Memorandum

To: Timothy J. Van Norman, Branch Chief, Permits
From: Ted Swem, Branch Chief, Fairbanks Endangered Species
Subject: Endangered Species Act conclusion regarding issuance of Marine Mammal Research Permit PRT-690038
Cc: Karen Oakley, USGS – Alaska Science Center
Richard Voss, Refuge manager, Arctic National Wildlife Refuge
Monica Farris, Biologist, Division of Management Authority
Debbie Nigro, Bureau of Land Management

1. INTRODUCTION

This document represents the U.S. Fish and Wildlife Service’s (Service) review of the proposed permitted actions under Marine Mammal Research Permit PRT-690038 for polar bears located on the North Slope of Alaska for Steller’s eiders (Polysticta stelleri), spectacled eiders (Somateria fischeri), polar bears (Ursus maritimus), designated critical habitat for Steller’s and spectacled eiders, and critical habitat for polar bears per section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.). The applicant is the U.S. Geological Survey (USGS) Alaska Science Center. The Service first consulted on this permit September 3, 2010. The Division of Management Authority (DMA) reinitiated consultation on this permit because the USGS requested an increase in biopsy darting of polar bears from An analysis of the potential impacts to Pacific walrus (Odobenus rosmarus divergens), and yellow-billed loons (Gavia adamsii) which have been designated as candidate species under the ESA is also provided.

2. DESCRIPTION OF THE PROPOSED ACTION

2.1 Proposed Action
The Alaska Science Center has an on-going research program investigating the ecology of polar bears. This Biological Opinion (BO) describes and evaluates the research activities planned
from 2011 through 2014. A complete description of the proposed action is provided as Appendix A, and is summarized below. Each year there are three discrete phases during which different activities occur, these phases are: Spring, Fall, and Winter.

**Spring Activities**

From approximately mid-March through the second week of May each year, USGS scientists will attempt to capture, observe, and sample tissue from polar bears on sea ice within 100 km of the Beaufort Sea coast between Barrow and the Canadian border. The crew will operate from a single helicopter flying over sea ice at an altitude of approximately 105 m. Once a bear is spotted a VHF transmitter is used to determine if the bear has been previously radio collared. Depending on a bear’s capture history (e.g., if it had been captured earlier in the study) the crew will either move on to look for another bear or evaluate the area to determine if it is safe to capture the bear.

If it is determined the area is safe, the helicopter will descend to approximately 5 m above the animal to be darted. Once the animal has been darted, the helicopter will move several hundred meters from the bear and circle the area at an altitude of approximately 100 m until the drug has taken effect. Any cubs of the year will be captured by hand and injected with tranquilizer drugs once the adult bear has succumbed to the drugs. Older cubs will be darted from the air after the mother.

Once the polar bear(s) are immobilized by the drugs a series of measurements and samples will be taken from each animal:

- Animals captured for the first time will be tattooed on the inside of both upper lips;
- Animals captured for the first time will have numbered plastic ear tags inserted through both ear pinnae;
- Each captured animal will be painted with an identification number in semi-permanent paint such that it will be visible from the air to prevent re-capture of the same animal;
- Samples of fur and feces are collected, along with two 6 mm fat biopsies, four 10 ml tubes of blood from all animals except cubs of the year which do not have blood drawn and first time captured animals which also have a premolar tooth removed to allow the animal to be aged; and
- Measurements of axial girth, neck at shoulders, neck at axis, skull width, skull length, total length, strait-line length, weight, and condition are made.

USGS is requesting authorization to capture up to 200 individual bears each year from 2011 through 2014. Between 2002 and 2010 similar work captured an average of 54 adult polar bears (95 total including cubs of the year and sub-adults) per year, with a maximum of 69 adults (136 including cubs of the year and sub-adults). A similar level of capture effort and geographic area is scheduled for the upcoming program, and therefore we would expect a similar number of polar bears to be captured.

Of the bears captured, USGS proposes to deploy radio collars on up to 24 of them in 2011 and a minimum of 20 and up to 50 in subsequent years. In 2011 a further 17 bears will be outfitted with radio-tags inserted through their ear pinnae and 30 with radio-tags glues onto their fur
behind their shoulders. Depending upon the success of these tags, the USGS may deploy them on up to 75 polar bears in subsequent years of the study.

USGS staff will also attempt to collect biopsy samples from polar bears which cannot be safely captured and other bears after the main capture efforts have concluded. This will be done remotely using dart guns from the helicopter. The polar bears will be darted near the shoulder where the movement of the joint facilitates the dart falling out of the animal. Once the animal has left the area the helicopter will land and the dart will be retrieved. The biopsy dart will also dye the bears’ fur which should prevent the same bear being sampled more than once per season. USGS is requesting authorization to deploy up to 300 biopsy darts per year (split between spring and fall activity periods).

