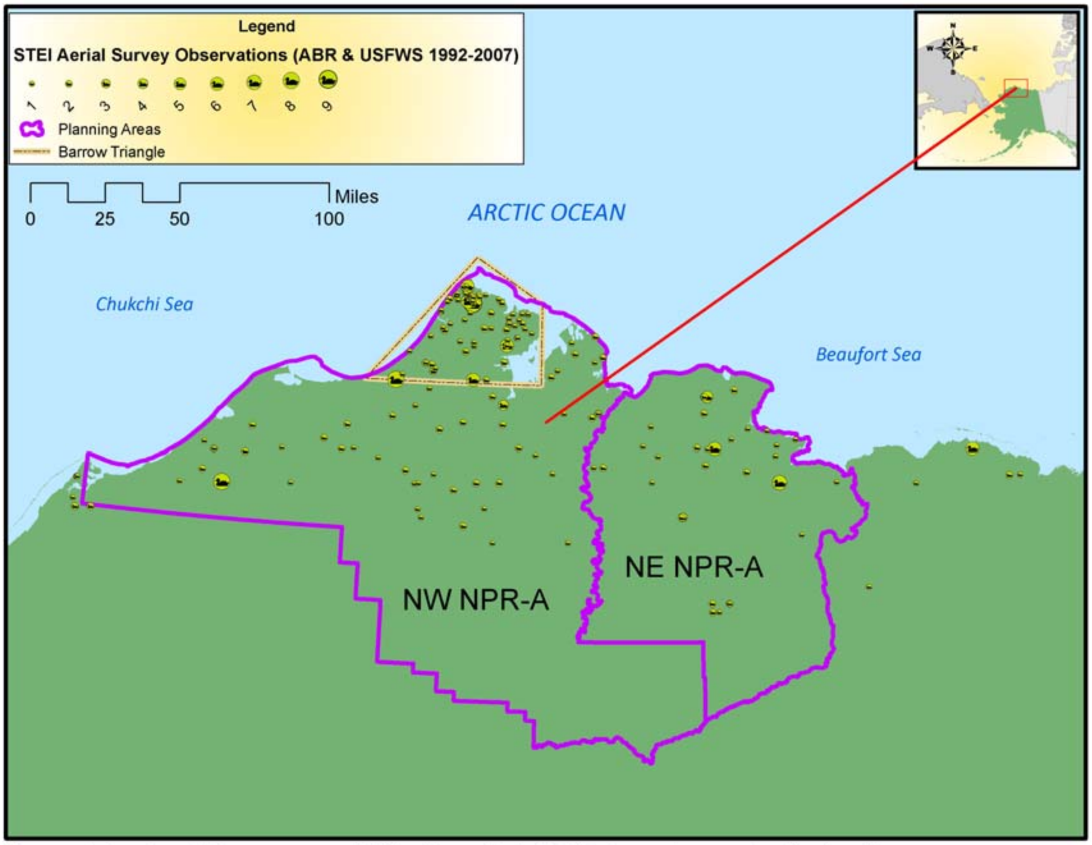

Figure 3.6 - Distribution of Steller's eiders from aerial surveys on Alaska's North Slope (Data from USF&WS and ABR Inc., Figure by BLM)

Post Breeding Locations and Migration

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, satellite-transmittered males and females 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.).

The combined (Russia- and Alaska-breeding) Pacific population molts in numerous locations in southwest Alaska, dispersing to winter in the eastern Aleutian Islands, the south side of the Alaskan Peninsula, and as far east as Cook Inlet.

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 Y-K Delta, 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. No critical habitat for Steller's eiders has been designated on Alaska's North Slope, and none is within the Action Area.

Causes of Population Decline
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 shot in wetlands, and changes in the marine environment. 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.

Polar Bear

Physical Appearance
Polar bears are characterized by a large stocky body, with a longer neck and proportionately smaller head than other members of the bear family, and without the distinct shoulder hump common to brown bears (*Ursus arctos*) (Figure 3.7). Polar bear fur color varies between white, yellow, gray, and brown, and is affected by oxidation or exposure to air, light conditions, and staining due to contact with fats from prey items. The nose, lips, and skin of polar bears are black (DeMaster and Stirling 1981, Amstrup 2003).

Polar bears exhibit sexual dimorphism with female body length, skull size, and body mass considerably less than males (Derocher et al. 2005). Adult males weigh up to 654 kg (1,440 lbs) (Kolenosky et al. 1992), with some individuals too large for weighing equipment but estimated at 800 kg (1,760 lbs) (DeMaster and Stirling 1981). Adult females weigh 181 to 317 kg (400-700 pounds).

Figure 3.7 – Polar Bears
Photo by Steve Hillebrand, USFWS

Distribution and Status
Polar bears are distributed throughout regions of arctic and subarctic waters where the sea is ice covered for large portions of the year. Although movements of individual polar bears overlap extensively, telemetry studies have demonstrated spatial segregation among groups or stocks of polar bear in different regions of their circumpolar range (Schweinsburg and Lee 1982, Amstrup 2000, Garner et al. 1990 and 1994, Messier et al. 1992, Amstrup and Gardner 1994, Ferguson et al. 1999, Carmack and Chapman 2003). Patterns in spatial segregation suggested by telemetry data, along with information from surveys, marking studies, and traditional knowledge, resulted in recognition of 19 partially discrete polar bear groups by the International Union for the Conservation of Nature (IUCN) Polar Bear Specialist Group (PBSG). These 19 groups have been described as management subpopulations (or stocks) in the scientific literature and regulatory actions. There is considerable overlap in areas occupied by members of these groups (Amstrup et al. 2005) and the boundaries have been adjusted as new data are collected.

The stock boundaries for polar bears in Alaska are shown in Figure 3.8, indicating the Southern Beaufort Sea (SBS) stock, the Chukchi Sea (CS) stock, and the area of seasonal intermingling (USFWS 2008a).

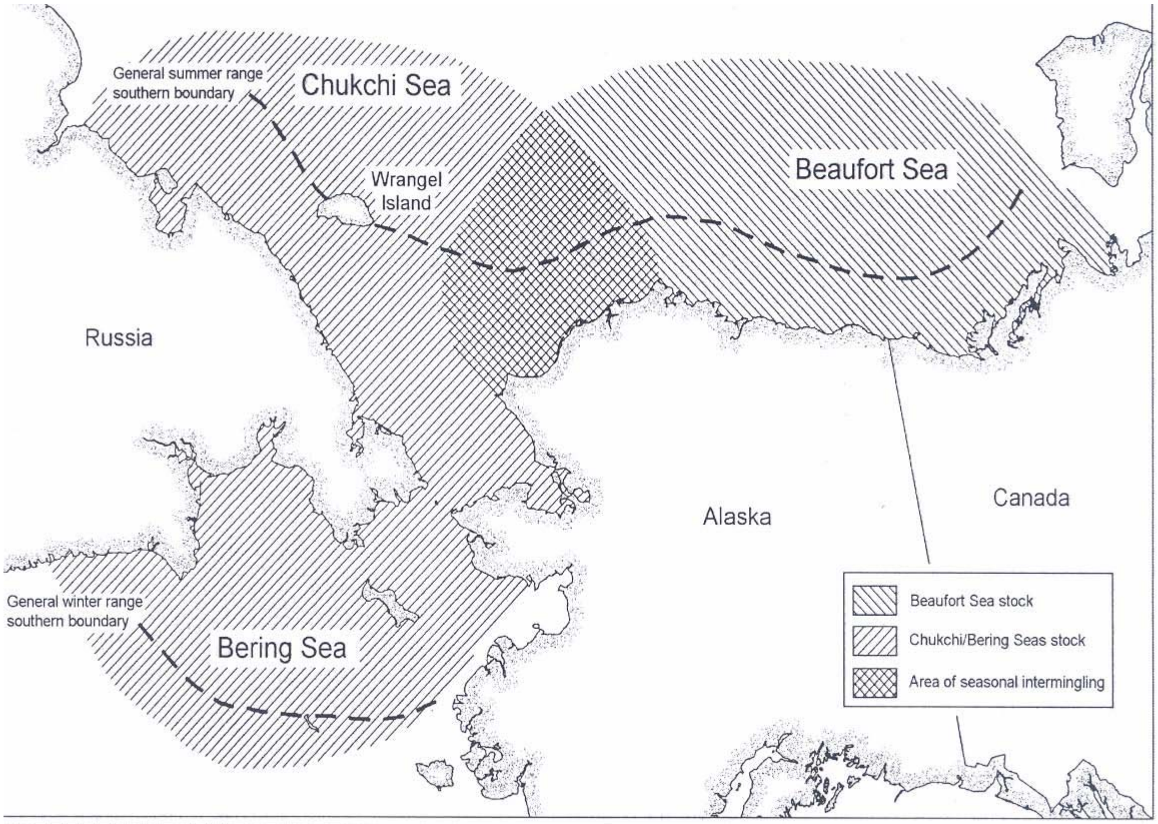

Figure 3.8 – Range Map of Beaufort Sea and Chukchi Sea Polar Bear Stocks

Because the principle habitat of polar bears is sea ice, it is considered a marine mammal, and it was included in those species covered under the Marine Mammal Protection Act of 1972 (MMPA). On May 15, 2008, the polar bear was listed as a threatened species range-wide under the ESA (73 FR 28212, May 15, 2008).

Alaskan Polar Bear Stocks

The total number of polar bears worldwide is estimated to be 20,000-25,000 bears (Schliebe et al. 2006), with the CS and SBS being the two stocks occurring in Alaskan waters.

The CS population is widely distributed on the pack ice of the northern Bering, Chukchi, and eastern portions of the Eastern Siberian seas (Garner et al. 1990, Garner et al. 1994, Garner et al. 1995). Polar Bears are seasonably abundant in the Chukchi Sea and their distribution is influenced by the movement of seasonal pack ice. Polar bears in the Chukchi and Bering seas move south with advancing ice during fall and winter, and move north in advance of receding ice in late spring and early summer (Garner et al. 1990). Polar bears are dependent upon sea ice for foraging and the most productive areas are near ice edges, leads, or polynyas where the ocean depth is minimal (Durner et al. 2004). Polar bears can be present along the Alaskan shoreline as they opportunistically scavenge on marine mammal carcasses.

The current CS population size is not known, but the best information available indicates it is approximately 2,000 animals (PBSG 2001, Schliebe et al. 2006). Estimates of population size were derived from observations of dens, and aerial surveys (Chelintsev 1977, Stishov 1991, Stishov et al. 1991); but the estimates have wide ranges (about 200-500 animals), so are considered of little use for management. Reliable estimates of population size based upon mark and recapture studies are not available for this region, and measuring the population size is a research challenge. It is believed the population of the CS population increased after harvest was reduced in 1972, but may now be declining (Aars et al. 2006). The CS population is subject to subsistence hunting in Alaska, where average annual harvest levels declined about 50% between the 1980s and 1990s (Schliebe et al. 1998) and have remained at low levels in recent years. No hunting quota is set for Alaska but in 2004/2005, 32 bears were harvested. There is believed to be a substantial illegal harvest in Russia where a minimum of 100 bears are thought to be harvested annually, and in some years the estimates have exceeded 200 animals killed in Russia (Schliebe et al. 2006). The combined Alaska-Chukotka polar bear harvest is currently believed to exceed sustainable levels, and the status of the CS polar bear population is considered uncertain or declining (Schliebe et al. 2006).

The SBS population occurs between Icy Cape, Alaska on the western boundary and Pearce Point, NWT (Amstrup et al. 1986, Amstrup and DeMaster 1988, Stirling et al. 1988). The size of the SBS population was estimated at 1,800 animals in 1986 (Amstrup et al. 1986). A new population assessment derived from capture-recapture data collected during 2001 to 2006 concluded there were 1,526 (95% CI = 1,211 - 1,841) polar bears in the region in 2006 (Regehr et al. 2006). Because the precision of the earlier estimate was low, the two estimates cannot be statistically differentiated. The harvest of polar bears in the SBS region is shared between Canada and the United States, and since 1988 has been managed under the "Polar Bear Management Agreement for the Southern Beaufort Sea" by the Inuvialuit Game Council of Canada, and the North Slope Borough of Alaska. The harvest quota for the SBS is 80 animals (40 for Alaska and 40 for NWT). In 2004/2005 the joint harvest was 46 bears (Schliebe et al. 2006). The status of the SBS population is designated as reduced (73 FR 28217. May 15, 2008) and the predicted trend is declining (Aars et al. 2006).

It is thought that nearly all bears in the central coastal region of the Beaufort Sea are from the SBS population, and that proportional representation of SBS bears decreases to both the west and east. For example, only 50% of polar bears occurring in Barrow, Alaska and Tuktoyaktuk, NWT are SBS bears, with the remainder being from the CS and Northern Beaufort Sea populations. Assignment of new boundaries may be suggested in the future that reflects improved understanding of the spatial and temporal use patterns of bears in this region (Amstrup et al. 2005).

Polar Bear Movements

Information from telemetry studies indicate polar bear movements are not random, nor do they passively follow ocean currents on the ice as previously thought (Pedersen 1945, Mauritzen et al 2003) Movement data come almost exclusively from adult female polar bears because male anatomy (their neck is larger than their skull) will not accommodate radio collars. The movements of seven male polar bears surgically implanted with transmitters in 1996 and 1997 were compared to movements of 104 females between 1985 and 1995 (Amstrup et al. 2001). The data indicated males and females had similar activity areas on a monthly basis, but males traveled farther each month (Amstrup et al 2000b). Activity areas have not been determined for many populations, and available information reflects movement data collected prior to recent changes wrought by retreating ice conditions. In the Beaufort Sea, annual activity areas for individually monitored female bears averaged 149,000 km^2 (range 13,000 km^2 to 597,000 km^2 (Amstrup et al. 2000b). Total annual movements by female bears in the Beaufort Sea averaged 3,415 km and ranged up to 6,200 km, with a movement rate of > 4 km/ hr sometimes sustained for long periods, and movements of > 50 km/day observed (Amstrup et al. 2000b). Mean activity area in the Chukchi Sea, characterized by highly dynamic ice conditions, was 244,463 km^2 (Garner et al. 1990). Average annual distance moved by CS female bears was 5,542 km.

The telemetry data from radio-collared females indicates some individuals occupy home ranges (or "multi-annual activity areas") which they seldom leave (Amstrup 2003). The size of a polar bear's home range is determined, in part, by the annual pattern of freeze-up and break-up of sea ice, and therefore by the distance a bear must travel to access prey (Stirling 1988, Durner et al. 2004). A bear with consistent access to ice, leads, and seals may have a relatively small home range, while bears in areas such as the Barents, Greenland, Chukchi, Bering or Baffin seas may have to move many hundreds of kilometers each year to remain in contact with sea ice from which to hunt (Born et al. 1997, Mauritzen et al. 2001, Ferguson et al. 2001, Amstrup 2003, Wiig et al. 2003).

Feeding Habits

Polar bears derive essentially all their sustenance from marine mammal prey and have evolved a strategy that utilizes the high fat content of marine mammals (Best 1985, Amstrup et al. 2007). Over half the caloric content of a seal carcass are located in the layer of fat between the skin and underlying muscle (Stirling and McEwan 1975). Polar bears show their preference for fat by quickly removing the fat layer from beneath the skin after they catch a seal. High fat intake from specializing on marine mammal prey allows polar bears to thrive in the harsh Arctic environment (Stirling and Derocher 1990, Amstrup 2003).

Over much of their range, polar bears are dependent on one species of seal, the ringed seal (*Phoca hispida*). Polar bears occasionally catch belugas (*Delphinapterus leucas*), narwhals (*Monodon monocerus*), walrus (*Odobenus rosmarus divirgens*), and harbor seals (*P. vitulina*) (Smith 1985, Calvert and Stirling 1990, Smith and Sjare 1990, Stirling and Øritsland 1995, Derocher et al. 2002). Where common, bearded seals (*Erignathus barbatus*) can be a large part of polar bear diets, and are probably the second most common prey item (Derocher et al. 2002). Walrus can be seasonally important in some parts of the polar bear's range (Parovshchikov 1965, Ovsyanikov 1996). However, throughout most of their range, polar bears are most dependent upon ringed seals (Smith and Stirling 1975, Smith 1980), and the relationship between ringed seals and polar bears is so close that the abundance of ringed seals in some areas appears to regulate the density of polar bears, while polar bear predation in turn, regulates density and reproductive success of ringed seals (Hammill and Smith 1991, Stirling and Øritsland 1995).

Polar bears rarely catch seals on land or in open water (Furnell and Oolooyuc 1980); rather they catch seals and other marine mammals at the air-ice-water interface, where aquatic mammals come to breathe (Amstrup et al. 2007). Although there are local exceptions, it appears that polar bears gain little overall benefit from alternate foods (Amstrup et al. 2007). Even in Hudson Bay where polar bears are forced onto land for extended periods with access to a variety of foods including human refuse, little terrestrial food is incorporated into polar bear tissues (Ramsay and Hobson 1991). Therefore, maintenance of polar bear populations is dependent upon marine prey, largely ringed seals, and polar bears are tied to the surface of the ice for effective access to that prey (Amstrup et al. 2007).

Breeding Biology

Polar bears have an intrinsically low reproductive rate characterized by late age of sexual maturity, small litter sizes, and extended maternal investment in raising young. Female polar bears enter a prolonged estrus between March and June, when breeding occurs. Ovulation is thought to be induced by mating (Wimsatt 1963, Ramsay and Dunbrack 1986, Derocher and Stirling 1992). Implantation is delayed until autumn, and gestation is 195-265 days (Uspenski 1977), with active development of the fetus suspended for most of that time. The timing of implantation, and therefore the timing of birth, is likely dependent upon body condition of the female, which in turn is dependent upon a variety of environmental factors (Schliebe et al. 2006). Derocher et al. (1992) found Hudson Bay polar bear births occurred from mid-November through mid- December. In the Beaufort Sea many pregnant females did not enter dens until late November or early December (Amstrup and Gardner 1994), and date of birth is assumed to be later than for Hudson Bay polar bears.

Throughout their range, most pregnant female polar bears excavate dens in snow located on land during September – November after drifts large enough to excavate a snow cave have formed (Harington 1968, Lentfer and Hensel 1980, Ramsay and Stirling 1990, Amstrup and Gardner 1994). The only known exceptions are in western and southern Hudson Bay where polar bears excavate earthen dens and later reposition into adjacent snow drifts (Jonkel et al. 1972, Richardson et al. 2005) and in the southern Beaufort Sea where a portion of the population dens in snow caves located on pack and shorefast ice. Successful denning by polar bears requires an accumulation of sufficient snow combined with winds to cause snow accumulation leeward of topographic features that create denning habitat (Harington 1968). The common characteristic of all denning habitat is topographic features that catch snow in the autumn and early winter (Durner et al. 2003).

Polar bear denning habitat in Alaska includes areas of low relief topography characterized by tundra with riverine banks within approximately 50 km of the coast (Amstrup 1993, Amstrup and Gardner 1994, Durner et al. 2001, 2003), and offshore pack ice pressure ridge habitat. Although the northern Alaskan coast gets minimal snow fall, because the landscape is flat the snow is blown continuously throughout the winter creating drifts in areas of relief.

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

Data suggests that an increasing number of SBS females are denning on land. Sixty percent of radio-collared females denned on land from 1996 – 2006, compared to forty percent in the previous 15 years. The geographic distribution of land denning also appears to have shifted westerly in recent years (71 FR 148, August 2, 2006).

Fidelity to denning locales was investigated by Amstrup and Garner (1994), who located 27 females at up to four successive maternity dens. Bears that denned once on pack ice were more likely to den on pack ice than on land in subsequent years. Similarly, bears were faithful to general geographic areas – those that denned once in the eastern half of the Alaska coast were more likely to den there than to the west in subsequent years. Annual variations in weather, ice conditions, prey availability, and the long-distance movements of polar bears (Amstrup et al. 1986, Garner et al. 1990) make recurrence of exact denning locations unlikely.

Polar bears give birth in the dens during mid-winter (Kostyan 1954, Harington 1968, Ramsay and Dunbrack 1986). Survival and growth of the cubs depends on the warmth and stable environment within the maternal den (Blix and Lentfer 1979). Family groups emerge from dens in March and April when cubs are about three months old and able to survive outside weather conditions (Blix and Lentfer 1979, Amstrup 1995).