**Fall Activities**
Two helicopter-based aerial surveys are planned each fall. These will take place from approximately August 1-15 and September 15-30. During each survey, one helicopter will fly a series of transects over the Beaufort Sea mainland and barrier islands from Barrow to the Canadian border. The helicopter will fly at an altitude of approximately 400 feet until a polar bear is observed. The helicopter will then descend and closely approach the bear to enable observations and biopsy darts of all independent (non-cub) bears. The number of polar bears observed in similar previous studies ranged from 60 to 120 Schliebe et al. (2008). Given the similar survey effort proposed in this study a similar number of polar bears would likely be encountered although if the opportunity arises USGS would like to deploy up to 200 biopsy darts in fall out of the annual total of 300.

**Winter Activities**
Using a small fixed-wing aircraft, the USGS proposes to conduct over-flights to pinpoint the den locations of up to 20 radio-collared females and their cubs, and observe the health and status of other non-denning radio-collared polar bears. These flights will occur in January or February of each year, and the work can be accomplished in two to three days. The plane flies at an altitude of approximately 5,000 feet until a radio signal is heard. The plane then gradually descends to approximately 200 feet to locate the source of the signal, and it may make up to four passes over free-ranging bears.

### 2.2 Action Area
The action area for this BO is the Beaufort Sea up to 100 km offshore and the coastline up to 30 miles inland from Barrow to the Alaska-Canada border.

### 3. EFFECT OF THE ACTION ON NON-POLAR BEARS LISTED AND CANDIDATE SPECIES AND THEIR DESIGNATED CRITICAL HABITAT

#### 3.1 Spectacled eiders, Alaska-breeding Steller’s eiders and Yellow-billed loons
Spectacled and Steller’s eiders and yellow-billed loons nest and rear their broods on Alaska’s Arctic Coastal Plain (ACP). However, the proposed action will not have any impact on the terrestrial environment used by these species.
Listed eiders and yellow-billed loons may be present in the action area from early June through September. Due to the temporal separation, the activities proposed for spring and winter will have no effect on these species. There is some temporal overlap between the fall aerial survey and biopsy darting and the presence of listed eiders and yellow-billed loons in the action area. At this time adults and broods may be migrating through the action area as they move to their molting and wintering areas. It is possible some listed eiders and yellow-billed loons may be disturbed by the proposed activities. While the survey aircraft may cause these birds to flush, we expect this response to be insignificant as the disturbance will only cause minor behavioral changes in a few individuals for an extremely short duration. We therefore conclude the proposed activities are not likely to adversely affect listed eiders or yellow-billed loons.

3.2 Designated Critical Habitat for Listed Eiders
Critical habitat has been designated for both spectacled and Alaska-breeding Steller’s eiders. However, this habitat is not within the action area and therefore no effects from the proposed action are anticipated.

3.2 Pacific Walrus
The Service published a Federal Register notice on February 10, 2011, determining the listing of the Pacific walrus (walrus) as a threatened or endangered species under the ESA was warranted, but was precluded by higher priority actions. The walrus is therefore a candidate species for ESA listing. Although not required by law, Service policy is to consider candidate species when making natural resource decisions. We have therefore evaluated the effects of the proposed action on this species.

Because the winter and spring work occur when the southern Beaufort Sea is frozen, no walrus are present and these activities will not result in adverse effects. Between 2000 and 2009, the Service conducted polar bear coastal surveys in the southern Beaufort Sea between Barrow and the Canadian border between August and October. The southern Beaufort Sea is not typically occupied by walrus and, during these nine years of surveying effort, only one walrus was encountered. Therefore, it is possible, but not likely, that very low numbers of walrus may be encountered during the fall aerial survey and biopsy darting efforts. Any adverse effects to walrus would be limited to a few individuals at most and are not likely to jeopardize the continued existence of walrus.

4. STATUS OF THE SPECIES & CRITICAL HABITAT (POLAR BEARS)

4.1 Polar Bears

Regulatory Status
Due to threats to its sea ice habitat, on May 15, 2008 the Service published a Final Rule in the Federal Register listing the world-wide population of the polar bear (Ursus maritimus) as threatened (73 FR 28212) under the ESA. In the U.S., the polar bear is also afforded protection under the Marine Mammal Protection Act (MMPA).
Population
Polar bears are widely distributed throughout the Arctic where the sea is ice-covered for large portions of the year. Sea ice provides a platform for hunting and feeding, for seeking mates and breeding, for denning, for resting, and for long-distance movement. Polar bears primarily hunt ringed seals, which also depend on sea ice for their survival, but they also consume other marine mammals (73 FR 28212).

The total number of polar bears worldwide is estimated to be 20,000-25,000 with 19 recognized management subpopulations or “stocks” (Obbard et al. 2010). The International Union for Conservation of Nature and Natural Resources, Species Survival Commission (IUCN/SSC) Polar Bear Specialist Group ranked 11, four, and three of these stocks as “data deficient,” “reduced,” and “not reduced,” respectively (Obbard et al. 2010). The status designation of “data deficient” for 11 stocks means the estimate of the worldwide polar bear population was made with data that are known to be uncertain.

Effects of Climate Change
Warming-induced habitat degradation and loss are negatively affecting some polar bear stocks, and unabated global warming will ultimately reduce the worldwide polar bear population (Obbard et al. 2010). Loss of sea ice habitat due to climate change is identified as the primary threat to polar bears (Schliebe et al. 2006, 73 FR 28212, Obbard et al. 2010). Patterns of increased temperatures, earlier spring thaw, later fall freeze-up, increased rain-on-snow events (which can cause dens to collapse), and potential reductions in snowfall are also occurring. In addition, positive feedback systems (i.e., sea-ice albedo) and naturally occurring events, such as warm water intrusion into the Arctic and changing atmospheric wind patterns, can amplify the effects of these phenomena. As a result, there is fragmentation of sea ice, reduction in the extent and area of sea ice in all seasons, retraction of sea ice away from productive continental shelf areas throughout the polar basin, reduction of the amount of heavier and more stable multi-year ice, and declining thickness and quality of shore-fast ice (Parkinson et al. 1999, Rothrock et al. 1999, Comiso 2003, Fowler et al. 2004, Lindsay and Zhang 2005, Holland et al. 2006, Comiso 2006, Serreze et al. 2007, Stroeve et al. 2008). These climatic phenomena may also affect seal abundances, the polar bear’s main food source (Kingsley 1979, DeMaster et al. 1980, Amstrup et al. 1986, Stirling 2002). However, threats to polar bears will likely occur at different rates and times across the species’ range, and uncertainty regarding their prediction makes management difficult (Obbard et al. 2010).

Other range-wide threats
Subpopulations of polar bears face combinations of human-induced threats, making conservation and management of polar bears challenging (Obbard et al. 2010). The largest human-caused direct loss of polar bears is harvest, but for most subpopulations where this occurs, harvesting of polar bears is a regulated and/or monitored activity (Obbard et al. 2010). Other threats include accumulation of persistent organic pollutants in polar bear tissue, tourism, human-bear conflict, and increased development in the Arctic (Obbard et al. 2010). How these factors interact with naturally-occurring polar bear loss and climate change create uncertainty regarding our knowledge of the status of the polar bear worldwide.
Summary
Loss of sea ice due to climate change is the largest threat to polar bears worldwide, and uncertainty exits regarding the numbers of bears in some stocks and how other human activities interact to affect the worldwide polar bear population.

4.2 Critical Habitat
The Service designated polar bear critical habitat on November 24, 2010 (75 FR 76086). The Primary Constituent Elements (PCEs) of critical habitat for the polar bear are:

1) **Sea-ice habitat** used for feeding, breeding, denning, and movements, which is sea ice over waters 300 m (984.2 ft) or less in depth that occurs over the continental shelf with adequate prey resources (primarily ringed and bearded seals) to support polar bears.

2) **Terrestrial denning habitat**, which includes topographic features, such as coastal bluffs and river banks, with the following suitable macrohabitat characteristics:
   a) Steep, stable slopes (range 15.5–50.0), with heights ranging from 1.3 to 34 m (4.3 to 111.6 ft), and with water or relatively level ground below the slope and relatively flat terrain above the slope;
   b) Unobstructed, undisturbed access between den sites and the coast;
   c) Sea ice in proximity to terrestrial denning habitat prior to the onset of denning during the fall to provide access to terrestrial den sites; and
   d) The absence of disturbance from humans and human activities that might attract other polar bears.

3) **Barrier island habitat** used for denning, refuge from human disturbance, and movements along the coast to access maternal den and optimal feeding habitat, which includes all barrier islands along the Alaska coast and their associated spits, within the range of the polar bear in the United States, and the water, ice, and terrestrial habitat within 1.6 km (1 mi) of these islands (no-disturbance zone).

Critical habitat does not include manmade structures (e.g., houses, gravel roads, generator plants, sewage treatment plants, hotels, docks, seawalls, pipelines) and the land on which they are located existing within the boundaries of designated critical habitat on the effective date of this rule.

As described in the Status of the Species and Environmental Baseline sections of this BO, sea ice, including ice designated as critical habitat, is rapidly diminishing. Terrestrial denning locations in Alaska do not appear to be a limiting factor. However, rain-on-snow events may decrease den quality, and later onset of freeze-up in the fall may limit sea ice in proximity and therefore access to terrestrial denning habitat (FR 72 1064). Erosion of barrier islands and the Arctic shoreline, presumably caused by climate change (Mars and Houseknecht 2008), may be affecting terrestrial denning habitat by changing land features.