Chronology of denning varies between polar bear populations. Satellite telemetry studies determined mean dates of den entry in the Beaufort Sea were 11 and 22 November for land (n = 20) and pack-ice (n = 16), respectively (Amstrup and Gardner 1994). Female bears were foraging right up to the time of den entry, and then denned nearby. The mean date of emergence was 26 March for pack-ice dens (n = 10) and 5 April for land dens (n = 18). Messier et al. (1994) reported mean date of den entry and exit varied among years depending upon sea ice, snow and weather conditions, with mean entry into maternal dens in the Canadian Arctic was 17 September and mean emergence was 21 March, with females and cubs remaining near dens for a mean 13 (SE = 13) days post emergence. Ferguson et al. (2000) observed that bears denning at higher latitudes entered dens a bit later than those to the south, but exit times did not differ by latitude; they reported a mean den entry of 15 September (1 September–7 October), a mean exit of 20 March (15-28 March), with a mean 180 days in dens (163–200 days). For bears denning on sea ice or moving from sea ice to land denning habitat, time of sea ice consolidation can alter the onset of denning. Sea-ice dens must be in ice stable enough to stay intact for up to 164 days while possibly moving hundreds of kilometers by currents (Amstrup 2003, Wiig 1998).

Polar bears are largely food deprived while on land in the ice-free period. During this time they survive by mobilizing fat. Pregnant females that spend late summer on land and then den may not feed for eight months (Watts and Hansen 1987, Ramsay and Stirling 1988). This may be the longest period of food deprivation of any mammal, and it occurs when females are gestating and lactating.

Newborn polar bears are very small, weighing approximately 0.6 kg (Blix and Lentfer 1979), and nurse from their hibernating mothers. Cubs grow very quickly and may weigh 10-12 kg by the time they emerge from the den about three months later. Young bears stay with their mothers until weaned, which occurs most commonly in early spring when the cubs are 2.3 years of age. Female polar bears are available to breed again after cubs are weaned. Therefore, in most areas, the minimum successful reproductive interval for polar bears is 3 years (Schliebe et al. 2006).

Age of maturation of mammals is often associated with a threshold body mass (Sadleir 1969), and in polar bear populations it appears to be largely dependent on numbers and productivity of ringed seals. In the Beaufort Sea, ringed seal densities are lower in some areas of the Canadian High Arctic and Hudson Bay. As a possible consequence, female polar bears in the Beaufort Sea usually do not breed for until they are 5 years of age (Lentfer and Hensel 1980), giving birth for the first time at 6 years of age. In contrast, many of the Canada females reach maturity at age 4 and produce their first young at age 5 (Stirling et al. 1980, 1984, Ramsay and Stirling 1982, 1988, Furnell and Schweinsburg 1984). Derocher et al. (1992) calculated average age of first breeding in the Hudson Bay area of 4.1 years, and cub production (assessed by estimated pregnancy rates) remained high between 5 and 20 years of age and declined thereafter.

Litter size and production rates vary by geographic area and may change in response to hunting pressure, environmental factors, and other population perturbations. Litters of two cubs are common (Schliebe et al. 2006), with litters of three cubs occurring sporadically across the Arctic and most commonly reported in the Hudson Bay region (Stirling et al. 1977, Ramsay and Stirling 1988, Derocher and Stirling 1992). Average litter size across the species range varied from 1.4 to 1.8 cubs (Schliebe et al. 2006), and several studies have linked reproduction to availability of seal prey, especially in the northern portion of their range. Body weights of mother polar bears and their cubs decreased markedly in the mid-1970s in the Beaufort Sea following a decline in ringed and bearded seal pup production (Stirling et al. 1976, 1977, Kingsley 1979, DeMaster et al. 1980, Stirling et al. 1982, Amstrup et al. 1986). Declines in reproductive parameters varied by region and year with the severity of ice conditions and corresponding reduction in numbers and productivity of seals (Amstrup et al. 1986). In the Beaufort Sea, females produce a litter of cubs at an annual rate of 0.25 litters per adult female (Amstrup 1995). Annual litter production rate in Hudson Bay region declined from 0.45 litters/female in the period 1965-1979 to 0.35 litters/female during 1985-1990 (Derocher and Stirling 1992).

Polar bear reproduction lends itself to early termination without extensive energetic investment on the female (Ramsay and Dunbrack 1986, Derocher and Stirling 1992).

Female polar bears may defer reproduction in favor of survival when foraging conditions are difficult (Derocher et al. 1992). Persistent deferral of reproduction could cause a declining population trend in populations with an intrinsically low rate of growth (Schliebe et al. 2006).

Survival
Polar bears are long-lived animals; the oldest known female polar bear in the wild was 32 years of age and the oldest known male was 28, although few bears in the wild live beyond 20 years (Stirling 1990). Taylor et al. (unpublished data) described survival rates that generally increased by age class up to approximately 20 years of age (cubs-of-the-year 35-75%; 1-4 year old bears 63-98%; adults 5-20 years 95-99%; and 72-99% for adults > 20 years of age).

Survival of cubs is dependent upon their weight when they exit maternity dens (Derocher and Stirling 1992), and most cub mortality occurred early in the period after emergence from the den (Amstrup and Durner 1995, Derocher and Stirling 1996), with early age mortality generally associated with starvation (Derocher and Stirling 1996). Survival of cubs to weaning stage (generally 27-28 months) is generally estimated to range from 15% to 56% of births (Schliebe et al. 2006). Subadult survival rates are poorly understood because collars cannot be used on rapidly growing individuals.

Population age structure data indicate subadults 2-5 years survive at lower rates than adults (Amstrup 1995), probably because their hunting and survival skills are not fully developed (Stirling and Latour 1978). Eberhardt (1985) hypothesized adult survival rates must be in the upper 90% range to sustain polar bear populations. Studies using telemetry monitoring of individual animals (Amstrup and Durner 1995) estimated adult female survival in prime age groups may exceed 96%, and survival estimates are a reflection of the characteristics and qualities of an ecosystem to maintain the health of individual bears (Schliebe et al. 2006). Polar bears that avoid serious injury may become too old and feeble to hunt efficiently and most are generally believed to die of old age.

Critical Habitat
No critical habitat has been proposed for the polar bear.

Causes of Population Decline
Current threats to polar bears range wide were described in the Status Review (Schliebe et al. 2006) and the final listing rule (73 FR 28211, May 15, 2008). Loss of sea ice habitat due to climate change was identified as the primary threat to polar bears range wide. Local and widespread climatic phenomena that have the potential to make seals less abundant or less available can significantly affect polar bear populations through survival or production (Kingsley 1979, DeMaster et al 1980, Amstrup et al. 1986, Stirling 2002). Other threats evaluated included hunting, oil and gas development, human-bear interactions, environmental contaminants, disease, and predation. Although none of those others are thought to currently be significant threats to polar bear populations, each could become more significant in the future in combination with climate change effects.

Ledyard Bay Critical Habitat Unit

Critical habitat for spectacled eiders was designated on February 6, 2001 (Federal Register 66(25): 9146-9185). In accordance with section 3(5)(A)(i) of the ESA and regulations in 50 CFR 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 ESA 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.

The LBCHU is the only designated or proposed critical habitat unit that may be affected by the Action. It was designated because of its importance to migrating and molting spectacled eiders, and includes waters of Ledyard Bay within about 1.85-74 km (1-40 nautical miles [nm]) from shore (Figure 3.9). Individuals from all three breeding populations molt in Ledyard Bay, including most (77%) females that nest on the North Slope (Petersen et al. 1999). Primary constituent elements identified for LBCHU are marine waters > 5 m and ≤ 25 m deep, along with associated marine aquatic flora and fauna in the water column, and the underlying marine benthic community.

Environmental conditions at Ledyard Bay create a predictable and abundant food supply for bottom-feeding diving predators like eiders: a shallow ocean shelf with near-shore sandy or gravelly substrates overlain by rich ocean currents; enhanced ice-edge productivity during the brief open water season; short but productive food chains and food webs; high benthic invertebrate biomass and abundance; and open water conditions over those resources during the summer/autumn molt. The Service believes these are the features of the primary constituent elements of Ledyard Bay that provide the conservation value of the critical habitat designated for spectacled eiders.

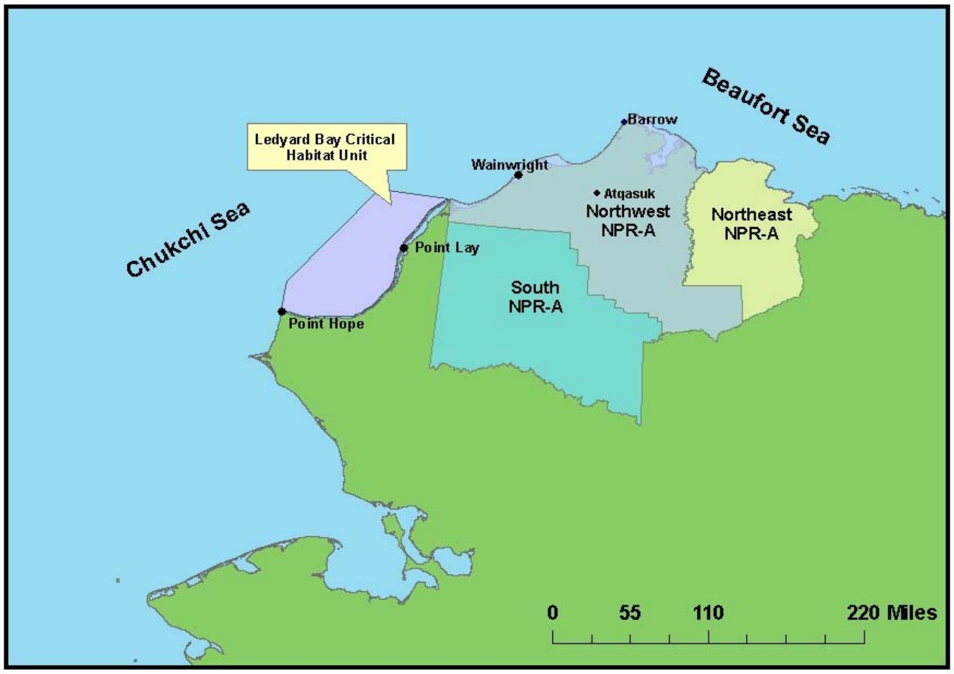

Figure 3.9 – Location of the Ledyard Bay Critical Habitat Unit in Relation to the NPR-A Planning Areas

4. ENVIRONMENTAL BASELINE

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

Spectacled and Steller's Eiders

Status in the Action Area

Both Steller's and spectacled eiders breed and are present in the Action Area from late May through at least late September.

Data from annual aerial surveys adjusted by a surrogate visual correction factor estimates the North Slope-breeding population of spectacled eiders is approximately 12,916 individuals (Stehn et al. 2006), most of which nest in the Action Area. Of spectacled eiders observed on the North Slope during aerial surveys, > 70% were within NW NPR-

A, roughly 19% were in NE NPR-A. The remaining spectacled eider observations were adjacent to NPR-A lands both to the west of NPR-A and east of the Colville River Delta. The highest densities of spectacled eiders are consistently found in the Barrow Triangle, the area near Peard Bay, southeast of Wainwright, and in NE NPR-A in the area northeast of Teshekpuk Lake (Figure 3.3).

As discussed in *Section 3 – Status of the Species*, it is difficult to determine the numbers 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. Of observations during the Service's annual breeding eider aerial survey from 1992–2005, only 5% were outside NE or NW NPR-A, approximately 9% were in the NE NPR-A and the remaining > 85% were observed in NW NPR-A. The highest densities occurred in the Barrow Triangle (Figure 3.6), which comprises lands near Barrow, north of 70^{o}50' N and west of Dease Inlet. 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, increase in predation, hunting, habitat loss through development and disturbance, and environmental changes due to climate change. As these species are relatively long-lived, and have low reproductive success, factors that affect adult survival may be most influential on population growth rates. Recovery efforts for both species are underway, including some efforts in the Action Area.

Toxic Contamination of Habitat

The deposition 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 Y-K Delta (Franson et al. 1995, Grand et al. 1998) and Steller's eiders on the ACP (Trust et al. 1997; Service unpublished data). Figure 4.1 shows blood lead concentrations of 7 female Steller's eiders nesting near Barrow in 1999; all had concentrations that reflected exposure (> 0.2 ppm lead) and 6 had concentrations that indicated poisoning (> 0.6 ppm). 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 illicit use of lead shot on the North Slope.

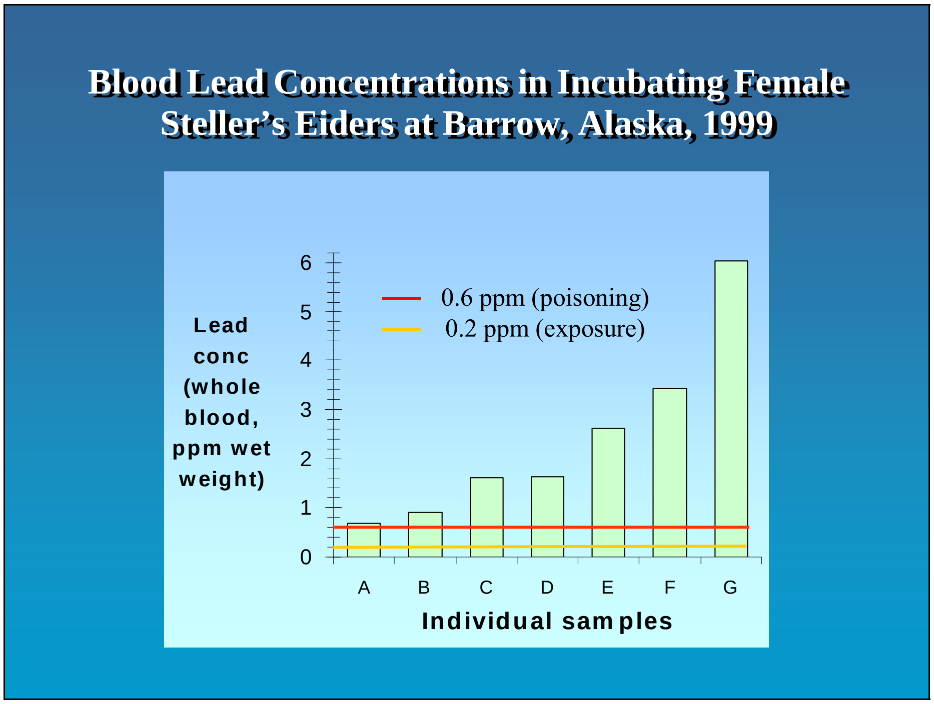

Figure 4.1 - Blood lead concentrations in incubating female Steller's eiders at Barrow, 1999 (USFWS data)

Water birds in arctic regions are also exposed to global contamination, including radiation, and 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 were apparently in good condition, but had high concentrations of metals and subtle biochemical changes that may be associated with long-term health effects (Trust et al. 2000).

Increase in 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). 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).

Hunting

Hunting for spectacled and Steller's eiders was closed in 1991 by Alaska State regulations and Service policy, and outreach efforts have been conducted by the North Slope Borough, BLM, and Service to encourage compliance. Recent harvest data indicate that listed eiders may continue to be taken during subsistence hunting on the

North Slope but estimates of the number taken are imprecise. Continued efforts to reduce harvest are being implemented in North Slope villages, and intra-service consultations for the Migratory Bird Subsistence Hunting Regulations are conducted annually.

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 communities, 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 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. The Service is also working with land owners in the Barrow area to develop a conservation agreement to protect listed-eider nesting habitat.

There are currently few permanent structures associated with the oil and gas industry in NPR-A. 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)).

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.

Table 4.1 summarizes recent activities across the North Slope, including the Action Area, which required formal section 7 consultation, and the estimated incidental take of listed eiders. These actions were all considered in the final jeopardy analysis of this BO. It should be noted that incidental take is estimated prior to the implementation of reasonable and prudent measures and associated terms and conditions which aim 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, it is important to note, 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% (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 we estimate for every 100 spectacled eider eggs laid on the Y-K Delta, between 5 and 34 would be expected to survive past 2 years old and enter 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 maturity.

Table 4.1 - Activities on Alaska's North Slope or adjacent areas that required formal section 7 consultation and the amount of incidental take provided.

Project Name	Impact Type	Estimated Incidental Take
Alpine Development Project	Habitat Loss Collisions	4 spectacled eider eggs/ducklings 3 adult spectacled eiders
Barrow Airport Expansion	Habitat Loss	14 spectacled eider eggs/ducklings 29 Steller's eider eggs/ducklings
Barrow Hospital	Habitat Loss	2 spectacled eider eggs/ducklings 17 Steller's eider
Barrow Landfill	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 eggs
Barrow Tundra Manipulation Experiment	Habitat Loss Collisions	2 spectacled eider eggs/chicks 1 Steller's eider eggs/chicks 2 adult spectacled eiders 2 adult Steller's eiders
Barrow Global Climate		6 spectacled eider eggs/ducklings

Change Research Facility Phase I & II	Habitat Loss Collisions	25 Steller's eider eggs/ducklings 1 adult spectacled eider 1 adult Steller's eider
Barrow Wastewater Treatment Facility	Habitat Loss	3 Steller's eider eggs/ducklings 3 spectacled eider eggs/ducklings
Beaufort Sea Planning Area Lease Sale 186, 195, & 202	Collisions	5 spectacled eiders 1 Steller's eider
ABR Avian Research/USFWS Intra-Service Consultation	Disturbance	5 spectacled eider eggs/ducklings
Chukchi Sea LS 193	Collisions	3 adult spectacled eiders 1 adult Steller's eider
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		0 birds
KMG Nikaitchuq Project	Habitat Loss Collisions	2 spectacled eider eggs/ducklings 7 adult spectacled eiders over 30 years
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
BLM 2008 Programmatic on Summer Activities in NPR-A	Disturbance	56 spectacled eider eggs/ducklings
MGM/USFWS Intra-Service Consultation 2008	Disturbance	21 spectacled eider eggs/ducklings

Table 4.1 illustrates the number and diversity of actions requiring consultation on the North Slope. We believe these estimates have overestimated and in some cases significantly overestimated actual take. Actual take is likely reduced by the implementation of terms and conditions in each BO, 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 impacts from those projected here. See Section 8 – *Incidental Take Statement* for further elaboration of the conservative assumptions in these take estimates.

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 and Oechel et al. 1995), and are losing water through increased evaporation and evapotranspiration resulting from longer ice-free periods, warmer temperatures, and longer growing seasons (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 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 (Quankenbush 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.

Polar Bears

Status in the Action Area

Polar bears spend the majority of their time on ice in near-shore, shallow waters over the productive continental shelf. Polar bears are generally widely and sparsely distributed across the Alaskan portion of the Beaufort and Chukchi seas. Unlike polar bears in eastern Canada, the Alaskan stocks do not currently spend extended periods of time on land (Garner et al. 1990). However, polar bears have been observed congregating on the barrier islands in the fall and winter feeding on bowhead whale (*Balaena mysticetus*) carcasses, notably at Cross and Barter islands, which are not in the Action Area (USFWS 2006).

Only pregnant female polar bears den; other members of the population (males, solitary females, and females with older cubs) remain active throughout winter. Some females from the approximately 2,000 animal Chukchi Sea and 1,500 animal Southern Beaufort Sea stocks may den in the Action Area. Durner et al. (2006) found approximately 50% of pregnant females in the Beaufort Sea came ashore to construct maternity dens, while Amstrup and Gardner (1994) found 42% of females observed in the Alaskan Chukchi and Beaufort seas and Canadian Beaufort Sea from 1983-1991 denned on land. The remaining females denned on shore-fast ice, or drifting pack ice. Of the 80 dens identified along the coast of the Beaufort Sea (including Canada) and Chukchi Sea in NW Alaska by Amstrup and Gardner (1994), six where found on land in NPR-A. Lentfer and Hensel (1980) searched for polar bear maternity dens across Northern Alaska along the Chukchi and Beaufort Sea coasts in the mid-1970s. Of 35 dens identified, six were on NPR-A lands.

Females come ashore to den in late October/early November depending upon ice movements and timing of freeze up (Lentfer and Hensel 1980). In Alaska, dens are sparsely distributed along a narrow coastal strip with sightings reported up to 48 km inland (Lentfer and Hensel 1980) and 61 km inland (Amstrup and Gardner 1994). Denning habitat includes areas such as coastal and river banks and bluffs where snow accumulates early.

Whereas loss of sea ice habitat is considered the principle threat to polar bears, other threats occurring in the Action Area, included hunting, oil and gas development, environmental contaminants, disease, and predation may impact this species.