Human activities such as ground-based vehicular traffic and low-flying helicopters and planes occur in polar bear critical habitat. These activities may temporarily create disturbance between den sites and the coast, and may temporarily degrade the ability of barrier island habitat from being a refuge from human disturbance. However, these activities are usually infrequent and have short-term effects.
Summary
While other activities may diminish the quality of polar bear critical habitat, the primary factor affecting its status is loss of sea ice unit from climate change.

5. ENVIRONMENTAL BASELINE – POLAR BEARS

5.1 Polar Bears
The southern Beaufort Sea and Chukchi/Bering Sea stocks occur in the action area with some intermingling of the two stocks (Figure 1). Declines in sea ice have occurred in optimal polar bear habitat in the southern Beaufort and Chukchi seas between 1985 to 1995 and 1996 to 2006, and the greatest declines in 21st century optimal polar bear habitat are predicted to occur in these areas (Durner et al. 2009). These stocks are vulnerable to large-scale dramatic seasonal fluctuations in ice movements which result in decreased abundance and access to prey, and increased energetic costs of hunting. The Chukchi/Bering seas and southern Beaufort Sea stocks are currently experiencing the initial effects of changes in sea ice conditions (Rode et al. 2010, Regehr et al. 2009, and Hunter et al. 2007).

Figure 1. Ranges of Alaska polar bear stocks (USFWS 2009)
**Southern Beaufort Sea polar bear stock**
The southern Beaufort Sea polar bear population is distributed across the northern coasts of Alaska, Yukon, and Northwest territories of Canada. Estimates of the population size of the southern Beaufort Sea stock were 1,778 from 1972 to 1983 (Amstrup et al. 1986), 1,480 in 1992 (Amstrup 1995), and 2,272 in 2001 (Amstrup, USGS unpublished data). Declining survival, recruitment, and body size (Regehr et al. 2006, Regehr et al. 2009; Rode et al. 2010), and low population growth rates during years of reduced sea ice (2004 and 2005), and an overall declining population growth rate of 3% per year from 2001 to 2005 (Hunter et al. 2007) suggest that the southern Beaufort Sea stock is now declining, and Regehr et al. (2006) estimated the southern Beaufort Sea stock to be 1,526. The status of this stock is listed as ‘reduced’ by the IUCN (Obbard et al. 2010) and ‘depleted’ under the MMPA.

**Chukchi/Bering Sea polar bear stock**
The Chukchi/Bering Sea stock is widely distributed on pack ice in the Chukchi and northern Bering seas and adjacent coastal areas in Alaska and Russia. Obtaining a reliable population estimate for this stock is difficult due to vast and inaccessible habitat, movement of bears across international boundaries, logistical constraints, and budget limitations (Amstrup and DeMaster 1988, Evans et al. 2003). The size of this stock is listed as ‘unknown’ and the status of this stock is listed as ‘reduced’ by the IUCN (Obbard et al. 2010) and ‘depleted’ under the MMPA.

**Use of subsistence-killed whale carcasses**
Bowhead whale carcasses have been available to polar bears as a food source on the North Slope since the early 1970s (Koski et al. 2005). As many as 65 polar bears have been observed feeding at a single bowhead whale carcass (Miller et al. 2006). Barter Island (near Kaktovik) has had the highest recorded concentration of polar bears on shore (17.0 ± 6.0 polar bears/100 km) followed by Barrow (2.2 ± 1.8) and Cross Island (2.0 ± 1.8). This is thought to be due to the proximity to ice edge and higher ringed seal density at Barter Island (Schleibe et al. 2008), rather than the amount of whale harvest as the Kaktovik harvest is lower than that at Barrow or Cross Island.

Stable isotope analysis of polar bears in 2003 suggested that bowhead whale carcasses may have contributed 11-26% (95% CI) of the late winter (i.e. February through March) diet of the sampled population (Bentzen et al. 2007). In the winter of 2003-2004, the proportion was lower, at around 0-41% (Bentzen et al. 2007). A wide range of isotope values further suggested that consumption of bowhead whales varied widely among individual bears (Bentzen et al. 2007). Because most bears feed on bowhead whale during the fall harvest and sampling from this study represented only late winter diet, consumption may differ from what was determined in this study.

**Subsistence harvest**
The largest loss of polar bears from humans in the action area is from subsistence hunting. Harvest quota levels are set by the Inuvialuit-Inupiaq (I-I) council and the U.S. – Russia Polar Bear Commission (Commission) for the southern Beaufort Sea and Chukchi/Bering Sea stocks, respectively. The I-I council recently set a quota of 70 polar bears (email T. DeBruyn, August 13, 2010) based on a population estimate of 1,526 (Regehr et al. 2006; email T. DeBruyn, August 13, 2010). Recently (June 2010), the Commission adopted an annual take limit of up to 58 polar bears with no more than 19 females (DeBruyn et al. 2010). The reported annual
average combined (Alaska-Canada) harvest for the southern Beaufort Sea from 2004 to 2009 was 44, and the 2008/2009 reported harvest for North Slope villages was 25 polar bears (DeBruyn et al. 2010).

**Polar bear research**
Currently there are several ongoing polar bear research programs studying polar bears in the action area. The long-term goal of these research programs is to gain information on the ecology and population dynamics of polar bears to help inform management decisions, especially in light of climate change. These activities may cause short-term adverse effects to individual polar bears targeted in survey and capture efforts and may incidentally disturb non-target individuals nearby. In rare cases, research efforts may lead to injury or death of polar bears. Polar bear research is authorized through permits issued under the MMPA. These permits include estimates of the maximum number of bears likely to be directly harassed, subjected to biopsy darting, captured, etc., and include a condition that halts a study if a specified number of deaths, usually four or five, occurs during the life of the permit. Permits are usually issued for five years.

**Other threats**
Polar bear viewing at sites such as the whale bone piles may result in disturbance of polar bears by humans on foot, ATVs, snow machines, and other vehicles. Activities associated with the oil and gas industry have the potential to impact polar bears and their habitat. These activities are regulated and authorized through the issuance of Incidental Take Regulations (ITRs) under the MMPA, and since the ITRs went into effect in 1993, there has been no known instance of a polar bear being killed as a result of industrial activities (USFWS 2008).

**Summary**
The primary concern for polar bears in the action area is loss of sea ice. While other threats are managed and not currently thought to be significant threats to polar bear populations, each could become more significant in combination with future effects of climate change and the resultant loss of sea ice.

5.2 **Polar Bear Critical Habitat**
As the action area is a large proportion of the entire critical habitat, the condition of PCEs in the action area is therefore similar to those described above for the entire critical habitat area.

### 6. EFFECTS OF THE ACTION

This section of the BO provides an analysis of the effects of the proposed action on polar bears and their critical habitat. Direct effects (those immediately attributable to the action), indirect effects (those caused by the proposed action, but which will occur later in time, and are reasonably certain to occur) are considered. Finally, the effects from interrelated and interdependent actions are also considered. These effects will then be added to the environmental baseline in determining the proposed action’s effects to the species or its critical habitat (50 CFR Part 402.02).
6.1 Beneficial effects
Beneficial effects are those effects of an action that are wholly positive, without any adverse effects, on a listed species or designated critical habitat. Although the proposed research will contribute beneficially to polar bear management, the positive effects cannot be accomplished without some adverse effects, and therefore do not meet the definition of beneficial effects under the ESA.

6.2 Direct effects on polar bears

Spring Activities
As described in section 2 of this document, spring activities consist of capture of polar bears, fitting bears with radio-tracking devices, and biopsy darting. The potential effects of each of these activities are described.

The USGS is requesting authorization to capture up to 200 polar bears per year from 2011 through 2014, although the actual number captured will likely be lower. Captured polar bears likely suffer stress. Tissue collection sampling, i.e., pulling a pre-molar, tattooing, and biopsy sampling will create wounds and cause pain for an unknown, but finite, period after the bear is released. Other polar bear studies have documented infected wounds caused by research activities (Durner 2009), but given the researchers’ experience and new techniques we expect the infection rate from the proposed activities to be very low or negligible.

Of the bears captured, USGS proposes to deploy radio collars on up to 24 of them in 2011 and a minimum of 20 and up to 50 in subsequent years. Amstrup and Durner (1995) studied survival of radio-collared female polar bears and their dependent young during a 12-year study of the Beaufort Sea population in which survival was estimated from 297 collared female bears. Controlling for human-related mortality from hunting and poisoning, survivorship was 0.996 (95%, c.i. = 0.990-1.002). The female bears studied had very high survivorship indicating the collars and subsequent tracking has negligible influence on survival once a bear is successfully released from capture and handling.

Up to 75 polar bears may be fitted with other radio tag devices each year. Depending upon the results of 2011 studies, this will be either tags mounted through ear pinnae or tags glued onto the bears’ fur between their shoulders.

The USGS has requested authorization to biopsy dart up to 300 polar bears each year. Polar bears pursued for biopsy darting would experience a change in their behavior as they are chased by a helicopter, and those which are sampled would suffer a small wound from the dart. While this wound may cause pain for a short time, the probability of infection or significant injury to an animal is low. The biopsy darts leave a paint mark on the animal which should reduce chances that the same animal would be biopsied more than once per season.

In addition to successful capture and biopsy darting, some additional individuals may be disturbed in rare cases when pursuit of bears with intent to dart or capture is aborted to avoid unsafe conditions or terminate excessive pursuit. It is not clear how often this would occur, but
given the new biopsy dart protocols proposed it is likely to be very low number (estimated at < 20 / year).