Hunting

In 1968, the International Union for Conservation of Nature/Polar Bear Specialist Group (IUCN/PBSG) was formed and developed the *1973 International Agreement on the Conservation of Polar Bears,* which called for international management of polar bear populations based on sound conservation practices. It prohibits polar bear hunting except by local people using traditional methods, calls for protection of females and denning bears, and bans use of aircraft and large motorized vessels to hunt polar bears. The PBSG meets every 3-5 years to review all aspects of polar bears science and management, including harvest management. There are no restrictions on the number, season, or age of polar bears that can be harvested by Native people in Alaska unless the population is declared depleted and harvest is found to prevent recovery. However, there is a more restrictive Native-to-Native agreement between Inũpiat from Alaska and Inuvialuit in Canada that was developed in 1988. This agreement, the Inuvialuit-Inũpiat Polar Bear Management Agreement, established quotas and recommendations concerning protection of denning females, family groups, and methods of take. Presently it is thought that the current harvest levels, which have averaged 36 bears per years since 1980, are sustainable for the Southern Beaufort Sea population (USFWS 2006).

An estimated 60 to 100 polar bears from the shared Russian–United States Chukchi Sea stock are also harvested every year (Evans et al. 2003). In 2000, the United States and the Russian Federation signed the Agreement on the Conservation and Management of the Alaska-Chukotka Polar Bear Populations. This agreement supports polar bear hunting for Alaskan and Russian Natives, and provides a framework for future management, enforcement, and allocation of harvest between the two countries (Evans et al. 2003). There is, however, concern about potential over-harvest of polar bears from the shared US-Russian Chukchi Sea population (Schliebe et al. 2006), possibly related to illegal harvest of animals from this stock.

Oil and Gas Development

Documented impacts on polar bears by the oil and gas industry in Alaska during the past 30 years are minimal. Polar bears have been encountered at or near most coastal and offshore production facilities, or along roads and causeways that link these facilities to the mainland. However, interactions have been minimized by implementation of Incidental Take Regulations (ITRs) for the Beaufort Sea (USFWS 2006) and the associated Letters of Authorization (LOAs) issued under the Marine Mammals Protection Act (MMPA).

The most significant potential impact of oil and gas development activities to polar bears in the Action Area are impacts from oil and other toxic substance spills (discussed below under *Environmental Contaminants*), and disturbance of denning females.

Amstrup (1993) concluded most females were relatively tolerant of human disturbance, although there was considerable variation in levels of response by individual bears. Females appear more likely to abandon their dens in the fall before cubs are born and relocate if disturbed (Lentfer and Hensel 1980, Amstrup 1993, Durner et al. 2006), than in the spring when young cubs are less likely to survive if they leave the maternal den early (Amstrup 1993). Efforts to identify polar bear denning habitat across the Arctic Coastal Plain are on-going (Durner et al. 2001, Durner et al. 2006). Mapping denning habitat should allow industry to avoid these areas, or conduct site specific searches prior to winter activities to ensure dens are adequately protected.

Formal section 7 consultations have been conducted for the Chukchi Sea and Beaufort Sea ITRs, which authorize the incidental taking of a small number of polar bears in these seas and the adjacent Arctic Coastal Plain during oil and gas activities in arctic Alaska. These consultations have been considered in the jeopardy analysis of this BO.

Environmental Contaminants

Three main types of contaminants in the Arctic are thought to present the greatest potential threat to polar bears and other marine mammals: petroleum hydrocarbons, persistent organic pollutants (POPs), and heavy metals.

Potential exposure of polar bears to petroleum hydrocarbons comes from direct contact and ingestion of crude oil and refined products from acute and chronic oil spills. Polar bear range overlaps with many active and planned oil and gas operations within 40 km (25 mi) of the coast or offshore (Schliebe et al. 2006). To date, no major oil spills have occurred in the Alaska marine environment within the range of polar bears.

Polar bears could come in contact with oil spilled in the marine or land environment, or by ingesting contaminated prey (Neff 1990). Polar bears groom themselves regularly as a means to maintain the insulating properties of their fur, so oil ingestion would also be likely during grooming behavior by a fouled bear (Neff 1990). Polar bears are curious and are likely to investigate oil spills and oil contaminated wildlife. Although it is not known whether healthy polar bears in their natural environment would avoid oil spills and contaminated seals, bears that are hungry are likely to scavenge contaminated seals, as they have shown no aversion to eating and ingesting oil (St. Aubin 1990, Derocher and Stirling 1991).

Due to the seasonal distribution of polar bears, the times of greatest impact from an oil spill are summer and autumn (Amstrup et al. 2000a). This is important because distributions of polar bears are not uniform through time. In fact, near-shore densities of polar bears are two to five times greater in autumn than in summer (Durner et al. 2000), and polar bear use of coastal areas during the fall open water period has increased in recent years in the Beaufort Sea. A large number of bears might be affected by a large oil spill in this area, particularly during the broken ice period. The number of polar bears affected by an oil spill could be substantially higher if the spill spread to areas of seasonal polar bear concentrations, such as the area near Kaktovik, in the fall where polar bears congregate at bowhead whale carcasses.

Industrial development in polar bear habitat may also expose individuals to other hazardous substances through improper storage or spills. For example, one polar bear died in Alaska from consuming ethylene glycol in 1988 (Amstrup et al. 1989).

Contamination of the Arctic and sub-Arctic regions through long-range transport of pollutants has been recognized for over 30 years (Bowes and Jonkel 1975, Proshutinsky and Johnson 2001, Lie et al. 2003). The Arctic ecosystem is particularly sensitive to environmental contamination due to the slower rate of breakdown of POPs, including organochlorine compounds (OCs), relatively simple food chains, and the presence of long-lived organisms with low rates of reproduction and high lipid levels. The persistence and lipophilic nature of organochlorines increase the potential for bioaccumulation and biomagnification at higher trophic levels (Fisk et al. 2001). The highest concentrations of OCs have been found in species at the top of the marine food chains such as glaucous gulls which scavenge on marine mammals and polar bears which feed primarily on seals (Braune et al. 2005). Consistent patterns between OC and mercury contamination and trophic status have been documented in Arctic marine food webs (Braune et al. 2005). The southern Beaufort Sea polar bear populations may have concentrations of mercury close to the biological threshold levels of 60 micrograms wet weight reported for marine mammals (AMAP 2005).

Disease

Except for the presence of *Trichinella* larvae, the occurrence of diseases and parasites in polar bears is relatively rare compared to other bears. Polar bears feed primarily on fat which is relatively free of parasites, except for *Trichinella* (Rogers and Rogers 1976, Forbes 2000). It is unknown whether polar bears are more susceptible to new pathogens due to their lack of previous exposure to diseases and parasites. Many different pathogens and viruses have been found in seal species that are polar bear prey (Duignan et al. 1997, Measures and Olson 1999, Dubey et al. 2003, Hughes-Hanks et al. 2005), so the potential exists for transmission of these diseases to polar bears. As polar bears become more stressed they may eat more of the intestines and internal organs than they do presently, thus increasing their potential exposure to parasites and viruses (Derocher et al. 2004, Amstrup et al. 2006).

Predation

Polar bears have no predators but man and other polar bears (see *Hunting*, above). Intraspecific killing has been reported among all North American bear species. Reasons for intraspecific predation in bears species is poorly understood but thought to include population regulation, nutrition, and enhanced breeding opportunities in the case of predation of cubs. Although infanticide by male polar bears has been well documented (Hannsson and Thomassen 1983, Larsen 1985, Taylor et al. 1985, Derocher and Wiig 1999), it is thought that this activity does not account for large percentage of the cub mortality. A potential reason for infanticide relates to density dependent mechanisms of population control as this behavior seems to occur more frequently with increasing population size (Derocher and Wiig 1999).

Cannibalism has been recently documented in polar bears (Derocher and Wiig 1999, Amstrup et al. 2006). Amstrup et al. (2006) observed three non-related instances of intraspecific predation and cannibalism in the southern Beaufort Sea during the spring of 2004. One incident was the first documented predation of an adult female in a den, the second was of a female and newly emerged cub from a den, and the third involved a yearling male. In a combined 58 years of research by the senior investigators similar observations had not taken place. Active stalking or hunting preceded the attacks and the killed bears were partially consumed. Adult males were believed to be the predator in the attacks. Amstrup et al. (2006) indicated that in general a greater portion of polar bears in the area where the predation occurred were in poor physical condition compared to other years. The authors hypothesized that adult males may be the first to show the effects of nutritional stress caused by significant ice retreat in this area (Skinner et al. 1998, Comiso and Parkinson 2004, Stroeve et al. 2005) because they feed less during the spring mating season and enter the summer in poorer condition than other sex/age classes. Derocher and Wiig (1999) documented a similar intraspecific killing and consumption of another polar bear in Svalbard, Norway, which was attributed to relatively high population densities and food shortages. Taylor et al. (1985) documented that a malnourished female killed and consumed her own cubs, and Lunn and Stenhouse (1985) found an emaciated male consuming an adult female polar bear. The potential importance of cannibalism and infanticide for population regulation is unknown. Given our current knowledge of disease and predation, we do not believe that these factors currently are having population level effects. However, increased cannibalism in polar bears was postulated and thought to be a result of nutritional stress brought on by climate change (Derocher et al. 2004).

Climate Change

Effects of sea ice loss on polar bear populations range wide have been considered by the Service based upon recent information. In 2007, a USGS science team released 9 reports to the Service that included (1) new observational data on polar bears, including updated information on the current status of 3 of the world's 19 subpopulations of polar bears, and (2) projections of the future distribution and abundance of polar bears in the rest of the 21st century, given changes expected in future sea ice conditions. The reports are available at: http://www.usgs.gov/newsroom/special/polar_bears/.

The overall conclusion of the USGS research effort was that if projected changes in future sea ice conditions are realized, approximately two-thirds of the world's current polar bear population will be lost by the mid-21st century. Because the observed trajectory of Arctic sea ice decline appears to be underestimated by currently available models, this assessment of future polar bear status may be conservative (Amstrup et al. 2007).

While climate change will have the largest impact on polar bears in the marine environment, it may also lead to changes in use and vulnerability of polar bears within the Action Area.

An estimated > 60% of females from the SBS stock den on land, including in NPR-A, while the remaining bears den on drifting pack ice (Fischbach et al. 2007). Durner et al. (2006) noted that in order for reproduction to be successful by ice denning females, ice must be relatively stable. As climate change continues, the quality of sea ice may decrease, forcing more females to den on land (Durner et al. 2006) in areas such as NPR-A. However, if large areas of open water persist until late winter due to a decrease in the extent of the pack ice, females may be unable to access land to den (Stirling and Andriashek 1992).

Climate change may affect the availability and quality of denning habitat on land. Durner et al. (2006) found that 65% of terrestrial dens found in Alaska between 1981 and 2005 were on coastal or island bluffs. These areas are suffering rapid erosion and slope failure as permafrost melts and wave action increases in duration and magnitude. In all areas, dens are constructed in autumn snowdrifts (Durner et al. 2003). Changes in autumn and winter precipitation or wind patterns (Hinzman et al. 2005) could significantly alter the availability and quality of denning habitat.

Polar bears' use of coastal habitats in the fall during open-water and freeze-up conditions has increased since 1992 (USFWS 2006). This may increase the number of human – polar bear interactions if bears occur close to human settlements or development. Amstrup (2000) observed that direct interactions between people and bears in Alaska have increased markedly in recent years. The number of bears taken for safety reasons, based on three-year running averages, increased steadily from about three-per-year in 1993, to about 12 in 1998, and has averaged about 10 in recent years. There are several plausible explanations for this increase. First it could be an artifact of increased reporting by the hunters, or of an increased polar bear population and corresponding increased probability of interactions with humans. Alternatively or in combination, polar bears from the SBS and CS populations typically move from the pack ice to the near shore environment in the fall to take advantage of the higher productivity of ice seals over the continental shelf. In the 1980s and early 1990s, the near shore environment would have been frozen by early or mid October, allowing polar bears to effectively access seals in the area. Since the late 1990s, the timing of ice formation in the fall has occurred later in November or early December, resulting in an increased amount of time that the area was not accessible to polar bears. Consequently, bears spent a greater amount of time on land and not feeding. The later formation of near-shore ice increases the probability of bear-human interactions occurring in coastal villages (Schliebe et al. 2006). Derocher et al. (2004) noted that some experts predict the number of polar bear – human interactions will increase as climate change continues.

Ledyard Bay Critical Habitat Unit

The 13,960 km^2 LBCHU was designated as critical habitat because it is used by large numbers of spectacled eiders during molt, which is an energetically demanding portion of their life cycle. Its relatively rich and abundant benthic community is food for spectacled eiders when they occupy Ledyard Bay. Therefore, environmental conditions that support the rich and abundant benthic community are ultimately important to Ledyard Bay's capacity to support spectacled eiders. Due to the lack of industrial development and minimal human presence and vessel traffic in the region, the Chukchi Sea is currently largely in natural condition. Several key environmental factors, such as good water quality and lack of contamination, contribute to what can be considered the current good environmental conditions of the LBCHU.

Current industrial impacts are minimal and pollution and/or sediments occur at very low levels in the area. The majority of water flowing into this marine environment is not subject to human activity or stressors and is considered unimpaired (Alaska's Final 2002/2003 Integrated Water Quality Monitoring and Assessment Report). There are no Section 303(d) impaired waterbodies identified within the Arctic Subregion by the State of Alaska. Background hydrocarbon concentrations in Chukchi waters appear to be biogenic (naturally occurring) and on the order of 1 part per billion or less; concentrations in the Hope Basin and Chukchi Sea are entirely biogenic in origin and are typical of levels found in unpolluted marine water and sediments. A study of heavy metals in sediments collected from portions of the eastern Chukchi in the 1990's (Naidu 2005) found concentrations were low and the environment was considered "pristine."

We believe, therefore, that the LBCHU is currently largely in natural condition, free of physical modification or significant pollutants in either its water and sediments; and its physical and biological processes are functioning and promote production of a rich and abundant benthic community upon which spectacled eiders feed when they occupy the LBCHU.

Climate Change

There are indications regional-scale environmental shifts may be underway in both the Chukchi and the Bering seas, which have important hydrologic and biologic connections. An average 1-m reduction in sea ice thickness has been estimated in the Chukchi and Beaufort seas (Rothrock et al 1999). Late summer arctic sea ice has declined 2-7.7% per decade (Parkinson et al. 1999, Stroeve et al. 2005), and the area of perennial sea ice has declined 9.8% per decade of since 1978 (Comiso 2006). Sea ice and the associated ice-edge productivity is a key factor in the heightened carrying capacity of arctic sea shelves (Grebmeier and Dunton 2000), including the LBCHU. Grebmeier et al. (2006) suggest that an ecological shift from arctic to subarctic conditions is occurring in the northern Bering Sea; this shift resulting in decreased sea ice may have profound impacts on arctic marine mammals and diving seabird populations through ecosystem linkages that change food supplies. A similar trend may be underway in the Chukchi Sea as recent retrospective studies of benthic communities indicate a changing marine system in both the Bering and Chukchi Seas (Iken and Konar 2003, Sirenko and Koltun 1992, Grebmeier and Dunton 2000).

Current understanding of regional-scale shifts in the arctic marine environment is primarily limited to measurements in the physical environment, such a sea ice thickness and water temperatures. Because similar types of changes are recently being linked to ecologic shifts in the Bering Sea (Grebmeier et al. 2006), it may be reasonable to conclude unmeasured ecological shifts may be occurring in the Chukchi Sea, or will occur, if trends continue. Specific effects of environmental shifts in the arctic environment are not possible to predict with reliability; so possible effects, their magnitude and direction on the LBCHU are unknown at this time.

5. EFFECTS OF THE ACTION ON LISTED SPECIES AND CRITICAL HABITAT

5.1 Introduction

This section of the BO analyzes direct effects, indirect effects, and interdependent and interrelated effects of the Action on listed species and critical habitat. The effects analysis also considers the protections provided to listed species through the ROPs and STIPs, and UL/RSO/NSO designations

5.2 Effects on Listed Eiders

The following types of adverse effects to listed eiders may result from the proposed action:

- Habitat Loss
- Disturbance and Displacement
- Collisions
- Increased Predation
- Increased Subsistence Hunting
- Oil Spills
- Toxic Contamination

Habitat Loss

BLM estimates that development resulting from the Action may result in fill being placed on 3,698 acres (14.97 km^2) of tundra in NE NPR-A, and 3,608 (14.6 km^2) in NW NPR-A to construct CPFs, in-field roads, satellite facilities, staging areas, and airstrips. Gravel mining would render unusable by eiders an additional 700 acres (2.83 km^2) in NE NPR-A and 650 acres (2.63 km^2) in NW NPR-A. These activities would render the habitat unusable for listed eiders for at least as long as the gravel substrate remained. The decision to remove a gravel pad following abandonment of a site is discretionary. If gravel is not removed, the slow natural recovery rates of vegetation on the North Slope will render the site unusable for listed eiders for an unknown period of time, but likely decades or longer.

The impact of habitat loss depends upon the location of gravel pads and material sites since spectacled and Steller's eider density varies across the Action Area (Figures 3.3 and 3.6). Assuming the gradient in observed density reflects a gradient in habitat quality, and that displacing birds from preferred habitat reduces their reproductive potential, placing fill in areas used by nesting eiders would compromise their reproductive potential.

This displacement and resulting reduction in reproductive potential could be particularly significant for Steller's eiders. Aerial surveys indicate they occur at very low densities across the ACP, with highest density in the vicinity of Barrow. The average density of

Steller's eiders observed during ACP surveys from 1992-2007 was 0.0058 birds/km^2 (Larned et al. 2007), while in the Barrow triangle the average density from 1999-2006 was 0.04 birds/km^2 (Ritchie et al. 2006), with densities immediately adjacent to Barrow of 0.66 birds/km^2 (Rojek 2006). To reduce habitat loss impacts for Steller's eiders, BLM will prohibit permanent oil and gas facilities, material sites, and staging areas, with the exception of pipelines on tracts subject to new leases or lease renewals in the Barrow triangle (defined as the area north of 70^{o}50' and west of Dease Inlet). These tracts total an area of 689,987 acres and support significant numbers of Steller's eiders.

Similarly, ROP/STIP E-17 prohibits gravel mines, staging areas, and permanent oil and gas facilities, except pipelines, in spectacled eider breeding habitat south and east of the Barrow triangle identified by the Service as being "high" density ($\geq$ 1.06 spectacled eiders/mile^2) using the best available long-term data from the annual eider breeding survey at the time development is proposed.

BLM's ROPs and STIPs will significantly reduce the impacts of habitat loss as they designate approximately 43% (2,703,848 acres) of the eider breeding habitat as UL, RSO, or NSO. These restricted areas contain approximately 57% of all aerial survey observations of spectacled eider, and therefore, we assume confer habitat protection to approximately 57% of the North Slope-breeding population of spectacled eiders.

In the remaining areas protections would be conferred through implementation of ROP E-11. This ROP requires three years of pre-construction surveys to determine listed eider use within the area of a proposed development project. The survey results will be used to assist in the design and placement of facilities to minimize or eliminate impacts to nesting and brood-rearing eiders.

Given the sparse distribution of spectacled eiders in the portions of the eider area where development may still occur (0.409 birds/km^2 which equates to 1.06 birds/mi^2 or 1 nest/2.12 mi^2), BLM carried out a spatial analysis to estimate the probability that facilities that may result from the Action would fall within 200 m of a spectacled eider location (BLM 2008b).

BLM first randomly plotted spectacled eider locations throughout the portions of the eider area available for development based on the spectacled eider density classes described by the Service's Migratory Bird Management Office from annual eider surveys. Next, 6,000 theoretical CPF developments (1,000 replicates of the 6 CPF predicted to result from the Action in each planning area) and their associated facilities were randomly plotted in each planning area. Based on the random placement of the developments, overlap with eider locations or the 200 m area surrounding locations at various density classes ranged from 25.1% to 55.2%. The analysis indicated if the 12 CPF complexes that may result from the Action are randomly placed in the portions of the eider area available for development, 2 would likely intersect spectacled eider locations in areas supporting the lowest 2 density classes (0-0.146 birds/km^2), 1 would intersect spectacled eider locations in areas supporting 0.146-0.255 birds/km^2, and 1 would intersect spectacled eider locations in areas supporting 0.255-0.409 birds/km^2.

Although placement of facilities is not random, this spatial analysis shows that it is plausible for development to spatially avoid eiders. One factor that may limit overlap of development with eiders is Industry's preference to construct in drier areas where the ground is more stable and less gravel fill is required, whereas listed eiders generally nest in wetter areas close to ponds. Of greater significance is ROP E-11 which requires three years of pre-construction surveys to determine listed eider use proximal to a proposed development project. The survey results will be used to assist in the design and placement of facilities to minimize, and potentially eliminate, impacts to nesting and brood-rearing eiders. Thus, the sparse distribution of listed eiders, combined with Industry's directional drilling capabilities, will serve to reduce potential for placement of facilities in habitats important to listed eiders.