Fall Activities
Two helicopter-based aerial surveys are planned each fall. Noise from these aircraft over-flights may disturb polar bears. The number of polar bears observed in similar studies at the same time of the year ranged from 60 to 120 (Schliebe et al. 2008). Given the similar survey effort proposed, a comparable number of polar bears would likely be encountered. However, if the opportunity arises the USGS would like to biopsy dart up to 300 polar bears.

Winter Activities
Amstrup (1993) studied the response of denning bears to research aircraft flying less than 50 to about 500 meters above the ground and recorded 40 cases of potential disruption of denning by research aircraft (44 dens were located in this study). Two bears left their dens temporarily, but disturbances did not appear to reduce cub production (Amstrup 1993). Assuming take (as defined under the ESA) results if a female polar bear leaves the den, we anticipate 4.5% (100 x [2/44]) of polar bears will be disturbed as a result of the winter aerial surveys. For this project, we estimate that at most one female and her two cubs per year (20 potentially radio-collared denning female polar bears x 4.5% = 0.9 polar bears, rounded up) will be temporarily disturbed by attempts to locate females in dens.

Radio-collared, non-denning polar bears would also likely be temporarily disturbed by the observation flights. However, due to the altitude at which the fixed-wing aircraft will conduct the study, disturbance of non-target polar bears (i.e., bears without radio collars) would only cause minor, short-term changes in behavior.

Long-term capture and disturbance effects
Capturing, biopsy-darting, and surveying polar bears could have unintended negative effects on polar bears that extend beyond the time frame of the study. Cattet et al. (2008) investigated long-term effects (persisting ≥ 1 month) of capturing and handling of grizzly (Ursus arctos) and black (U. americanus) bears. They found aspartate aminotransferase and creatine kinase concentrations (which assess muscle injury) were above normal in 18% of grizzly bears captured by helicopter darting. Daily movements were 57% (c.i. = 45-74%) and 77% (c.i. = 64-88%) lower than those of normal for radio-collared grizzly and black bears, respectively, and returned to normal 3-6 weeks (grizzly bears: mean of 28 days, c.i. = 20–37 days; black bears: mean of 36 days, c.i. = 19–53 days) later. Cattet et al. (2008) also found that for both species, age-specific body condition of bears captured two or more times in a six year period was generally poorer than that of bears captured only once, with the magnitude of effect directly proportional to number of times captured and the effect more evident with age. However, the majority of bears in this study were captured using techniques that differ from those used by the applicant, including leg snaring and culvert traps which were demonstrated to result in a greater frequency of muscle injury than helicopter darting. Thus, Cattet et al. (2008)’s conclusion that movement was restricted for three to six weeks following capture and that bears demonstrated poorer body condition may be more commonly associated with these methods than the method used by the applicant.
The proposed action involves capturing and possibly recapturing polar bears via helicopter and disturbing and darting polar bears which may have bears previously captured in other studies. While Ramsay and Stirling (1986) suggested that handling polar bears, especially sows with cubs, may have slight but detectable long-term negative effects, Rode et al. (2007) found no evidence that polar bears captured two or more times were smaller or in poorer condition than bears captured only once. This negative finding was consistent for all age groups (Rode et al. 2007). The applicant also generally observes the majority of bears for 24 hours post-capture to affirm that bears are walking and behaving normally for this interval. Some bears have also been observed on seal kills within 24 hours of capture. The effect of disturbing previously captured polar bears with aircraft (during survey efforts) is not known, but negative effects are likely much lower than recapturing polar bears. Because the current method of re-capturing polar bears does not appear to have long-term effects on body condition and time between re-captures is likely greater than a year, we expect long-term capture effects of the proposed action on polar bears to be low.

6.2 Direct Effects to Critical Habitat

Effects on physical PCEs
The proposed action is unlikely to alter physical features of critical habitat or affect the PCEs to the degree that the habitat no longer can support the essential life functions of the polar bear. Because impacts to the physical environment will be limited to helicopter landings and walking across land and ice, impacts to the physical environment will be so minor as to be considered insignificant.

Effects of spring captures on sea ice
Except for sea ice that is part of barrier island critical habitat, only spring capture activities will affect sea ice critical habitat. Although these activities may temporarily reduce site specific availability of the sea ice habitat for feeding, mating, and movements and access to prey, these actions would occur over a very small area around the helicopter and researchers and would be temporary (no more than three hours), and the sea ice habitat’s capability to support feeding, mating, and movements of polar bears would return once the researchers leave. Therefore, the short-term effects of capture work on the availability of sea ice critical habitat are insignificant.

Effects of disturbance on the conservation role of critical habitat to polar bears
Because the terrestrial denning and barrier island critical habitat units include lack of human disturbance as a PCE, the Service must separately analyze effects of disturbance on polar bears from its effects on critical habitat. The section Effects of the Action on Polar Bears included an analysis of possible effects of disturbance on polar bears. In contrast, this section contains an analysis of disturbance effects on the ability of critical habitat to hold the value (e.g., lack of disturbance from humans) for which it was designated. Therefore, this section may reference disturbance of polar bears if it is meaningful to the discussion of the capability of critical habitat to support polar bears, but it is not a re-analysis of effects on polar bears and possible take.