While the ROPs will significantly reduce the impacts of habitat loss, some adverse effects are still anticipated. These impacts are discussed further in Section 8 – *Incidental Take Statement*.

All stages of a development project involve construction of ice roads and pads to transport materials to and from project areas. BLM estimates construction of 310 acres of ice roads/year for 50 to 70 years. There have been several studies on impacts of ice road construction to different tundra types. Overall, these studies found impacts from ice roads are low, with occasional areas of moderate level impacts (Pullman et. al. 2003). In one survey, damage occurred on higher, drier sites with little or no damage observed in wet or moist tundra areas (Payne et al. 2003, cited by Pullman et. al. 2003). Jorgenson (1999) found impacts were limited to isolated patches of scuffed high microsites and crushed tussocks. McKendrick (2003) studied several riparian willow areas and found while branches were damaged the plants remained viable.

ROP C-2 implements measures to protect stream banks, and minimize soil compaction, and the breakage, abrasion, compaction or displacement of vegetation during winter operations and governs the construction and operation of ice roads in both planning areas. Although minor impacts to tundra vegetation may occur, significant impacts that would adversely affect listed eiders are not anticipated.

Disturbance and Displacement

Oil and gas development activities that may result from the Action could disturb Steller's and spectacled eiders. Seismic surveys, exploratory drilling, gravel mining, material hauling, pad, road, and pipeline construction, and pipeline maintenance are all expected to occur in winter and therefore not disturb listed eiders. However, once pads, staging areas, and roads are constructed there will be year-round human activities on them, including machinery and facility noise, pedestrians, and vehicle traffic. Frequent fixed-wing and helicopter flights into and out of CPF airstrips will occur, particularly during the construction and development-drilling phase.

Disturbance occurring during the nesting period (approximately June 5 - August 15), could adversely affect individuals by: 1) displacing adults and or broods from preferred habitats during pre-nesting, nesting, and brood rearing, leading to reduced foraging efficiency and higher energetic costs; and 2) flushing females from nests or shelter in brood-rearing habitats, exposing eggs or ducklings to inclement weather and predators. Hens may also damage eggs as they are flushed from a nest (Major 1989); and may abandon nests entirely, particularly if disturbance occurs early in the incubation period (Livezy 1980, Götmark and Ählund 1984). Individual tolerance and behavioral response of Steller's and spectacled eiders to disturbance likely varies, and their response to oil development activities is not fully understood.

Human disturbance may also displace hens and broods from preferred brood-rearing habitat, which could negatively impact duckling growth and survival (Flint et al. 2006). Several studies have documented the location of spectacled eider nests in relation oilfield structures. Anderson et al. (2007) recorded the distance between spectacled eiders and oilfield structures from 1993 - 2006. Pre-nesting period spectacled eiders (observed in groups or pairs) were located an average of 238.99 m from structures, whereas the average distance from nests to oilfield structures was 441.86 m. Pooled data of spectacled eider nest locations in relation to Prudhoe Bay infrastructure in 1990 - 1992 produced an average distance of nests to infrastructure of 711 m (TERA 1993). Again, pre-nesting birds were observed much closer to structures. Johnson et al. (2006) compared distances between pre-nesting spectacled eiders and the location of Alpine oilfield structures before and after construction and found no statistically significant differences. While their field work focused on the assessing potential effects of aircraft traffic on nesting spectacled eiders, distances from nests to oilfield structures were recorded. In 2005 the average distance to successful nests was 840 m (n=6) and unsuccessful nests was 937 m (n=12). In summary, these studies found spectacled eider nests were generally > 400 m from oilfield structures, but nest success did not show a statistically significant relationship with distance to oilfield structures.

While it is likely other factors, such as the availability of preferred habitat are also important in determining nest location, these studies suggest that eiders may be less comfortable nesting than foraging near oilfield structures, which if true, supports the contention that habitat near facilities becomes less useable to nesting eiders. Human activity and disturbance at facilities displacing listed eiders from nearby habitat effectively results in a reduction of available nesting and brood-rearing habitat. It is, however, difficult to estimate how much habitat would be rendered less suitable for nesting as a result of disturbance. Based on best judgment we assume nesting behavior may be disrupted by human activities within 200 m of nests. BLM estimates that the amount of habitat within 200 m of facilities where disturbance may displace listed eiders is 223.19km^2 in NE NPR-A and 216.49km^2 in NW NPR-A (BLM data, M. Varner *pers. comm*.).

Eider response to aircraft may vary with location. Steller's eiders have been observed nesting and raising broods near Barrow Airport, and spectacled eiders are known to nest near Deadhorse Airport (Service data). Studies of spectacled eider responses to aircraft and construction activities at the Alpine oilfield suggest broods can be raised successfully near significant levels of disturbance (Johnson et al. 2006). In these areas aircraft disturbance is regular and ongoing, allowing sensitive individuals to move away and less sensitive individuals to become habituated to disturbance. The displacement of sensitive individuals from habitat adjacent to runways at the CPFs is included within the assessment of habitat loss.

In remote areas of NPR-A, birds are not subject to regular disturbance by landing aircraft or helicopters. Hence, eiders nesting in these areas likely have not become habituated, and may be sensitive to this type of disturbance. Incidental take from these types of activities is anticipated, and is discussed further in Section 8 – *Incidental Take Statement*.

Activities that happen infrequently or in undeveloped areas, such as helicopter landings and field research in remote areas, communication tower repairs, and spill response exercises, do not allow birds to become habituated. While these occasional activities may not displace eiders from preferred habitat, they could cause adverse effects by flushing hens from nests or disrupting and separating hens with ducklings. ROP F-1, which applies to both planning areas, and Stipulation K-4 in NE NPR-A, implement restrictions on aircraft operating in areas used by caribou for insect relief and geese for molting. These requirements will also presumably reduce aircraft disturbance effects on listed eiders in these areas. However, individuals exposed to novel disturbance events may be adversely affected, and incidental take is anticipated.

In the marine environment, barges transporting materials for construction of CPFs, and boats taking part in oil spill response exercises, may disturb listed eiders. In the Beaufort Sea, and along most of the barge route in the Chukchi Sea, only small numbers of listed eiders would be encountered and temporarily displaced to adjacent, comparable habitat. However, if vessels enter the Ledyard Bay Critical Habitat Unit (LBCHU) between mid-June and mid-October (Petersen et al. 1999), large numbers of flightless, molting spectacled eiders could be disturbed.

Collisions

Structures that may result from the Action could pose a collision risk for listed eiders. However, their location, timing of use and design will influence the magnitude of risk.

Migratory birds suffer substantial mortality from collisions with man-made structures (Manville 2004). Birds are particularly at risk of collision with objects in their path when visibility is impaired during darkness or inclement weather, such as rain, drizzle, or fog (Weir 1976). In a study of avian interactions with offshore oil platforms in the Gulf of Mexico, Russell (2005) found collision events were more common, and affected greater numbers of birds during poor weather. Certain types of lights (such as steady-state red) on structures increase collision risk (Reed et al. 1985, Russell 2005, numerous authors cited by Manville 2000). This is particularly apparent in poor weather when migrating birds appeared to circle around structures after being attracted to lights and becoming unable to escape the "cone of light" (Russell 2005, Gauthreaux & Belser 2002, Federal Communications Commission 2004).

The flight behavior of eiders puts them at risk of colliding with structures. Day et al. (2005) reported eiders near Northstar Island in the Beaufort Sea flew at an average height of 6 m above sea / ground level, and at relatively high speed (~ 45 mph). Johnson and Richardson (1982), in their study of migratory behavior along the Beaufort Sea coast, reported that 88% of eiders flew below an altitude of 10 m and > 50% flew below 5 m. Listed eiders could collide with structures during spring or fall migration or during local flights within nesting territories.

Spring migration routes of Steller's and spectacled eiders within, and adjacent to, the Action Area are not well understood. In the Chukchi Sea, king eiders follow spring leads that parallel the Alaska coastline (S. Oppel, University of Alaska-Fairbanks, unpublished data), and listed eiders have also been observed in these areas (William Larned, USFWS, and Dr. James Lovvorn, University of Wyoming, *pers. comm.*). However, few data exist on movement of listed eiders across the Beaufort Sea or NPR-A to their breeding areas. Very few spectacled or Steller's eiders, even considering their small population sizes, were observed during spring migration counts at Point Barrow (Woodby and Divoky 1982, and Suydam et al. 2000). Their absence at Barrow led Woodby and Divoky (1982) to suggest spectacled eiders may migrate over land south of Point Barrow in spring. Radar data at Oliktok Point on Alaska's north coast indicated eiders migrated over a broad front, with eiders recorded 25 km onshore and 25 km offshore (the radar detection limit) in spring (Johnson and Richardson 1981), while TERA (1999) suggested spring migration of spectacled eiders on the North Slope is largely overland after departing the Chukchi Sea. No telemetry data of Steller's eiders' late spring migration and arrival on Alaskan breeding grounds exist.

Male spectacled eiders depart the breeding grounds before females, in mid-June (TERA 2002 and Petersen et al. 1999). Satellite telemetry data suggest most male spectacled eiders spend little time in the Beaufort Sea, with the exception of areas with ice-free water such as offshore from the Colville River Delta (TERA 2002). Transmittered males migrated an average of 6.6 km offshore (Petersen et al. 1999), although two came onshore near Teshekpuk Lake and flew overland to the Chukchi Sea (TERA 2002). However, in the TERA (2002) study, many males appeared to cross over multiple points of land en route to the Chukchi Sea. Females with transmitters staged in the Beaufort Sea an average of two weeks (TERA 2002). Their migrations were further offshore than males', averaging 16.5 km offshore (Petersen et al. 1999). Both satellite telemetry studies attributed this slight difference in migration route to timing, specifically the amount of ice-free, open water present when the females moved west later in summer.

Male Steller's eiders remain on the breeding rounds until late June or early July, also departing the area before females. Steller's eiders captured near Barrow during breeding and non-breeding years used marine waters close to Barrow (within 25 km) before initiating their fall molt migration offshore through the Chukchi Sea (Martin et al. *in prep.)*.

Each phase of development poses different collision risk. Seismic and exploration activities take place in winter, when listed eiders are absent from the Action Area, and hence pose no risk. Although rigs are stored with their derricks laying down, parallel to the ground, the over-summer storage of equipment could present a collision hazard, particularly if equipment is stored in areas with higher densities of listed eiders.

Production drilling is anticipated to be a year-round activity. Based on the average number of wells/pad, and time required to drill wells, BLM anticipates 124 production-drillrig years in NE NPR-A and 121 in NW NPR-A. These drillrigs will be located on pads with other structures, including one guyed, 60-foot tall communications tower at each CPF. BLM will implement ROPs E-10 and E-11(c) in both planning areas in an effort to reduce collision risk. ROP E-10 requires all structures > 20 feet tall with artificial lighting to direct lighting inward and downward, and ROP E-11(c) requires guy wires on communication towers be clearly marked to improve their visibility to birds.

It is also conceivable that listed eiders could collide with vehicles, or be killed while crossing in-field roads. Birds, particularly grouse and passerines, are regularly killed by vehicle collisions along the Dalton Highway (BLM 2008). However, the Service is not aware of listed eider mortality associated with road vehicles. Traffic on in-field road systems is anticipated to be highest in winter, when listed eiders are not present in the Action Area, reducing collision risk.

Despite the ROPs, which aim to reduce risk, collisions between listed eiders and oil and gas structures in NPR-A are still likely to occur. The magnitude of risk will vary considerably depending on the location of structures. Stipulation K-6 precludes construction of facilities within ¾ mile of shorelines in both planning areas, and may reduce risk during molt migration when males, in particular, may be moving close to shore. The further east a structure is located the fewer eiders will encounter it, and hence we assume potentially collide with it, as there is little evidence suggesting listed eiders move further east than their breeding location. Similarly, structures located in areas of relatively high listed eider density would be encountered by more eiders during local flights, presumably posing a risk to more individuals than a similar structure located in a low density area. Incidental take is anticipated, and is discussed further in Section 8 – *Incidental Take Statement*.

Increased Predation

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 (Day 1998, Eberhardt et al. 1983). Day (1998) conducted a comprehensive literature review examining four key predators of tundra-nesting birds, and concluded that individual glaucous gulls, grizzly bears (*Ursus arctos*), arctic foxes, and common ravens had increased survival and reproductive success when additional anthropogenic food sources such as garbage dumps were available. A population increase in these species could affect listed eiders and other ground-nesting avifauna through predation of eggs, young, and adults. Nest predation may pose a significant threat to listed eiders. At Barrow, Steller's eider nest success rates in the late 1990s were low, documented at 16% (Obritschkewitsch et al. 2001) using the Mayfield method (Mayfield 1975). After a fox control project in 2007 nest success in the same area was recorded at 47% (95% C.I.: 23-

92%) (Rojek 2007). This data suggests that fox control may have resulted in an increase in nest success, but other factors may also have played a role in this increased success.

Predators may be attracted to development if it provides a source of food, nesting/denning habitat, or a perch to increase hunting efficiency. Although practices in the existing North Slope oil fields have not prevented predators and scavengers from accessing human wastes (Eberhardt et al. 1983, Garrott et al. 1983), more recent regulations applied by BLM in NPR-A have required complete control of waste to eliminate this problem. ROPs A-1 and A-2 are partially intended to prevent garbage and food being accessed by wildlife in both planning areas through appropriate management, storage, and disposal. The effectiveness of these ROPs is unproven; however, observations at the relatively new Alpine field suggest no evidence of food availability attracting potential eider nest predators (BLM 2008). The ROPs should eliminate anthropogenic food sources for eider predators at oil and gas facilities. As food scarcity is probably the single most important population-limiting factor for arctic foxes (Burgess 2000), and is thought to play a major role in limiting glaucous gull populations (Day 1998, Rojek 2008) implementation of these ROPs should prevent fox and gull population increases near industrial infrastructure.

New infrastructure may also provide nesting substrate for ravens. Ravens appear to have expanded their breeding range on the North Slope by utilizing buildings and other manmade structures for nest sites (Day 1998). ROP E-9 requires operators to "avoid human-caused increases in populations of predators of ground nesting birds." Lessees are required to use best available technology to prevent facilities from providing nesting, denning, or shelter sites for ravens, raptors, and foxes in both planning areas. Observations at the Alpine field suggest that the ROP is preventing mammalian predators' (foxes) use of project structures; however, two pairs of ravens are now nesting on facilities at the Alpine development. Day (1998) interviewed a number of biologists who work on the North Slope and many felt that ravens may be highly efficient egg predators. Ravens have been observed depredating Steller's eider nests at Barrow (Rojek 2008), and feeding their young on waterfowl eggs in the Endicott Oil Field (Truett et al. 1997).

Increased Subsistence Hunting

While facilities constructed as a result of the Action would not be accessible to the general public for tourism or recreation, development areas are open to rural subsistence hunters. If facilities are close to, or accessible from, villages there may be easier access to remote hunting areas for subsistence hunters. Increased access could adversely affect listed eiders by increasing harvest, deposition of lead shot into wetland habitats (although use of lead-shot is now prohibited in the Action Area), and disturbance of nests and broods.

Prior to the listing of Steller's and spectacled eiders under the Act, subsistence harvest of both species occurred across the North Slope (Braund et al. 1993). This has continued since listing, despite prohibitions against taking spectacled and Steller's eiders. The actual number of listed eiders taken during waterfowl hunts on the North Slope is poorly documented. Outreach efforts to educate local residents about the protected status of the species are ongoing. We anticipate the slopewide outreach and law enforcement efforts will enhance competence in any areas made accessible by the Action.

Poisoning from lead-shot is thought to have been a contributing factor in the decline of spectacled eiders on the Y-K Delta (Franson et al. 1995, Grand et al. 1998). High lead concentrations have been recorded for Steller's eiders on the ACP (Trust et al. 1997), and from female Steller's eiders nesting at Barrow (Service unpublished data). Lead isotope tests of samples collected at Barrow confirmed the lead was from lead shot origin and not naturally occurring forms found in Steller's eider habitat (Angela Matz, USFWS, unpublished data).

Increased access to previously unused or little used hunting areas could result in new deposition of lead shot into the wetland habitats of listed eiders. However, use of lead shot for hunting waterfowl is prohibited statewide, and for all bird hunting in State Game Management Unit 26 on the North Slope (which includes the Action Area). Hunter outreach programs and law enforcement activities are occurring and aim to reduce illegal use of lead shot the North Slope. We assume the prohibition of lead shot use for bird hunting in Unit 26 will prevent lead-shot contamination of previously less-accessible wetlands in the Action Area, although it is unknown to what degree compliance will progress.

On-tundra subsistence activities have the potential to disturb nesting and brood rearing eiders. The mechanisms by which disturbance can have adverse effects are discussed above. BLM (2008) suggests that subsistence hunters may avoid oil and gas development areas, and since oil-field roads will not be connected to outside facilities (such as villages or existing roads) they may be hard to access. It is difficult to determine what effect oil and gas activities resulting from the Action will have on subsistence use of the area. However, significant increases in disturbance to listed eiders from subsistence activities that result from oil and gas development in this area are not anticipated.

Crude and Refined Oil Spills

Both crude and refined oil spills are predicted to occur as a result of the Action. Spectacled and Steller's eiders could be killed if these spills reach tundra or marine habitats. Exposure to oil can cause bird mortality in numerous ways. External oiling disrupts feather structure, causing matting, and permits wetting of the bird. Death typically results from hypothermia and drowning (Jenssen 1994). Ingestion of petroleum products through preening, or consumption of contaminated food or water, and inhalation of fumes from evaporating oil, may be immediately lethal, or in lower does cause debilitating effects including gastrointestinal irritation, pneumonia, dehydration, red blood cell damage, impaired osmoregulation, immune system suppression, hormonal imbalance, inhibited reproduction, retarded growth, and abnormal parental behavior (Jenssen 1994, Hartung and Hunt 1966, Miller et al. 1978, Szaro et al. 1981, Leighton 1991, Fry 1986, Eppley 1992, Fowler et al 1995, Walton 1997, and Briggs et al. 1997). These effects can cause death from starvation, disease, or predation, especially in the harsh arctic environment. Oil that contacts bird eggs, either directly from a spill, or via an oiled incubating adult, can cause toxic effects or death to embryos (Aibers 1978, Hoffman 1978, and White et al. 1979).

BLM analyzed spill probability for development that may result from the Action using historical data from oil development on Alaska's North Slope. Spills were divided into three size categories: small (< 500 bbl); large (≥ 500 to ≤ 120,000 bbl); and very large (≥ 120,000 bbl). There have been numerous small spills of both crude and refined oil (principally diesel) since oil development began. The majority of these spills have been confined to gravel pads and roads, and when they reached tundra have impacted areas of < 5 acres. Two large spills have occurred. The first was a 2,380 bbl spill in 2003, and the most recent was a 4,800 bbl spill from a low-pressure pipeline in 2006. This spill resulted in changes in federal regulations governing the inspection and monitoring of low-pressure oil pipelines. No very large spills have occurred on the North Slope.

Based on these data, BLM assumes there is a > 99.9% probability of one of more small spills occurring as a result of the Action. Table 5.1 shows the number and volume of spills in each planning area that are predicted to result from the Action.

BLM also predicts that < 3 large spills with an estimated total volume of 13,320 bbl will occur in NE NPR-A, and < 3 large spills with an estimated total volume of 12,888 bbl will occur in NW NPR-A if full development takes place. However, the probability of a very large spill occurring is considered to be extremely low (BLM 2008).

Table 5.1 – Number and Volume of Crude and Refined Oil Spills Predicted Under the RFDs for each Planning Area

	NE NPR-A	**NW NPR-A**
Number of Small Crude Oil Spills	659	637
Volume of Small Crude Oil Spilled	1,977 bbl	1,911 bbl
Number of Small Refined Oil Spills	1,628	1,575
Volume of Refined Oil Spilled	1,293 bbl	1,103 bbl

Impacts from a spill are dependant on numerous factors including: effectiveness of spill response, weather conditions, time of year, and location / habitat type (i.e., tundra, gravel pad, ponds and lakes, or marine waters). Spills to tundra can be contained more easily than those reaching water bodies. Oil flowing over land can infiltrate vegetation and soil which can act as absorbents slowing the spread of oil, and snow which may preventing it from reaching the tundra surface. The flat topography of the North Slope also limits oil flow. Spills to water quickly cover a much larger area than a spill of comparable size in a terrestrial environment. The spread of oil in ponds or freshwaters may be slower in the arctic than in more temperate areas as low water temperature increases oil viscosity. However, this effect may be absent in shallow ponds and marshy areas in late summer when water temperatures can reach 64^{o}F (Miller et al. 1980, cited by BLM 2008). In flowing waters, oil will spread as in other water bodies, but will also form linear slicks as currents move it downstream. Oil may reach the marine environment where wind, wave Action, and currents will spread it to an increasingly large area. The timing of a spill, particularly the presence of ice or broken ice, and its stage of development (i.e., freeze up, mid-winter, or breakup), plays a significant role in determining the behavior and fate of spilled oil in this environment.