The proposed activities would involve the capture, biopsy darting, disturbance by aerial surveys, and radio tracking of polar bears from the southern Beaufort Sea and Bering/Chukchi Sea stocks that may alter the use of critical habitat by polar bears through the mechanism of disturbance.
During aerial surveys, polar bears may respond by moving from their original positions, or entering the water if on land or ice. Similarly, capture efforts include a chase component which alters a bear’s original location on sea ice. Capture efforts may also prevent other polar bears from using critical habitat occupied by researchers and the anesthetized polar bear. These disturbances could interfere with the capability of small, localized critical habitat areas to provide their intended function temporarily. These components of the proposed research will be considered separately with respect to effects of disturbance on each critical habitat unit.

Spring Activities
Terrestrial Denning Habitat: Although some captures (of non-denning bears) may take place in terrestrial denning habitat, in general denning polar bears occur at low densities across a vast region. Disturbances from capture activities may cause temporary displacement from local den sites, if a denning bear were encountered, but typically these events are periodic, short in duration, and not overly traumatic to the bears and thus are not likely to reduce the long-term availability of the habitat or restrict movements of sows and cubs-of-the-year traveling to the sea ice to hunt after natural den abandonment. Because the likelihood of encountering bears using critical habitat for denning activities is low, and if they are prevented from using the habitat in this manner it will only be for a short time, the effect of aerial surveys on the ability of critical habitat to support denning bears would be discountable and insignificant.

Barrier Island Habitat: While capture efforts may occur on or near barrier islands in the Beaufort Sea, this critical habitat area was designated to provide denning habitat, refuge from human disturbance, and to allow movements along the coast to access maternal den habitat. Peak use of barrier islands occurs in summer and fall, and therefore capture work would have insignificant effects on use of barrier island critical habitat.

Fall Activities
During the fall aerial survey and biopsy darting work, some polar bears will be disturbed and may be temporarily disrupted in their use of critical habitat.

Terrestrial Denning Habitat: The aerial surveys and fall biopsy darting will occur between August 1-15 and September 15-30 along the coastline of the critical terrestrial denning habitat. These activities are unlikely to impact occupied maternal dens because mean entry dates for land and pack-ice dens were 11 November and 22 November, respectively (Amstrup 1995), after these activities have concluded.

Barrier Island Habitat: While polar bears use barrier island critical habitat most frequently during the open water period in summer and early fall, sea ice is the polar bears’ preferred habitat and is used when available rather than barrier islands. Because they prefer sea ice and current climate conditions still allow for sea ice in Arctic regions during fall, the number of polar bears likely to be using barrier island critical habitat during these surveys is comparatively low. Thus, if surveys prevented use of barrier island critical habitat, it would only be for a small proportion of the southern Beaufort Sea / Chukchi Sea stocks. Further, most bears are minimally disturbed by aerial surveys: a few run and/or enter the water and start swimming; thus they stop using the habitat for the value which it was designated (i.e., resting, feeding, or movement along the coast). Evidence that bears are very likely to be re-sighted during repeated surveys in one
fall season indicates that interruptions in habitat occupancy are temporary (e.g., likely lasting a few moments to about five minutes) and the value of critical habitat will return to a zone free of human disturbance once the aircraft leaves. Thus, we expect that fall aerial surveys will have no long-term effects on the intended purpose of designated barrier island critical habitat and the no disturbance zone.

**Winter Activities**

**Terrestrial & Barrier Island Denning Habitat:** Because pregnant sows have already initiated maternal denning when this study commences, none of the proposed winter activities will prevent them from initiating use of critical habitat for denning. The aerial survey work will take place at relatively high altitude such that denning females which have not been radio collared are not likely to be affected by noise from the aircraft. While ground based activities close to maternal dens has been shown to result in temporary disturbance of denning habitat (Amstrup 1993), no evidence of significant disturbance of denning polar bears has been documented from similar studies (Durner *pers. comm.*).

Barrier Island Habitat: In addition to denning habitat, barrier islands were designated as critical habitat to provide refuge from human disturbance, and to allow movements along the coast to access maternal den habitat. Effects of aerial work to barrier island denning habitat are expected to be similar to effects to terrestrial denning habitat, as described above. The peak use of barrier islands for refuge from human disturbance and movements occur in summer and fall and would therefore not be affected by winter work.

**6.4 Indirect effects**

Indirect effects of the action are defined as “those effects that are caused by or will result from the proposed action and are later in time, but are still reasonably certain to occur” (50 CFR §402.02).