The impacts of a terrestrial spill will also be determined by: 1) the density of nesting eiders (i.e., oil could adversely impact a greater number of individuals in a high density area compared to a low density area); and 2) timing (whether oil and/or cleanup efforts persist into summer). In the marine environment the most significant factor in determining the severity of effects would be the location of oil, and in particular if it reaches area where listed eiders congregate such as open water offshore from river deltas.

Several ROPs and STIPs aim to decrease spill probability and improve spill response if spills occur. STIPs K-6 and K-1, which preclude most permanent oil and gas facilities within ¾ mile of the coastline and ½ mile from major rivers, will significantly reduce the probability of oil reaching the marine environment. Impacts to listed eiders could range from none, to mortality of individuals, depending upon the location, timing, and the success of cleanup efforts.

Toxic Substance Spills

In addition to crude and refined oil, spills of other substances, such as seawater, sewage, and hazardous materials are possible. A spill of seawater to freshwater or tundra could have a significant impact, potentially rendering nesting habitat unusable for years. Drilling mud and cuttings contain heavy metals and hydrocarbons that are toxic to biota.

To reduce the probability and impacts of toxic substance spills, BLM has developed ROPs and STIPs for both planning areas that require hazardous materials contingency planning (ROP A-3), spill prevention and response contingency plans (ROP A-4), limits on fuel storage and refueling (ROP A-5), no surface discharge from reserve pits (ROP A-6), and limits for on-pad storage of mud/drill cuttings prior to required re-injection (ROP A-2).

As with an oil spill, the location, timing, and characteristics of a toxic substance spill would determine the severity of impacts to listed species. As with an oil spill there is a range of potential outcomes of a toxic substance spill from no effect to mortality of an unknown number of individuals.

5.3 Effects on Polar Bears

The following types of adverse effects to polar bears may result from the Action:

- Habitat Loss
- Disturbance
- Increased Mortality from Bear – Human Interactions
- Oil Spills and Toxic Contamination

Habitat Loss

Gravel pads, roads, and mine sites that may result from the Action would impact approximately 35 km^2 (21.75 mi) of tundra habitat. Polar bears use coastal areas for denning, hunting, and travel corridors, and we suspect with changing ice patterns more polar bears will be encountered on land in the future. When polar bears do occur on land, they are predominantly found in coastal areas. As development within ¾ mile (1.2 km) of the coastline is precluded under STIP K-6, impacts from habitat loss are not anticipated for non-denning bears.

While females den in the same habitat type as they used previously, such as sea ice or terrestrial sites, they do not appear to reuse the same site (Amstrup and Garner 1994). Terrestrial dens in Alaska are sparsely distributed along a narrow coastal strip, with observations up to 61 km (37.9 mi) inland (Amstrup and Gardner 1994). Denning habitat includes coastal bluffs, along river banks, and bluffs where snow accumulates early (Durner et al. 2003). Stipulation K-6 precludes the construction of oil and gas facilities within ¾ mile (1.2 km) of the coast, and STIPs K-1 and K-2 preclude facilities within ¼ mile (0.4 km) of many lakes and ½ mile (0.8 km) of many rivers. These STIPs should prevent significant loss of denning habitat. It is possible a small amount of potential denning habitat may be destroyed or altered by development activities, however, denning habitat is not limiting population size, and adverse effects from habitat loss are not anticipated (C. Perham, USFWS- Marine Mammals Management Office *pers. comm.*).

Disturbance

Noise and vibrosis from seismic surveys, exploratory drilling, aircraft flights, ice road and other construction, and production activities, including pipeline maintenance, may adversely affect polar bears through disturbance.

Disturbance from industrial activities may cause individual bears to move away or avoid the area of activity. There is, however, some evidence that polar bears exposed to routine industrial noises may acclimate to those noises and show less vigilance than bears not exposed to such stimuli (Smith et al. cited by USFWS 2006).

Although den sites have also been recorded within 2.8 km (1.74 mi) of a production facility (USFWS 2006), female polar bears with cubs, especially in dens, are thought to be more sensitive than other age and sex groups to disturbance (Amstrup and Gardner 1994). If disturbance coincides with the initiation of denning by a pregnant female polar bear, there is a possibility the preferred denning site may be avoided. Industrial noise and activities that commence after the female has denned (e.g., seismic surveys, ice road construction, or winter pipeline maintenance) may cause a female to abandon the den site before the cubs are developed enough to survive outside. Such den abandonment due to human disturbance was described in January 1985 when a female polar bear was believed to have abandoned her den as a result of disturbance from rolligon traffic, which occurred between 250 m and 500 m (820 ft and 1,640 ft) from the den site. Researcher disturbance, created by camp proximity and associated noise, which occurred during a den emergence study in 2002 on the North Slope, may have caused a female bear and her cub(s) to abandon their den and move to the ice sooner than necessary. Information indicates events such as these have been infrequent and isolated (USFWS 2006).

Post-emergence, females and cubs spend an average of 8 days in the area before the den site is abandoned (USGS data cited by USFWS 2006). These bears may be particularly susceptible to disturbance at this time, although observations of post-emergence behavior noted a range of individual bear responses.

BLM has developed a series of ROPs and STIPs to minimize adverse effects to polar bears. ROP C-1 prohibits cross-country use of heavy equipment and seismic activities within 1 mile (1.61 km) of known polar bear dens, and requires project proponents contact the Service prior to winter work so that den detection surveys or other mitigation methods must be implemented prior to initiation of activities. This should prevent disturbance of females and cubs in known dens from these activities.

Routine aircraft traffic is not anticipated to adversely affect polar bears in the Action Area. Amstrup (1993) studied the response of denning bears to research aircraft and found no detectable motion among collared bears in their dens when flights took place. Reactions of non-denning polar bears appear limited to short-term changes in behavior. Hence, no long-term adverse impacts to individuals from aircraft activities are anticipated.

Operations at CPFs, satellite facilities, gravel mines, and pump stations may disturb and displace individual polar bears from the immediate area. Given the sparse distribution of polar bears on the North Slope, and their limited use of the Action Area, adverse effects from disturbance are anticipated to be infrequent and affect few individuals.

Disturbance that disrupts behavioral patterns of polar bears is classified as take under the MMPA. The MMPA prohibits incidental take of marine mammals unless specific (ITRs have been promulgated under section 101(a)(5) of the MMPA and a subsequent LOA has been issued. The Service has issued ITRs and LOAs for oil development projects on the North Slope and Beaufort Sea including seismic and exploration work in NPR-A (71 FR 43925), and ITRs for oil and gas seismic and exploration activities in the Chukchi Sea and adjacent area, including a portion of NPR-A (73 FR 33211).

Under the MMPA, incidental take is only permitted provided the total of such taking will have no more than a negligible impact[4] on the marine mammal species (or stock in the case of the Beaufort and Chukchi Sea ITRs), and does not have an [5]unmitigable adverse impact on the availability of these species for subsistence uses. While activities that may occur as a result of the Action may increase the amount of incidental take under the MMPA, the number of facilities predicted is relatively low compared to the number and extent of existing oil facilities on the North Slope.

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[4] Negligible impact - an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival.

[5] Unmitigable adverse impact - is an impact resulting from the specified activity (1) that is likely to reduce the availability of the species to a level insufficient for a harvest to meet subsistence needs by (i) causing the marine mammals to abandon or avoid hunting areas, (ii) directly displacing subsistence users, or (iii) placing physical barriers between the marine mammals and the subsistence hunters; and (2) that cannot be sufficiently mitigated by other measures to increase the availability of marine mammals to allow subsistence needs to be met.

Increased Mortality from Bear – Human Interactions

Polar bear/human encounters can be dangerous for both the polar bear and human. For the bear, a human encounter may result in the bear being hazed away from the area or, in the worst case, being killed in defense of life and property.

While loud noises may deter bears from entering an area of operation, polar bears are curious and commonly approach noise sources, such as industrial sites (Stirling 1988). All phases of project development, from seismic surveys, through exploratory drilling, ice road construction, and production activities including pipeline maintenance will create noise that may be a bear attractant. Although currently rare (USFWS 2006), chance encounters between polar bears and humans are likely to increase as more development activities occur in winter in the Action Area. Polar bears may also be attracted to facilities if garbage or waste food were available.

To minimize interactions between humans and polar bears, ROPs A-1 and A-2 require management and disposal of garbage and wastes (including pumpable wastes and wastewater), to prevent wildlife accessing anthropogenic sources of food. ROP A-8 aims to minimize conflicts between bears and humans through facility design, development of on-site procedures if a bear is observed in the area, and training of personnel to implement these procedures. ROP A-8 also requires procedures to deter bears from a drill site and provide contingencies in the event bears do not leave the site or cannot be deterred by authorized personnel if intentional take as defined by MMPA has been authorized.

Authority to harass (haze) polar bears may be requested under section 112(c), and/or 101(a)(4)(A) of the MMPA, which allows the Service to set up cooperative agreements with industry or other publics, and under sections 109(h) which states that a person may take a marine mammal in a humane manner if such taking is for: (a) protection or welfare of the mammal; (b) protection of public health and welfare; or (c) non-lethal removal of nuisance animals. This type of action is considered Level B Harassment[6]. Although hazing may have some short term adverse effects by displacing a bear, the safe removal of a bear to non-industrial areas may prevent more serious impacts to the bear possibly including lethal take in defense of life and property. Since the implementation of ITRs, LOAs, and authorization of intentional take, no polar bears are known to have been killed due to encounters with industry on the North Slope of Alaska. In contrast, 33 polar bears were killed in the Canadian Northwest Territories from 1976 to 1986 during encounters with industry (Stehnhouse et al. 1988).

Oil Spills and Toxic Contamination

Oil and toxic substance spills are predicted to result from the Actio, and oil is known to be highly toxic to polar bears (St. Aubin 1990). Bears can be affected by contacting

[6] Level B Harassment - has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering but which does not have the potential to injure a marine mammal or marine mammal stock in the wild.

spilled oil or ingesting contaminated prey (Stirling 1990). The size, location, and timing of a spill will determine the number of polar bears affected.

In the terrestrial portion of the Action Area, polar bears are absent or sparsely distributed. Therefore, BLM (2008) concluded that a large spill to tundra, even if it entered lakes and tundra wetland complexes would likely only contact and result in mortality to a maximum of three polar bears.

A spill to marine waters may contact, and potentially kill, a larger number of polar bears or their prey. Amstrup et al. (2006) modeled the potential impacts to polar bears of large oil spills from development projects in the Beaufort Sea (Northstar and Liberty) based on spill trajectory models and radio telemetry data on bear movements. Their model showed that a 5,912 barrel marine spill (thought to the largest spill possible from a pipeline connecting specific existing or planned offshore developments with onshore facilities) could contact up to 74 polar bears depending on the spill's trajectory, as well as location and timing of the spill. The most likely number of bears to be contacted was far lower, however, with median estimates ranging from 1-3 or 3-11 bears, depending upon the location and month of the spill (75% of likely trajectories contacted less than 9 or 20 bears, depending on spill location). The specific scenarios evaluated in this model are not directly applicable to the proposed project being considered here (both oil trajectory estimates and bear movement data come from areas to the east of the current Action Area) but the results support the contention that a spill of low thousands of barrels reaching the marine environment could encounter low tens or possibly high tens of polar bears, depending on season, location, and trajectory.

While an oil spill reaching marine waters may have the most significant impacts, there are a number of factors that significantly reduce the potential that oil spilled in the Action Area will reach large aggregations of polar bears. Although offshore leases may be made available, STIP K-6 prohibits the construction and operation of permanent facilities (including oil pipelines) < ¾ mile (1.2 km) inland from the coastline. STIP K-1 requires that permanent oil and gas facilities have a minimum ½ mile (0.8 km) setback from rivers (for some rivers the setback is greater). For thousands of barrels of oil to reach the marine environment, a spill to tundra would need to be extremely large to cross these buffers. Although BLM anticipates < 3 large spills will occur in each planning area, a very large spill which may have sufficient oil to cross these buffers is considered to be an extremely unlikely event.

Essential pipeline crossings perpendicular to the main channel will be permitted under STIP K-1; again these must be located > ¾ mile (1.2 km) inland from the coastline. A large spill at a river crossing in summer/fall could result in oil being transported to the marine environment. Amstrup et al.'s (2006) model predicted a large spill in the eastern Beaufort Sea could kill tens of polar bears. The mortality levels that may occur as a result of a spill from the Action Area are likely to be lower than those predicted by Amstrup et al. (2003) as there are no high density polar bears areas, such as Barter Island, near the Action Area.

In conclusion, a large spill to marine waters in summer/fall could kill polar bears. However, such an event is unlikely given the coastal and river buffers preventing all but the largest terrestrial spills from reaching the marine environment, coupled with extremely low probability of an extremely large spill occurring. Even under the worse case scenario, where a large spill from a pipeline crossing a river in summer/fall where oil reaches the marine environment killing polar bears, population level effects would not result.

5.4 Effects to Critical Habitat

Critical habitat has been designated for both Steller's and spectacled eiders. Only the LBCHU may be affected by activities resulting from the Action. As described above under disturbance / displacement, barges transporting materials could enter this unit, potentially disturbing molting spectacled eiders. Significant disturbance from watercraft is not anticipated, however. The LBCHU is relatively shallow and vessels do not have to traverse it to access either NW or NE NPR-A. Therefore, avoidance of LBCHU will prevent adverse effects. If this assumption proves to be incorrect and vessels are unable to avoid entering the LBCHU, consultation will be reinitiated.

No critical habitat has been proposed or designated for polar bears hence no adverse impacts to critical habitat will result from the Action.

5.5 Indirect Effects

It is possible that oil and gas development predicted to result from the Action may facilitate additional oil and gas development in adjacent areas such as Native owned lands, State, and Federal waters above that previously predicted and consulted on in prior BOs. However, the nature and extent of this additional development is unknown at this time. Oil and gas development in these areas, both offshore and terrestrial, would require federal permits. These permits would trigger a review and consultation under section 7 of the ESA to ensure the proposed activity would not violate section 7(a)(2) of the ESA.

5.6 Interrelated and Interdependent Effects

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 Action that could result in additional effects to listed species.

6. CUMULATIVE EFFECTS

Under the ESA, 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 in this section because they will require separate consultation under the ESA. The vast majority of the land in the Action Area is under Federal management, and nearly all lands in the Action Area are classified as wetlands. Therefore, nearly all activities that may occur in the future in the Action Area would require separate consultation and are not cumulative effects under the ESA. The following types of activities were considered during this analysis:

Further Oil and Gas Development

Further oil and gas development, be they in Federal or State waters or in the terrestrial environment on State, private, Native-owned, or Federal lands, would require Federal permits (such as section 404 of the Clean Water Act authorization from the U.S. Army Corps of Engineers (COE), and National Pollution Discharge Elimination System permits from the Environmental Protection Agency) and, therefore, are not considered cumulative impacts.

Gas Line

BLM now considers the development and export of North Slope natural gas from the Action area via pipeline to be reasonably foreseeable. While much of this line is likely to be on State lands, a project of this magnitude would require Federal permits and section 7 consultation. It is therefore, not a cumulative effect under the ESA.

Community Growth

As described in *Section 4 – Environmental Baseline*, community growth is anticipated to continue across the North Slope. The footprints of North Slope villages will likely increase, along with associated infrastructure such as roads, powerlines, communication towers, landfills, and gravel pits and these activities may adversely affect listed species. The scale of impacts will depend not only on the amount of growth, but the location as it relates to eider habitat. For example, community development projects at Barrow may potentially impact Steller's eiders to a much higher degree than developments at Point Lay.

Because over 97% of the Action Area is wetlands or open water (USGS National Land Cover Database), and listed eiders breed and use wetland areas, a section 404 permit from the COE would likely be necessary for all large scale community development projects that may impact eiders. The issuance of these permits would also trigger consultation under the ESA.

As the population of North Slope communities increases so does the number of subsistence hunters in the Action Area. This could adversely affect listed eiders through direct harvest of these birds and contamination of habitat by lead shot. As described in Section 5 – *Effects of the Action,* both law enforcement and education and outreach activities are on-going across the North Slope, and aim to eliminate these impacts to listed eiders.

Commercial fishing

There is a small commercial fishery for Arctic Cisco in the Colville River Delta. This fishery occurs in late summer/fall through winter. No listed species use these fish, and the fishery is not thought to impact habitat. Hence, adverse impacts from this relatively small fishing operation are not anticipated.

Reduction in the extent and duration of sea ice may increase the potential for commercial fishing or other maritime traffic in the region, but the likelihood and magnitude of these activities are unknown at this time. Future commercial fisheries in the Action Area would likely be managed by the National Marine Fisheries Service, and the issuance of regulations would require section 7 consultation requirements.

Increased Scientific Research
Scientific research across the North Slope is increasing as concern about effects of climate change in the arctic grows. There are a number of long-term study plots in NPR-A providing baseline data, further increasing interest in the area. While much research is conducted by universities and private institutions, all activities in NPR-A require land use authorization by BLM and therefore, require section 7 consultation.

Tourism
All commercial guiding or outfitters operating in the Action Area require a commercial use permit from BLM. Historically, BLM has issued less than 10 of these permits each year, and the number is not increasing (*pers. comm.,* Donna Wilcox, BLM Land Use Permit Coordinator, Arctic Field Office). Although this suggests that commercially guided trips are not increasing, we have no data on the amount of independent tourism taking place in NPR-A, or if it is increasing significantly. It is possible that visitors to NPR-A could disturb a few individual listed species each year but we have no data suggesting significant adverse effects to listed species are occurring or are likely to occur in the future.

Conclusion
In summary, we anticipate oil and gas development, community growth, scientific activities, and other activities will continue in the Action Area in coming decades. Most notably activities with potential to affect significant numbers of individuals of listed species (such as oil and gas development, community growth, and large-scale science projects) are expected to require consultation under the ESA, whereas those that may not require consultation (e.g., independent tourism) will likely have minor impacts to only a few individuals.

7.0 CONCLUSION

This BO considers impacts to listed Steller's and spectacled eiders, polar bears, and critical habitat that may result from the Action. The potential effects of the Action including oil and gas exploration, and construction, operation, and abandonment of oil and gas facilities were considered and added to information on the current status of spectacled eiders, Steller's eiders, polar bears, and the LBCHU; the environmental baseline for the Action Area; and cumulative effects. After considering these aggregate effects on the species, it is the Service's biological opinion that the Action is not likely to jeopardize the continued existence of any of these species, nor will it destroy or adversely modify critical habitat. The incidental take estimates upon which this conclusion is predicated are detailed in Section 8 – *Incidental Take Statement*.

Section 7(a)(2) of the ESA requires Federal agencies ensure their activities are not likely to: (1) jeopardize the continued existence of any listed species, or (2) result in the destruction or adverse modification of designated critical habitat. Regulations that implement section 7(a)(2) of the ESA define "jeopardize the continued existence of" as "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, number, or distribution of that species" (50 CFR 402.02).

In evaluating the impacts of the Action to listed species, the Service identified a number of adverse effects that may occur. These are discussed more fully in Section 5 – *Effects of the Action* and are summarized below. Incidental take has been authorized for activities that may adversely affect listed eiders. Impacts to polar bears were assessed in order to ensure the Action is in compliance with section 7(a)(2). However, no incidental take for polar bears has been authorized in this BO, as activities resulting from the Action that may affect polar bears require authorization under the MMPA prior to authorization of incidental take under the ESA.

Listed Eiders

Habitat Loss and Disturbance/Displacement – We conclude habitat loss from fill and gravel mining and of immediately adjacent habitat from disturbance may adversely affect listed eiders. To ensure potential impacts to listed eiders were not underestimated, we assumed all development activities would occur in the eider breeding area, although it comprises approximately only 47% of the Action Area. There is considerable variation in eider density, and hence potential impacts, even within the eider breeding area. Our estimates of incidental take are based on the acreage of gravel fill and the 200 m zone of influence surrounding facilities, the lifetime of structures, and the density of listed eiders in areas within which development can occur.

Using the methodology described in Section 8 – *Incidental Take Statement* we anticipate the incidental take of 77 spectacled eider eggs or ducklings/year and 8 Steller's eider eggs or duckling/year. This estimate is predicated upon a series of conservative assumptions that are more fully explained in Section 8 – *Incidental Take Statement* which lead us to believe we have likely over estimated incidental take.

Disturbance from Helicopter Landings in Undeveloped Areas – We anticipate helicopter landings in undeveloped areas may adversely affect listed eiders by flushing females from nests, possibly resulting in nest abandonment or partial or complete depredation. The magnitude of these effects will vary with the density of listed eiders and the number of landings. Using the methodology used in Section 8- *Incidental Take Statement*, we estimate an incidental take of less than 10 spectacled eider eggs or ducklings/year and < 4 Steller's eider eggs or ducklings/year.

Significant disturbance from watercraft is not anticipated. The LBCHU is relatively shallow and vessels do not have to traverse it to access either NW or NE NPR-A. As a result we assume vessel will avoid LBCHU and therefore, avoid impacts within the LBCHU. If this assumption proves to be incorrect, consultation will be reinitiated.

Collisions – Collisions between birds and human-built structures are episodic in nature and it is difficult to quantify the collision risk for listed eiders from this Action. Our estimates of incidental take, described in Section 8 – *Incidental Take*, are based on an estimate of collision rates along the Beaufort Sea coast where eiders appear to concentrate in migration. Given the terrestrial location of structures that may result from this Action compared to the principally marine fall migration route of eiders, and the comparatively small profile of structures within the path of migrating eiders predicted incidental take of < 7 spectacled and <1 Steller's eiders killed/year by collisions is likely an overestimate. BLM's ROPs E-10 and E-11 will also likely reduce collision risk but to an unknown degree so we have not adjusted our take estimates to reflect this likelihood.

Crude and refined oil and toxic substance spills – BLM anticipates there is a > 99.9% probability that one or more small spills of crude or refined oils will occur. In each planning area an additional < 3 large spills are anticipated to occur, (for a total of < 6) but a very large spill (> 120,000 bbl) is considered to have a very low probability of occurring. If large spills impact tundra or lakes they may contact and kill an estimated 4 spectacled eiders and < 1 Steller's eiders each. In the worst-case scenario (a large volume of oil entering marine waters in summer in an area where listed eiders congregate) oil could contact and kill larger numbers of Steller's eiders and/or spectacled eiders. However, given BLM's assessment of the very low probability of a very large spill occurring, STIPs K-1 and K-6, which preclude most oil and gas structures within ¾ mile of the coast shoreline and ½ mile from large rivers, and the limited spatial extent and temporal duration of concentrations of listed eiders in the marine environment, the likelihood of a significant quantity of oil spilled in NPR-A reaching concentrations of listed eiders in marine waters is not considered reasonably expected to occur.

Polar Bears

Disturbance – Operations at CPFs, satellite facilities, gravel mines, and pump stations may disturb and displace individual polar bears, however, given the sparse distribution of polar bears on the North Slope, and their limited use of the Action Area, the number of polar bears impacted will likely be low. Disturbance that disrupts the behavior of a marine mammal is considered as take under the MMPA and subsequent authorization under section 101(a)(5) of the MMPA would be required for these activities. Authorization can only be provided if the total of such taking will have no more than a negligible impact on the marine mammal species (or stock in the case of the Beaufort and Chukchi Sea ITRs), and does not have an unmitigable adverse impact on the availability of these species for subsistence uses. Analysis to determine that impacts will not have a greater than negligible impact upon the stock, is required every 5 years (or more often if necessary). Before an LOA for oil and gas activities may be issued, the Service must ensure that the activities fall within the scope of the ITRs and the conclusion that the activities impact would have no more than a negligible on the stock. After an LOA is issued, annual monitoring is required to ensure that actual impacts do not exceed these predicted. Therefore, LOAs will be reissued annually, but only after ensuring that their reissued is within the scope of the negligible impact determination set forth in the ITRs. This provides additional assurance that adverse effects associated with disturbance will not rise to population level impacts.

Increase in Polar Bear–Human Interactions – Activities that may result from the Action will likely result in an increase in polar bear-human interactions. These interactions are anticipated to be non-lethal, but may involve intentional hazing of polar bears away from facilities and operational areas. Based on historical data of Alaska's oil industry interactions with polar bears, the Service anticipates small numbers of polar bears in the SBS and CS stocks may be adversely affected, but lethal take is not expected and population level effects are not anticipated.

Oil Spills and Toxic Contamination – As described above, spills of crude and refined oil and other toxic substances are likely to occur as a result of the Action. Given the sparse distribution of polar bears in the Action Area, even large spills to lakes or tundra are unlikely to contact more than three polar bears. Under the worst-case scenario, a large volume of oil entering marine waters could kill up to low tens of polar bears. However, given BLM's assessment of the very low probability of a very large spill occurring, the STIPs precluding most oil and gas structures within ¾ mile of the coast shoreline and ½ mile from large rivers, and the limited spatial and temporal concentrations of polar bears within and close to the Action Area, this level of take is not reasonably expected to occur.

Summary – Listed Eiders

The Service believes the Action may result in adverse effects to spectacled and Steller's eiders. Although there is uncertainty surrounding our estimate of impacts, our estimates are based on the best available information, and include a number of conservative assumptions. We believe we have likely overestimated numbers of listed eiders that may be incidentally taken as a result of the Action, and that it is extremely unlikely we have underestimated impacts, further bolstering the reliability of our non-jeopardy determination. Based on our analysis we conclude the Action is not likely to appreciably reduce the likelihood of both the survival and recovery of Steller's or spectacled eiders in the wild.

Summary – Polar Bears

The Action may result in adverse effects to polar bears. We anticipate a number of polar bears from the CS and SBS stocks may be disturbed by oil and gas activities in the Action Area. This disturbance may rise to the level of intentional take by hazing, and it is possible, although unlikely based on data from the Alaskan oil industry, that a few individual polar bears may be killed as a result of human-polar bear interactions. Many small, and < 6 large, oil spills are anticipated to result from the Action; however, a very large oil spill is considered by BLM to be an extremely unlikely event. It is possible, although unlikely, that oil from a spill resulting from this proposed Action could reach marine waters and may contact and kill up to tens of polar bears from the CS and SBS stocks. This sequence of events is unlikely, and even if it did occur, would not result in population or species level effects. Therefore, the Service concludes the Action is not likely to jeopardize the continued existence of polar bears.

Summary – Critical Habitat

There are a number of critical habitat units designated to protect Steller's and spectacled eider habitat. However, only the LBCHU may be affected by the Action. As described in Section 5 - *Effects of the Action*, vessels transporting materials for development projects in NPR-A may affect the LBCHU. However, as explained in Section 8 – *Incidental Take Statement*, we assume that vessels will avoid the area, and this activity is not anticipated to have any adverse effects on the critical habitat unit. Therefore, the Action is not anticipated to result in the adverse modification or destruction of critical habitat. We note, however, that consultation would be re-initiated if this assumption is violated.

No critical habitat has been proposed or designated for polar bears.

8. INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. "Harm" is further defined 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, but not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement (ITS).

The measures described below are non-discretionary, and must be undertaken by BLM 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. BLM has a continuing duty to regulate activities covered by this incidental take statement. If the BLM (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, BLM must report the progress of the Action and its impact on the species to the Service as specified in the incidental take statement.

As described in Section 5 - *Effects of the Action*, activities predicted to result from the Action may adversely affect Steller's and spectacled eiders through habitat loss, disturbance and displacement, collisions with structures, and spills of crude oil, refined oil, and other toxic substances. Polar bears may be adversely affected by disturbance, an increase in bear-human interactions, and spills of oil, refined oil, and other toxic substances.

8.1 Incidental Take of Listed Eiders

Habitat Loss
Full development described in the RFDs would result in the loss of 35.03 km^2 of nesting habitat from gravel fill. Additionally, the capability of immediately adjacent habitat to support breeding eiders may be completely or partially compromised by human activity associated with oil and gas structure. The width of this zone of influence remains unknown and it is also unknown whether eiders are simply displaced from this zone (possibly at compromised fitness) or continue to use it but possibly at reduced fitness. As described in Section 5 – *Effects of the Action,* we assume habitat within this 200 m zone of influence around facilities will not support eider nesting when facilities are in operation due to activities and disturbance. As such, this zone of influence is considered to be lost nesting habitat. An estimated 439.68 km^2 of habitat would be within 200 m of a pad, road, runway, pump or compressor station, or staging area (BLM data, M. Varner *pers. comm.*). BLM anticipates that each CPF and its associated satellites and facilities will operate for 50 years, as described in the BA.

The location of impacted habitat will determine impacts to listed eiders. It is currently unknown where development projects will ultimately occur. To estimate impacts, the Service and BLM assumed all development would occur in portions of the Action Area used by listed eiders for nesting. However, this conservative assumption likely results in an overestimation of impacts.

<u>Spectacled Eiders</u>
The density of listed eiders varies considerably across the Action Area. To depict the variation in density, the Service has developed spectacled eider density distribution polygons for the eider breeding survey area (Figure 3.3). The polygons were developed using aerial survey data from 1993-2005. Five density classifications which were determined using the Jenks classification tool in ArcMap, which picks class breaks that best group similar values and maximizes differences among classes. The features are divided into classes whose boundaries are set where there are relatively big jumps in data values. Density classes identified in this manner range from 0-0.034 bird/km^2 to 0.409-1.248 birds/km^2 (the highest density of spectacled eiders observed).

BLM has committed to implement ROP/STIP E-17 to minimize impacts to spectacled eiders. This measure requires that no material sites, staging areas, or permanent oil and gas facilities, except pipelines, would be allowed in spectacled eider nesting and breeding habitat identified by the USFWS as being "high" density ($\geq$ 1.06 spectacled eiders per sq. mile, which equates to 0.409 spectacled eiders/km^2) using the best available long-term data from the Annual Eider Breeding Survey at the time development is proposed. By implementing this measure, spectacled eiders nesting in the highest spectacled eider density class will not be impacted by construction and operation of CPFs, satellite facilities, roads, pump and compressor stations, staging areas, or material sites.

Therefore, only habitat supporting a density < 0.409 spectacled eiders/km^2, may be impacted by development. Table 8.1 indicates that amount of habitat in each density class which is unconstrained by ROPs and STIPs, and its relative abundance in the Action Area.

Table 8.1 – Amount and proportion of different density classes of spectacled eiders in habitat unconstrained by ROPs and STIPs

Density Class	Area (km^2)	Proportion
0–0.035 birds/km^2	4,544.3	31.4%
0.035–0.146 birds/^{2}	4,851.2	33.5%
0.146–0.255 birds/km^2	2,835.5	19.6%
0.255-0.409 birds/km^2	2,248.5	15.5%

Incidental take from habitat loss was derived using the following calculation:

Total fill habitat loss = 35.03 km^2 x 100 years (project life) = 3,503 km^2.

Total zone of influence habitat loss = 439.68 km^2 x 50 years (CPF and associated facility project life) = 21,984 km^2

Total Habitat Loss = 3,503 km^2 + 21,984 km^2 = 25,487 km^2 (total area of habitat impacted over the life of the project).

Note that the estimate of "total habitat loss" should not be construed as a total area impacted. A very small subset of this area (35.03 km^2) is actual footprint where gravel fill will render habitat useless to nesting eiders with certainty. Another 439.68 km^2 within 200 m of this footprint would likely have compromised ability to support eider breeding (the zone of influence). Thus, the total area with reduced ability to support eider breeding in any year would be < 500 km^2, which comprises < 2% of the eider breeding habitat within NPR-A (which totals > 25,000 km^2). The figure calculated for total habitat loss is this maximum footprint plus buffer times the maximum number of years that the habitats' ability may be affected (100 years for footprint and 50 years for the buffer, which is only affected when operations are conducted on adjacent footprint).

Not all habitats support the same density of spectacled eiders, so the 25,487 km^2 of total habitat loss was proportioned based on the abundance of each density class that is unconstrained by ROPs and STIPs:

0-0.035 spectacled eiders /km^2 = 31.4% = 8,003 km^2 x 0.035 = 280 birds = 140 nests
0.035–0.146 spectacled eiders /km^2 = 33.5% = 8,538 km^2 x 0.146 = 1,246 birds = 623 nests

0.146-0.255 spectacled eiders /km^2 = 19.6% = 4,995 km^2 x 0.255 = 1,274 birds = 637 nests
0.255-0.409 spectacled eiders /km^2 = 15.5% = 3,950 km^2 x 0.409 = 1616 birds = 808 nests

Total number of nests impacted = 2,208 / 100 year project life = 22 spectacled eider nests/year

Average clutch size for spectacled eiders in northern Alaska is 3.5 (Peterson et al. 2000). If we assume all displaced pairs fail to breed, habitat loss through tundra fill and excavation, and human disturbance from facilities and operations, could result in a loss of production of 77 spectacled eider eggs or ducklings/year.

Steller's Eiders
Steller's eiders are rare throughout most of the North Slope aerial survey area, with an average density from 1992-2007 of 0.0058 birds/km^2 (Larned et al. 2007). Only 9% of Steller's eider observations from the annual eider surveys were in NE NPR-A, while > 85% were in NW NPR-A. Density of Steller's eiders increases with proximity to Barrow. In the Barrow triangle portion of NW NPR-A the average density from 1999-2006 was 0.04 birds/km^2 (Ritchie et al. 2006), with densities immediately adjacent to Barrow of 0.66 birds/km^2 (Rojek 2006). In NE NPR-A, where few Steller's eiders occur, the survey area wide average of 0.0058 birds/km^2 was used in incidental take calculations.

BLM has committed to prohibiting permanent oil and gas facilities, material sites, and staging areas, with the exception of pipelines on tracts subject to new leases or to lease renewal in the Barrow triangle. This designation precludes construction of all oil and gas infrastructure with the exception of pipelines. As development that may result in habitat loss has been precluded from this area, the aerial survey-wide average of 0.0058 birds/km^2 was also used in the incidental take calculations for NW NPR-A.

Steller's eiders clutch size has averaged 5.5 eggs near Barrow from 1991-2007 (Quakenbush et al. 1995, Obritschkewitsch 2001, Rojek 2005, Rojek 2006, Rojek 2007, Rojek 2008). If we assume all displaced pairs fail to breed, habitat loss through tundra fill and excavation, and human disturbance from facilities and operations, could result in a loss of production of 8 Steller's eider ducklings/year.

There are a series of conservative assumptions implicit in our approach to estimating take from habitat loss for both spectacled and Steller's eiders, and we believe they cumulatively may have resulted in a significant overestimate of impacts. First, implicit in the calculation of habitat loss from the actual footprint is the assumption that eiders displaced by development cannot nest elsewhere. Similarly, by considering the 200 m zone of influence adjacent to footprint as habitat loss, we have implied that eiders that would have nested within the zone of influence also cannot nest elsewhere, nor can they nest at some lower rate within the 200 m zone of influence. We believe both of these assumptions likely underestimate the ability of eiders to move elsewhere on the landscape or adjust to nearby development.

Also, multiplying the total habitat loss by eider density to estimate the number of pairs or nests that may be impacted assumes that the placement of facilities would be completely independent of habitat type or eider nest locations. This is unlikely to be true, however. Analysis by BLM, which is based upon a non-uniform theoretical spatial distribution of spectacled eiders (at classes < 0.409 birds.km^2) overlaid by a random placement of development footprints, suggests that development would have a 25.1% to 55.6% likelihood of intersecting spectacled eider locations or the area within 200 m of eider locations, within the lowest to highest density classes, respectively.

Second, development of oil and gas facilities on the North Slope typically results in fill being placed in higher, drier habitats rather than lower, wetter habitats favored by waterfowl, due to engineering and financial constraints.

Third, ROP E-11 requires 3 years of eider surveys and habitat mapping at development sites prior to development being authorized. This information will be used in consultation by BLM and the Service to situate facilities to reduce impacts to listed eiders and their habitat. Although no development has yet been proposed and subjected to this ROP within NPR-A, we believe that this requirement will significantly reduce the likelihood that facilities will be placed within important eider habitat. We are unable to identify methods to objectively adjust our computation of estimated take for these 2 factors, but we believe they will additively serve to significantly reduce impacts to listed eiders. Our incidental take estimate, therefore, likely overestimates impacts, possibly significantly.

Disturbance and Displacement
We anticipate activities on pads and roads may disturb and displace eiders, which would effectively reduce the amount of habitat used for breeding. These impacts are included in the above estimate of habitat loss.

Disturbance of nesting eiders from helicopter landings may occur. In areas where aircraft displacement is regular and ongoing, sensitive individuals may move away from the area and less sensitive individuals may become habituated to disturbance. In remote areas of NPR-A, birds are not subject to regular landings and may be sensitive to this type of disturbance.

Landing in remote areas may be isolated single landings (e.g., for site visits), or multiple landings close together (track landings) (e.g., during litter pickup or right-of-way staking operations). In order to estimate take we developed a process to evaluate how many birds may be impacted by landings. We first estimated the area within which each landing may flush a listed eider. The number of landings that may occur was then estimated, and finally the number of birds that would be impacted by a landing at any given location (i.e., eider density) was estimated.

The distance at which listed eiders will be flushed by an aircraft landing is unknown, and the response probably attenuates with distance from the landing site. A landing close to a nest would likely flush a female and prevent her from returning for as long as the aircraft and associated human activity remain near the nest. It is difficult to predict the effect that helicopter landings will have on nesting eiders in undeveloped areas because response has not been documented or studied, and because it will likely vary with duration of the disturbance and the type of associated human activities, which are unknown. For the purposes of calculating incidental take for isolated landings we assumed all hens within a 600 m radius of an isolated landing will be flushed, and hence their nests will be at risk from abandonment or a predation event.

It is unclear how many of these flights may occur each year as development proceeds from the current exploration phase, through construction, production, and finally abandonment. In 2007 the number of summer oil and gas development related landings in undeveloped areas was < 246 isolated landings with 23.96 km of track landings, while in 2008 the number of landings is predicted to be 250, with 21.7 km of track landings. Based on this limited data, we assumed 250 isolated landings and 22.83 km of track landings will occur each year and will be split equally between the two planning areas.

The number of hens that may be flushed as a result of a landing will vary considerably depending upon the density of birds in the area. Unlike development, aircraft landings in undeveloped areas are permitted in areas supporting high densities of eiders.

We assumed all landings will occur in the eider breeding area, and will occur in each of the different density classes in proportion to their occurrence. No reduction is made for areas UL, RSO, or NSO. Table 8.2 shows the acreage and relative abundance of each of the density categories within the Action Area.

Table 8.2 – Area of each spectacled eider density category in the eider use area

Density	Area (km^2)	Proportion of Area
0-0.035 spectacled eiders/km^2	7,038.9	27.66%
0.035-0.146 spectacled eiders/km^2	7,808.2	30.68%
0.146-0.255 spectacled eiders/km^2	4,594.2	18.05%
0.255-0.409 spectacled eiders/km^2	3,445.4	13.54%
0.409-1.248 spectacled eiders/km^2	2,534.8	9.96%

As described above in *Habitat Loss*, Steller's eider density varies considerably between the two planning areas, with the highest densities recorded in the Barrow triangle. As landings may occur in the Barrow triangle, the average Steller's eider density recorded from 1999-2006 in this area (0.04 birds/km^2 from Ritchie et al. 2006) was used to estimate incidental take from landings in NW NPR-A, while the lower, aerial survey wide average of 0.0058 birds/km^2 was used for landings in NE NPR-A. This approach should ensure that potential impacts to Steller's eiders are not underestimated.

By multiplying a radius 600 m from a landing site (1.13 km^2), by the number of landings in each density class, with the density of eiders, the number of hens that may be flushed was calculated. For track landings, the length of track was multiplied by 1,200 m (i.e., a 600 m buffer on each side of the track line) to provide an area of effect, before multiplying by eider density. These calculations, shown below, provide an estimate of the number of eiders that could conceivably be flushed by landings.

Steller's Eiders
125 landings x 1.13 km^2 (area impacted) x 0.0058 birds/km^2 = 0.819 flushes from isolated landings + 11.415 km of tracks x 1.2 km x 0.0058 = 0.494 flushes from track landings in NE NPR-A
+
125 landings x 1.13 km^2 x 0.04 birds/km = 5.65 flushes from isolated landings + 11.415 km x 1.2 km x 0.04 = 0.548 flushes from track landings in NW NPR-A

Total number of flushes ~ 8 /year

Spectacled Eiders
Proportion of landings in each density class multiplied by the density =

27.66% of 54.948km^2 x 0.035 spectacled eiders/km^2 = 0.532 flushes
30.68% of 54.948km^2 x 0.146 spectacled eiders/km^2 = 2.461 flushes
18.05% of 54.948km^2 x 0.255 spectacled eiders/km^2 = 9.918 flushes
13.54% of 54.948km^2 x 0.409 spectacled eiders/km^2 = 7.440 flushes
9.96% of 54.948km^2 x 1.248 spectacled eiders/km^2 = 6.830 flushes

Total number of flushes ~ 27/year

Not all flushes will result in a nest being abandoned or depredated. Bowman and Stehn (2003) compared survival between disturbed and undisturbed spectacled eider nests on the Y-K Delta (disturbed nests were revisited within 1.4 days of original visit) and noted a 4% increase in nest failure rate at disturbed nests. Grand and Flint (1997) observed a 14% reduction in nest success for spectacled eider nests on the Y-K Delta that were disturbed versus undisturbed nests. In the Grand and Flint (1997) study, nests were disturbed every 7 days rather than just once as in the Bowman and Stehn (2003) study and the likely pattern of helicopter landings being considered here. The difference in nest success recorded by these studies was attributed to investigator disturbance. For the purposes of estimating incidental take, we estimate 9% (the mid-point of nest failure rate between the two studies) of flushes will result in nest loss. Hence, landings in undeveloped areas were estimated to result in the loss of < 10 spectacled eider eggs or ducklings /year, and < 4 Steller's eider eggs or ducklings / year.

A *post-hoc* analysis of landings that occurred in summer 2007 found the number of eiders actually impacted (as estimated from density at landing sites) was lower than anticipated impacts for isolated landings. The "tract landing" methodology was developed in response to this analysis as it likely provides a more accurate estimate of impacts than the isolated landing methodology for these types of activities (USFWS 2008c).

Significant disturbance from watercraft is not anticipated. Vessels, such as supply barges, that enter the Ledyard Bay Critical Habitat Unit (LBCHU) between mid-June and mid-October (Petersen et al. 1999) when large numbers of flightless, molting spectacled eiders are present could adversely affect these birds. However, the LBCHU is relatively shallow and vessels do not have to traverse it to access either NW or NE NPR-A. Therefore, avoidance of LBCHU will prevent adverse effects. If this assumption proves to be incorrect and vessels are unable to avoid entering the LBCHU consultation will be reinitiated.

Collisions

The Service anticipates threatened eiders will collide with oil and gas structures that may result from the Action. Estimating the number of collisions is complicated by: 1) a lack of information on listed eider migration routes, behavior, and vulnerability to collisions with structures, 2) uncertainty over locations of development in the Action Area, and 3) the extent to which ROPs and STIPs will reduce collision risk.

Migration routes of the species are not fully understood and may have considerable inter- and intra-annual variation. Because spectacled and Steller's eiders are believed to stage, molt, and winter in the Chukchi and Bering seas to the west of their North Slope nesting range, we assume only those individuals that nest east of structures will be put at collision risk by migrating past that structure. Data from 1993–2006 aerial surveys for breeding eiders on the North Slope was combined to provide a longitudinal distribution of spectacled eider observations. The western boundary of NE NPR-A in the eider survey area is approximately 154^{o}W, and distribution data indicates only 29.12% (3,761 birds) of the North Slope population of spectacled eiders occur east of this longitude. The western boundary of NW NPR-A is approximately 162^{o}W, and 98.45% (12,716 birds) of North Slope spectacled eiders occur east of this longitude.

Comparable longitudinal data is not available for Steller's eiders. However, as described in Section 4 – *Environmental Baseline,* only 9% of Steller's eider observations were east of NW NPR-A. We therefore assumed 9% of the population would migrate through or past the NE NPR-A and therefore could encounter structures in NE NPR-A. Only 5% of Steller's eiders observations were west of NPR-A, so up to 95% of the population may migrate through NW NPR-A. The size of the North Slope breeding population of Steller's eiders is unknown, but is thought to number in the hundreds (see Section 3 – *Status of the Species*). For the purposes of estimating incidental take we assumed a population of 500. If this is an underestimate, while the number of Steller's eiders taken would be expected to be higher, the proportion of the population vulnerable to collisions would not.

Incidental take from collisions will likely be reduced by ROPs E-10 and E-11 which we believe will ameliorate the conditions that often contribute to collision risk. The ROPs that prohibit most development in high-density spectacled eider habitat and the Barrow triangle, and local surveys and facility siting to avoid habitat supporting high densities of listed eiders will further reduce collision risk for birds making local flights. Stipulation K-6 prohibits permanent oil and gas facilities within ¾ mile from the coastline potentially reducing collision risk during molt migration, when males in particular, may be moving close to the coastline.

Some estimate of vulnerability is required to estimate collision risk, but no specific data on spectacled or Steller's eider collision rates are available. We therefore used recorded numbers of common eider (*Somateria mollissima*) collisions at the human built Northstar Island in the Beaufort Sea as a surrogate. In 2000-2004, respectively, 6, 8, 0, 4, and 3 common eiders struck the island, for an average of 4.3/year (2000 data reported by BP Alaska to the Service; 2001-2004 data from Day et al. 2005).

A strike rate (percent of population killed per year) was then calculated as the annual average of Northstar Island common eider strikes divided by 176,109, the population estimate of common eiders migrating across the Beaufort Sea at that time (Quakenbush & Suydam 2004), according to the following formula:

$$\frac{\text{Annual average number of strikes}}{\text{Population estimate}} \times 100 = \text{Percent of population killed each year by collisions (strike rate)}$$

or:

$$\frac{4.3}{176{,}109} \times 100 = 0.0024\ \%$$

We assumed spectacled and Steller's eider collision risk is similar to that of common eiders at Northstar, and this strike rate was applied to the number of spectacled and Steller's eiders migrating through each planning area using the formula:

Strike rate x population migrating through area = number killed per year per structure.

Structures that may result from the Action would occur in the terrestrial environment and are likely to have a lower strike rate than Northstar, which is in the Beaufort Sea and within the main marine route used by migrating eiders. However, in the absence of data from terrestrial facilities the Northstar strike rate is the best available data.

The results of this estimate are shown in Table 8.3

Table 8.3 – Estimated number of Steller's and spectacled eiders strikes/structure/year in NE NPR-A and NW NPR-A

	NE NPR-A	NW NPR-A
Spectacled Eider	0.090	0.305
Steller's Eider	0.0011	0.011

BLM (2008) provided estimates of project structure life history, for example, each CPF is anticipated to operate for 50 years. These were used to estimate the number of "structure years" for each planning area. With 6 CPFs operating for 50 years each, 32 satellite facilities operating for 29 years each, 6 pump stations operating for 50 years each, and 124 drillrig years estimated by BLM, the total number of structure years for NE NPR-A is estimated at 1,653 years. In NW NPR-A the estimated number of structure years is

1,621. By multiplying structure years by the figures in Table 8.1, the following incidental take from collisions is estimated:

NE NPR-A: Steller's eiders = 0.02/year
Spectacled eiders = 1.49/year

NW NPR-A: Steller's eiders = 0.18/year
Spectacled eiders = 4.94/year

These numbers include adults and juveniles post fledging.

We believe we have likely significantly overestimated the incidental take that may occur as a result of collisions. As described in Section 5 – *Effects of the Action*, during molt migration females and young, and many males, migrate offshore (TERA 2002, Petersen et al. 1999) and therefore, would not be at risk of colliding with structures in the terrestrial environment. Limited data on spring migration of listed eiders suggests they may migrate overland (Woodby and Divoky 1982, TERA 1999). This migration is thought to occur over a broad front (Johnson and Richardson 1981) and birds are likely to be sparsely distributed across the area as there are no physiographic features to constrain and concentrate flight paths. Given the small profile of oilfield structures relative to the size of the eider breeding area, which ranges from approximately 15 km to 135 km wide in NPR-A, we believe that a small proportion of migrating eiders would encounter structures and thereby be at risk of collisions. Further, it is daylight 24 hours per day during spring migration, when we believe listed eiders are more likely to migrate overland across the Action Area, which we believe would further reduce the likelihood of collisions.

Predators
The ROPs should eliminate anthropogenic food sources for eider predators at oil and gas facilities, assuming universal compliance. ROP E-9 requires "the lessee utilize best available technology to prevent facilities from providing nesting, denning, or shelter sites for ravens, raptors, and foxes." The lessee is also required to provide an annual report on the use of oil and gas facilities by ravens, raptors, and foxes as nesting, denning, and shelter sites. We assume that best available technology will prevent ravens from nesting on new facilities. If the annual monitoring reports indicate this assumption is not met, reinitiation of consultation may be required.

Oil and Toxic Substance Spills
There is a > 99.9% probability of one or more small spills occurring as a result of the Action. In each planning area a further < 3 large spills are predicted. The impact of these spills is dependent on numerous factors including effectiveness of spill response, weather conditions, time of year, and location / habitat type (i.e., tundra, gravel pad, ponds and lakes, or marine waters).

Oil spills on tundra are likely to kill fewer listed eiders as they are more easily detected, and spread slowly because of the flat topography of the area, allowing oil containment and wildlife hazing from the spill site. If oil reaches tundra wetland complexes and lakes, a larger area would be impacted and we assume more eiders may contact oil and be killed. Based on oil spill risk assessments for spectacled eiders developed by McDonald et al. (2002), and using the mid-point of the highest spectacled eider density classification (as described above in the *Habitat Loss* section), BLM estimates a large tundra or lake spill could contact and kill four spectacled eiders. The highest Steller's eider densities on the North Slope are found immediately adjacent to Barrow where densities of 0.66 birds/km^2 (Rojek 2006) have been recorded. Using the same analysis a large tundra or lake spill could kill one Steller's eider. As < 6 large spills are predicted over the life of the Action, we estimate that spills may result in the death of a total of 24 spectacled eiders and ~ 6 Steller's eiders, which may be from any age class.

The greatest potential impacts would occur if oil reached marine waters where listed eiders are known to stage. Oil reaching Peard Bay and marine waters adjacent to Barrow in summer could contact and kill a low number of adult Steller's eiders. Male spectacled eiders have been observed staging in near deltas of large rivers such as the Colville River, where open water is more prevalent (TERA 2002), and females are known to make extensive use of areas of the Beaufort Sea (TERA 2002). Oil reaching these areas could kill tens to hundreds of adult spectacled eiders.

However, there are a number of factors that significantly reduce the potential that oil spilled in the Action Area will enter the marine environment. Although offshore leases may be made available, STIP K-6 prohibits the construction and operation of permanent facilities (including oil pipelines) ¾ mile inland from the coastline. STIP K-1 requires that permanent oil and gas facilities have a minimum ½ mile setback from rivers (for some rivers the setback is larger), although some pipeline crossings are permitted. For oil to reach the marine environment, a spill to tundra would need to be extremely large to cross these buffers. BLM considers a very large spill which may have sufficient oil to cross these buffers to be an extremely unlikely event.

Although small and large spills of oil and toxic substances are anticipated, and they may result in mortality of listed eiders, they are not an otherwise legal activity and no incidental take is authorized.

Summary

We anticipate that activities that may result from the Action could incidentally take < 87 spectacled eider eggs or ducklings/year and < 12 Steller's eider eggs or ducklings/year from habitat loss and disturbance, and < 7 spectacled eider/year and < 1 Steller's eider/year from collisions. Take may occur as a result of oil and toxic substance spills but is not authorized.

8.2 Incidental Take of Polar Bears

Protections under the Marine Mammal Protection Act

All activities that may take[7] polar bears are subject to prohibitions of the MMPA. The Beaufort Sea ITRs (71 FR 43925) assessed seismic, exploratory drilling, development, and production activities on North Slope and Beaufort Sea including parts of NPR-A. LOAs issued under these regulations authorize the nonlethal, incidental, unintentional take of small numbers of polar bears and Pacific walrus during year-round oil and gas industry exploration, development, and production operations in the Beaufort Sea and adjacent northern coast of Alaska between August 2, 2006 and August 2, 2011. Seismic and exploration activities in the portions of NPR-A adjacent to the Chukchi Sea coast were included in the Chukchi Sea ITRs (73 FR 33212). LOAs issued under these regulations can authorize the nonlethal, incidental, unintentional take of small numbers of polar bears and Pacific walrus during year-round oil and gas industry exploration, operations in the Chukchi Sea and adjacent western coast of Alaska between June 11, 2008 and June 11, 2013. Entities (e.g., industry) seeking authorization for particular projects under these ITRs will apply for a LOA from the Service's Marine Mammals Management (MMM) Office.

The Service has conducted intra-service programmatic section 7 consultations for the Chukchi and Beaufort Sea ITRs. The programmatic consultations provide incidental take authorization under the ESA at the time the LOA is issued. Activities not considered in these regulations, including future activities in NPR-A occurring after these 5-year regulations expire, have not been reviewed under the MMPA.

In addition to LOAs, industry may apply for intentional take permits. These permits, issued under sections 101(a)(4)(A), 109(h), and 112(c) of the MMPA allow the non-lethal harassment of polar bears to deter them from facilities to reduce the likelihood of death or injury of polar bears. These types of activity (considered Level B harassment) will only occur for:

1. The protection or welfare of the animal;
2. The protection of the public health and welfare; or
3. The non-lethal removal of nuisance animals.

Hazing activities reduce the risk of polar bear mortality resulting from polar bear-human interactions. These activities are described under the MMPA as intentional take,

[7] As defined by the MMPA, take means "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal" (§3(13)). The definition is expanded in 50 CFR 18.3: "… including, without limitation, any of the following: The collection of dead animals or parts thereof; the restraint or detention of a marine mammal, no matter how temporary; tagging a marine mammal; or the negligent or intentional operation of an aircraft or vessel, or the doing of any other negligent or intentional act which results in the disturbing or molesting of a marine mammal." *Harassment* means "any act of pursuit, torment, or annoyance which – (i) has the potential to injure a marine mammal or marine mammal stock in the wild; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering" (§3(18)(A)). The MMPA refers to (i) as "*Level A harassment*" (§3(18)(C)) and (ii) as "*Level B harassment*" (§3(18)(D)).

although they are incidental to, and result from, the activities that may occur as a result of the Action being consulted upon here.

The Service cannot provide incidental take authorization for polar bears for those activities that may occur as a result of the Action in this BO where incidental take of marine mammals has not been authorized under section 101(a)(5) of the MMPA. In most cases following issuance of such regulations or authorizations, the Service would amend this BO. However, we anticipate authorizing incidental take of polar bears through consultation on the issuance of ITRs and LOAs under the MMPA. Similarly, this document cannot issue incidental take for activities that may result in intentional take of polar bears as defined under sections 101(a)(4)(A), 109(h), and 112(c) of the MMPA. Authorization of intentional harassment will be subject to subsequent review under the ESA.

Although incidental take under the ESA is not provided in this BO, we have assessed potential impacts to polar bears to ensure activities that may result from the Action do not jeopardize the continued existence of the species as required under section 7(a)(2) of the ESA. As described in Section 5 – *Effects of the Action*, activities that may result from the Action could adversely affect polar bears through disturbance, an increase in polar bear-human interactions, and spills of oil and toxic substances.

Disturbance

Seismic and exploratory drilling activities in NPR-A may incidentally take polar bears as defined under the MMPA and were included in the Beaufort and Chukchi Sea ITRs. Subsequent activities, including seismic surveys, exploration, construction, and production occurring after these 5-year regulations expire that may result from the Action, will likely adversely affect a small number polar bears through disturbance. Effects are likely to be minimal with individuals being displaced to undisturbed areas. As this disturbance is considered incidental take under the MMPA, it would require authorization under the MMPA, and cannot be authorized under the ESA until authorized under the MMPA (Section 7(b)(4)(iii)). This authorization would likely be addressed in future ITRs and authorized by issuance of LOAs on a project-specific basis. These LOAs will also likely include project specific mitigating measures to reduce impacts to polar bears.

The MMPA requires the total of incidental takings to have no more than a negligible impact on the marine mammal species. The polar bear ITRs evaluate impacts at the affected stock level, so must determine that impacts will be negligible for the Chukchi Sea and Southern Beaufort Sea polar bear stocks. In contrast, under the ESA, jeopardy / non-jeopardy determinations for polar bears will be made at the species scale as this species has been listed range wide.

Monitoring and reporting is a requirement of each LOA issued under the MMPA ITRs. From 1993-2004, 262 LOAs were issued for oil and gas activities in the Beaufort Sea and adjacent Arctic Coastal Plain. If we use data from 2004 as an example, 59% of polar bear sightings consisted of observations of polar bears traveling through or resting near the monitored area without a detectable reaction to human presence (71 FR 43942). Even if all development that may result from the Action were within 25 miles of the coast, where polar bears are most common, no significant increase in the number of bears observed (and potentially disturbed) is anticipated because: 1) polar bears are sparsely distributed in NPR-A; 2) development is prohibited within ¾ mile of the coastline and offshore where polar bears are more common; and 3) the number of facilities that may result from the Action is relatively small compared to the total number of oil and gas facilities already in existence on the North Slope.

Increased Polar Bear-Human Interactions
As industry activity increases in the Action Area, we anticipate an increase in the number of polar bear-human interactions. As described in Section 5 – *Effects of the Action*, BLM has developed a number of ROPs and STIPs that aim to minimize interactions between humans and polar bears. However, non-lethal interactions, including intentional harassment, are anticipated which may adversely affect polar bears by altering their behavior and displacing them from a project area. It is difficult to predict how many interactions will occur. Monitoring data from 2004 showed the Alaska oil and gas industry reported a total 89 polar bear sightings involving 113 individual bears. Of these observations, 41% (n = 36) involved some form of intentional take (Level B harassment), with no injuries to polar bears reported. Of the 89 sightings, 63% were at offshore facilities (71 FR 43926).

Given the relatively low number of intentional takes in relation to the number of oil facilities on Alaska's North Slope, the predominance of interactions occurring at offshore facilities (which are not anticipated to result from the Action), and the restricted range of the polar bear compared to the Action Area as a whole (i.e., only facilities located within approximately 30 miles of the coast are thought to be within the range of polar bears), we do not anticipate large numbers of polar bears will be adversely affected by an increase in polar bear-human interactions that may result from the Action. However, non-lethal, adverse effects, to a small number of polar bears, will likely occur.

Oil Spills and Toxic Contamination
There is a >99.9% probability that one or more small spills may result from the Action. In each planning area a further < 3 large spills are predicted. Even large spills to tundra are unlikely to kill more than three polar bears as they are sparsely distributed across the Action Area. A spill to marine waters is likely to contact and kill the largest number of polar bears or their prey. BLM considers a very large spill (> 120,000 bbl) such as would be required to breach the coastline and river buffers if oil were spilled on tundra, to be an extremely unlikely event. A spill could reach marine waters if a pipeline crossing a river failed during summer or fall. Oil in the marine environment could kill polar bears over a large area but significant concentrations of polar bears are not present close to the Action Area.

Although there is a potential for take to occur, spills are not an otherwise legal activity and no incidental take authorization is, or will be, provided for impacts from possible oil spills.

Summary
With the exception of oil and toxic substance spills, which may result in mortality of polar bears, no lethal take is anticipated to occur as a result of the Action. A small numbers of polar bears may be adversely affected through disturbance or polar bear-human interactions which may include intentional take. These adverse effects and mortality will impact only the Chukchi Sea and Southern Beaufort Sea polar bear stocks and population level impacts to the species are not anticipated. Incidental take cannot be authorized under the ESA until the activities resulting in this take are reviewed and authorized under the MMPA.

9. REASONABLE AND PRUDENT MEASURES

These reasonable and prudent measures (RPMs) and their implementing terms and conditions aim to minimize the incidental take anticipated to result from the Action. As described in Section 8 – *Incidental Take Statement*, activities resulting from the Action may lead to the incidental take of spectacled and Steller's eiders through habitat loss, disturbance, and collisions.

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

1. To minimize the likelihood that migrating spectacled and Steller's eiders will strike drill rigs, towers, buildings, communication and transmission wires, and associated infrastructure within the NE and NW NPR-A, BLM and their agents will avoid the use of lighting that unnecessarily increases collision risk, avoid the use of overhead wires except in extremely rare exceptions, and avoid the use of unmarked guy wires supporting towers.

2. To avoid and reduce temporary impacts to productivity from disturbance near Steller's and/or spectacled eider nests, ground level activity (by vehicle or on foot) within 200 meters of occupied Steller's and/or spectacled eider nests will be restricted to existing thoroughfares. Construction of permanent/temporary facilities, placement of fill, alteration of habitat, and introduction of high noise levels within 200 meters of occupied Steller's and/or spectacled eider nests is prohibited. Aircraft flights to areas of existing gravel fill are not restricted.

3. BLM compliance specialists will monitor industry compliance with Reasonable and Prudent Measures, Terms and Conditions, STIPs, ROPs, and enforceable elements of assumptions listed in Appendix 1 of this BO at sites of oil and gas industry activity.

4. To minimize impacts to spectacled and Steller's eider nesting habitat and avoid or reduce impacts to productivity from disturbance, BLM will allow no permanent facilities, except pipelines, within administered lands located in the Barrow Triangle area, which has been documented to be disproportionately important to the conservation of listed

eiders on the ACP. Within the Barrow triangle, BLM will also require lessees extracting resources from BLM-leased lands to comply with all STIPs and ROPs that affect Steller's and/or spectacled eiders.

5. To minimize impacts to important spectacled eider nesting habitat, BLM will allow no permanent oil and gas facilities, with the exception of pipelines, within areas determined to be high-density spectacled nesting habitat.

10. TERMS AND CONDITIONS

In order to be exempt from the prohibitions of Section 9 of the ESA, BLM must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary. (The reasonable and prudent measures are re-iterated, in italics, before the corresponding terms and conditions).

1. To minimize the likelihood that migrating spectacled and Steller's eiders will strike drill rigs, towers, buildings, communication and transmission wires, and associated infrastructure within NE and NW NPR-A, BLM and their agents will avoid the use of lighting that unnecessarily increases collision risk, avoid the use of overhead wires except in extremely rare exceptions, and avoid the use of unmarked guy wires supporting towers.

1A. To prevent unnecessary radiation of light that will increase the risk of migrating Steller's and/or spectacled eiders colliding with drill rigs, towers, buildings, and other structures, illumination of all structures shall be designed to direct artificial exterior lighting inward and downward, rather than upward and outward, unless otherwise required by the Federal Aviation Administration (FAA). This restriction applies exclusively to the interval Aug 1 to October 31 each year.

1B. To reduce the possibility of Steller's and/or spectacled eiders colliding with above-ground utility lines (power and communication), such lines shall either be buried in access roads or suspended on vertical support members except in rare cases which are to be few in number and limited in extent. Exceptions are limited to the following situations, and must be reported to the Service when exceptions are authorized:

1. Overhead power or communication lines may be allowed when located entirely within the boundaries of a facility pad;
2. Overhead power or communication lines may be allowed when engineering constraints at the specific and limited location make it unfeasible to bury or connect the lines to a vertical support member; or
3. Overhead power or communication lines may be allowed in situations when human safety would be compromised by other methods.

1C. To reduce the likelihood of Steller's and/or spectacled eiders colliding with communication towers, towers should be located, to the extent practicable, on existing pads and as close as possible to buildings or other structures, and on the east or west side of buildings or other structures if possible. Support wires associated with communication towers, radio antennas, and other similar facilities, should be avoided to the extent practicable. If support wires are necessary, they should be clearly marked along their entire length to improve visibility to low flying birds. Such markings shall be developed through consultation with the Service.

2. To avoid and reduce temporary impacts to productivity from disturbance near Steller's and/or spectacled eider nests, ground level activity (by vehicle or on foot) within 200 meters of occupied Steller's and/or spectacled eider nests will be restricted to existing thoroughfares. Construction of permanent/temporary facilities, placement of fill, alteration of habitat, and introduction of high noise levels within 200 meters of occupied Steller's and/or spectacled eider nests is prohibited. Aircraft flights to areas of existing gravel fill are not restricted.

2A. Temporary impacts to Stellers' and/or spectacled eider productivity due to disturbance and direct habitat impacts must be minimized by ensuring protection of females with nests and ducklings. Ground-level activity (by vehicle or on foot) within 200 meters of occupied Steller's and/or spectacled eider nests, from June 1 through August 15, will be restricted to existing thoroughfares, such as pads and roads. Construction of permanent facilities, placement of fill, alteration of habitat, and introduction of high noise levels within 200 meters of occupied Steller's and/or spectacled eider nests will be prohibited. In instances where summer (June 1 through August 15) support/construction activity must occur off existing thoroughfares, Service-approved nest surveys must be conducted during mid-June prior to the approval of the activity. Collected data would be used to evaluate whether the Action could occur based on employment of a 200 m buffer around nests, or if the activity would be delayed until after mid-August once ducklings are mobile and have left the nest site. BLM will also work with the Service to schedule oil spill response training in riverine, marine and inter-tidal areas, that occurs within 200 meters of shore, outside sensitive nesting/brood-rearing periods or conduct nest surveys. The protocol and timing of nest surveys for Steller's and/or spectacled eiders will be determined in cooperation with the Service, and must be approved by the Service. Surveys should be supervised by biologists who have previous experience with Steller's and/or spectacled eider nest surveys.

3. BLM compliance specialists will monitor industry compliance with Reasonable and Prudent Measures, Terms and Conditions, STIPs, ROPs, and enforceable elements of assumptions listed in Appendix 1 of this BO at sites of oil and gas industry activity.

3A. One or more BLM compliance specialists will monitor industry compliance with STIPs, ROPs and enforceable elements of assumptions listed in Appendix 1 of this BO at sites of oil and gas related activity. BLM will provide the Service with a copy of the monitoring plan. To ensure protection of listed eiders, special emphasis shall be placed on compliance monitoring for ROPs A-1 through 7, E-9, 10, 11, 12, 14 and F-1 and

STIPs D-2 and K-1, 2, 3, 6 and 8. All acts of noncompliance or nonconformance to the ROPs, STIPs and enforceable elements of assumptions mentioned above will be reported in writing to the Field Supervisor, U.S. Fish and Wildlife Service, Fairbanks Fish and Wildlife Field Office, 101 12th Ave., Fairbanks, AK 99701. In the event that noncompliance/nonconformance issues arise, BLM and the Service will cooperatively develop a strategy to eliminate the problem.

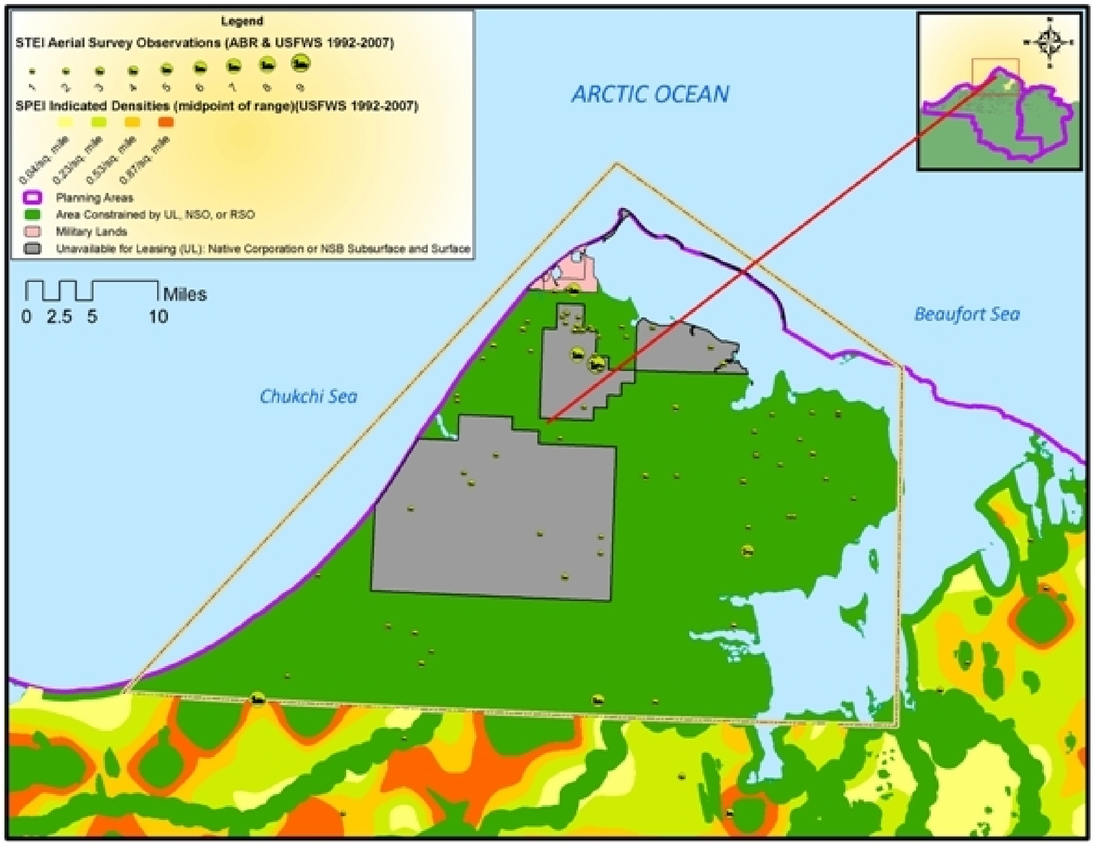
4. To minimize impacts to spectacled and Steller's eider nesting habitat and avoid or reduce impacts to productivity from disturbance, BLM will allow no permanent facilities, except pipelines, within administered lands located in the Barrow Triangle area, which has been documented to be disproportionately important to the conservation of listed eiders on the ACP. Within the Barrow triangle, BLM will also require lessees extracting resources from BLM-leased lands to comply with all STIPs and ROPs that affect Steller's and/or spectacled eiders.

4A. The Barrow triangle is the 2,757 km^2 area north of 70°50' north latitude and west of Dease Inlet. The majority of sightings of Stellers' eiders made in the last 20 years have occurred within this area, despite that it comprises <4% of the area annually surveyed during the North Slope eider breeding survey. High densities of spectacled eiders also occur in this area (Figure 10.1). To protect this area's long-term potential to support Steller's and spectacled eider reproduction, BLM shall prohibit permanent oil and gas facilities, material sites, and staging areas, with the exception of pipelines on tracts subject to new leases or tracts subject to lease renewals. In addition, to extract federal subsurface mineral resources by constructing and utilizing new facilities based on adjacent non-federal surface lands, lessees will be required to comply with ROPs and STIPs outlined in Table 10.1.

Table 10.1 – ROPs and STIPs that will reduce impacts to listed eiders

Protection	Listed Eiders ROP/Stipulation	
	NE	**NW**
Predator Attraction	A1, A2a, b; E9	A1, A2a, b; E9
Disturbance	E11, F1e, I1, K1, K2, K3; K4, d, f, g (development); K5d; K5e1, e3, e5, e6; K6, K9; K10	E11, F1e, I1, K1, K2, K6, K8
Habitat	E1; E2; E5; E6; E11; E17; K1; K2; K3; K4; K6; K9; K10	E1; E2; E5; E6; E11; E17; K1; K2 K6; K8
Contaminants	A2c, d; A3; A4; A5; A6; E4	A2c, d; A3; A4; A5; A6; E4, K3
Collisions	E10; E11	E10; E11

Figure 10.1 – Density of spectacled eiders, locations of Steller's eider observations, and land ownership in the Barrow Triangle potion of NW NPR-A



No warranty is made as to the accuracy or reliability of these data for individual use or in aggregate with other data.

5. To minimize impacts to important spectacled eider nesting habitat, BLM will allow no permanent oil and gas facilities, with the exception of pipelines, within areas determined to be high-density spectacled nesting habitat.

5A. With the exception of pipelines, no permanent oil and gas facilities, material sites, or staging areas would be permitted in spectacled eider nesting and breeding habitat identified by the USFWS as being "high" density ($\geq$1.06 eiders per sq. mile) in NE NPR-A, and in the portion of NW NPR-A south and east of the Barrow triangle using the best available long-term data from the Annual Eider Breeding Survey at the time development is proposed.

11. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

We recommend the following actions be implemented during the leasing and exploration phase of the lease sale:

1. BLM is encouraged to continue to contribute to monitoring efforts for threatened eiders and BLM special status species in NE and NW NPR-A . Results will allow the Service and BLM to better evaluate abundance, distribution, and population trends of listed eiders and other special status species. These efforts will enhance the likelihood that future oil development within NE and NW NPR-A will not jeopardize listed eiders or lead to listing additional species.

2. BLM is encouraged to work with the Service and other Federal and State agencies in implementing recovery actions identified in the Stellers' and spectacled eider recovery plans. Research to determine important habitats, migration routes, and wintering areas of spectacled and Steller's eiders would be an important step toward minimizing conflicts with current and future North Slope oil/gas activities.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

12. REINITIATION NOTICE

This concludes formal consultation on the actions outlined in the Bureau of Land Management's BA and supplemental materials pertaining to multiple-use management, including oil and gas leasing, in NE and NW NPR-A. As provided in 50 C.F.R. 402.16, re-initiation of formal consultation is required where discretionary Federal agency involvement or control over the Action has been retained (or is authorized by law) and if:

1) The amount or extent of incidental take 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; and
4) A new species is listed or critical habitat designated that may be affected by the Action.

The analysis, and hence conclusions in this BO, rely on a series of assumptions about the type, location, and amount of development as described in Appendix 1. If these assumptions prove to be inaccurate, consultation should be reinitiated. For example, an increase in the amount of development anticipated to result from the Action would require discussion with the Service to determine if an increase in effects of the Action on listed species would result, causing a need for reinitiation.

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

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APPENDIX 1 - ASSUMPTIONS

There is considerable uncertainty regarding the amount, timing, and location of development that may result from the Action. The analysis and conclusions of this BO are based on BLM's reasonably foreseeable development scenarios (RFDs) as applied to Alternative D of the NE NPR-A IAP/SEIS and the NW NPR-A and considering the ROPs and STIPs in each planning area. A number of other assumptions have also been made during the analysis, and these are described in the BO text.

For the analysis and conclusions of this BO to remain valid, the assumptions underpinning the RFDs, and made in the document must remain valid. Should the assumptions change, or no longer apply, consultation should be reinitiated to ensure the impacts to listed species have not been underestimated.

For ease of monitoring, a list of assumptions underpinning this BO is provided here.

1. Estimated volume of economically recoverable oil in the NE NPR-A is 4.3 billion barrels (Bbbls) without management constraints and 3.7 Bbbls in the NW NPR-A. This is based upon an assumption that the price per barrel is so high that production is not likely to increase with an even higher price per barrel.

2. The first fields to be developed in the Action Area will be oil fields.

3. The amount of infrastructure that would be necessary to develop the amount of recoverable oil is conservatively estimated, and is likely an overestimate. For example, it is assumed that each satellite production pad would require a 10-mile gravel road and pipeline of equal length, however based upon ConocoPhillips development of the Alpine field, the average road and pipeline distances could be less than six miles.

4. Multiple lease sales would be held.

5. Industry would aggressively lease and explore the tracts offered, which could require large numbers of exploration wells and seismic surveys.

6. Several industry groups would independently explore and develop new fields in the NPR-A.

7. For the purpose of developing a hypothetical scenario for impact analysis, a "Development Complex" generally would include one large Central Processing Facility (CPF) pad with 5 production pads. In fact there is likely to be a range of developments from a single CPF pad with no production pads, to CPF pads with 1-10 production pads.

8. The hypothetical Development Complex comprises the following ranges of recoverable oil accumulations:

a. one 250 - 450 MMbbl,
b. one 60 - 70 MMbbl,
c. two 50 - 60 MMbbl, and
d. one 40 - 50 MMbbl and
e. one 30 - 40 MMbbl.
f. Using the mean accumulation values, a Development Complex would be capable of producing approximately 600 MMbbl of recoverable oil (350 MMbbl produced from the main CPF pad and an average of approximately 50 MMbbl produced from each satellite production pad).

9. Economic conditions (particularly oil price) would remain favorable to development in northern Alaska.

10. New geologic information would not substantially change the present assessment of resource potential, future drilling would confirm what today are perceived as high-potential plays, and new high-potential plays would not be discovered.

11. Projections of well numbers, facilities, and infrastructure include potential Alpine satellite developments in NPR-A.

12. Future petroleum production would use existing North Slope infrastructure, most importantly the TAPS pipeline.

13. Holders of existing NE NPR-A leases will convert to the new STIPs and ROPs rather than the existing prescriptive STIPs.

14. Development activities associated with multiple future sales would continue for many years, and the complete inventory of petroleum resources in NPR-A could take decades to develop.

15. The RFDs assume that about ten years of exploration, proving, permitting, facility construction, and development drilling would precede initial production. It is also assumed that development of multiple CPFs within the NE or NW NPR-A portions of the Action Area will not occur simultaneously, but instead occur approximately ten years apart, although development in the NE and NW NPR-A may occur in parallel.

16. Northwest development likely would not occur on its own unless an oil field of 750 MMbbls or greater were discovered.

17. Development of each satellite would take about two years, allowing for a complement of satellites to be on-line before the next CPF is constructed to maximize sales pipeline throughput. The staged development assumption results in construction activities for new pads extending out 60 to 70 years. As a result of the RFDs timeline, some CPFs and satellites would be decommissioned while others were being constructed.

18. Because of the small volumes of gas in gas-only plays and the generally higher profitability of oil development, gas would only be developed as part of a development primarily undertaken to produce oil. BLM projects that the only significant additional infrastructure required by gas development in the planning area would be pipelines to transport gas from CPFs to gas pipelines east of the Action Area and associated compressors at the CPFs and along the pipeline route. The RFDs assume that there would be 1 compressor in NE and 1 in NW (each compressor station would be 10-20 acres in size). Pipelines are expected to be buried but may be co-located adjacent to the oil sales lines on vertical support members (VSMs).

19. Power and communication lines will be on VSMs / pipe racks or buried, with minor exceptions as described in the terms and conditions of this BO.

20. There will be no roads linking the in-field roads (i.e., roads between a CPF and its satellite facilities) and external roads such as the Dalton Highway or Village road systems.

21. There will be no offshore production facilities.

22. Vessels such as supply barges will not enter the Ledyard Bay Critical Habitat Unit (LBCHU) between mid-June and mid-October.

23. ROP E-9 requires "the lessee utilize best available technology to prevent facilities from providing nesting, denning, or shelter sites for ravens, raptors, and foxes." We assume that best available technology will prevent ravens from nesting on facilities, and denning by arctic foxes.

24. We assume that ROPs A-1 and A-2 will prevent wildlife accessing anthropogenic sources of food.

25. All projects that fall within activities covered by existing incidental take regulations, per section 101(a)(5) of the MMPA, in the Beaufort and Chukchi seas and adjacent Alaska coast, will receive and comply with a LOA for the life of the project (i.e., multi-year projects will renew their LOA as required).

26. Industry will continue to request, and the Service will continue to issue (with an accompanying determination of "negligible impact"), polar bear incidental take regulations under the MMPA for oil and gas activities for the duration of this Biological Opinion.

27. That all development will occur in the portion of the Action Area that supports eider breeding (as defined by the boundaries of the Service's annual aerial surveys for breeding eiders).

APPENDIX 2

NPR-A Consultation – Sequence of Activities

3/26/07	FFWFO receives notice that BLM is preparing a new BA for the Supplemental NE NRP-A Amended IAP/EIS.
6/18/07	Hollen (BLM) - The Draft BA has not been finalized but is in progress.
11/13/07	Hollen – BA has been delayed and has missed the mid-October submission goal, now anticipates a submission before Thanksgiving.
12/8/07	Hollen – Provided a preliminary Draft BA, no preferred alternative was identified.
1/28/08	Hollen – Alternative D will be the preferred alternative.
2/1/08	Regional Directors of BLM and FWS and the Regional Solicitors Office (RSO) meet to discuss FWS and RSO concerns that impacts to NW NPR-A have not been addressed in the Draft BA.
2/19/08	BLM, FWS, RSO conference call to discuss conducting the consultation to cover both NE and NW NPR-A, and noted that if the polar bear is listed it will need to be included.
2/21/08	Hollen – BLM intends to initiate consultation on the combined NE and NW areas of NPR-A. The BA will take at least 4 weeks but no more than 8 weeks to complete. The ROD is due to be signed on July 3.
3/19/08	Service and BLM – Meeting to discuss BA/BO.
4/11/08	BLM provides a Draft Biological Assessment covering both NE and NW NPR-A.
5/9/08	BLM provides an electronic version of the Final Biological Assessment, with a hard copy arriving on May 15, 2008.
5/30/08	BLM and FWS meeting to discuss status of BO. FWS agrees to provided Reasonable and Prudent Measures (RPMs), terms and conditions, and conservation recommendations by June 13, 2008 and the final document by June 23, 2008.
6/13/08	FWS provides RPMs, terms and conditions, and conservation recommendations to BLM for their review.