Previously captured (or biopsy darted) bears may perceive a helicopter as a greater threat than bears without previous capture and/or darting experience, and their stress level may increase whenever a helicopter (including for those engaged in non-research activities) flies above it at a similar altitude. However, it is unclear to what extent this may adversely affect the animal.

Because we expect disturbance within polar bear critical habitat to occur only when researchers are present, we do not expect indirect effects to critical habitat to occur.

**6.5 Interrelated and interdependent effects**

Interdependent actions are defined as “actions having no independent utility apart from 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 can identify no effects from interdependent or interrelated actions resulting from this project.
6.6 Summary

Polar Bears
The USGS is requesting permission to capture up to 200 polar bears per year. Although rare, polar bears may be injured or die from capture and sampling procedures. While there is some risk of unintentional injury of polar bears during capture procedures, the researchers involved have sufficient experience to minimize the risk to polar bears from these activities. An estimated 320 polar bears may be disturbed each year by aircraft working on the project, of these a maximum 300 could be biopsy darted. These proposed activities may adversely affect polar bears.

Critical Habitat
The proposed activities are unlikely to alter physical features of critical habitat. They may result in a reduction in use of the habitat, but these impacts are anticipated to be temporary, short lived and over an insignificant proportion of the available habitat within the critical habitat units.

7. CUMULATIVE EFFECTS

7.1 Polar Bears
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 because they require separate consultation under the ESA.

Some disturbance of polar bears may occur from residents on the North Slope incidental to activities such as hunting and travel within polar bear habitat. This amount, however, is difficult to estimate due to lack of information, but is likely comparatively low.

7.2 Critical Habitat
Some private citizens may create a disturbance as they travel in the area while hunting, camping, etc., within polar bear critical habitat that temporarily precludes its use. Because of the remoteness of most of the action area, the cumulative effects from these activities are likely low.

8. CONCLUSION

8.1 Polar Bears
The regulations (51 FR 19958) that implement section 7(a)(2) of the ESA define "jeopardize the continued existence of" as, "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species." After reviewing the current status of the polar bear, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects, it is the Service’s biological opinion that the proposed action is not likely to jeopardize the continued existence of polar bears.
This conclusion is based on the information and analysis that:
1. Disturbance of bears during project activities is temporary. Therefore, it is unlikely to significantly affect the reproduction, numbers, or distribution of polar bears.
2. Biopsy darting is not likely to lead to serious injury, infection, or death.
3. The researchers are unlikely to kill enough polar bears during captures to appreciably reduce the likelihood of survival and recovery of polar bears because the permit requires research to cease if and when five polar bears are injured or killed. Thus, there is a finite limit to the potential impacts, and we believe this limit is well below that which would result in significant population-level impacts.

8.2 Critical Habitat
After reviewing the current status of the polar bear, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects, it is the Service’s biological opinion that the issuance of this permit, as proposed, is not likely to adversely modify polar bear critical habitat.

We based our conclusion on the following:
1. The proposed action does not include changes to the physical features of critical habitat.
2. The reduction in use of the habitat as a result of disturbance in all critical habitat units is temporary, short lived and of small geographic scale; researchers will only be present for portions of the spring and fall. Therefore, the habitat and its conservation value to polar bears will recover when the research is completed.

9. INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by FWS 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 FWS as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity.

Polar bears
Under the authorization of section 4(d) of the ESA, the Service amended regulations at 50 CFR part 17 to create a final special rule for polar bears so that if an activity is authorized or exempted under the MMPA or CITES, the Service will not require any additional authorization under the ESA regulations associated with that activity (73 FR 76249). Intentional and incidental take for polar bears that may occur from these activities will be authorized under a MMPA permit issued by the service’s Division of Management Authority Office. Therefore, incidental take does not require additional authorization through an incidental take statement.
10. CONSERVATION MEASURES AND REPORTING REQUIREMENTS

Based on the project description USGS researchers may:
- Capture up to 200 polar bears each year for 5 years;
  - Fit up to 50 of these bears with radio collars each year;
  - Fit up to 75 of these bears with glue on or ear-inserted radio tags each year;
- Deploy up to 300 biopsy darts each year for 5 years; and
- Disturb an estimated 320 polar bears each year for 5 years with project aircraft.

These activities could affect a large proportion of the Beaufort Sea stock and polar bears from the Bering Sea/Chukchi Sea stock. As the status of polar bear populations deteriorates, concerns over the potential impacts to individual animals and stocks of polar bears from research may increase. We urge USGS to work to minimize the impacts of their research through the use of new techniques, and collaborating with other studies and researchers to avoid duplication of efforts and minimize the disturbance and handling of polar bears.

The Fairbanks Endangered Species Office requests a report, due at the same time as reporting requirements under the MMPA permit issued by DMA, containing the following:

1. Annual reports provided to DMA for all study components as required by the MMPA permit;
2. The number of polar bears pursued in abandoned dart runs and the number successfully darted;
3. Number of females who leave their dens in response to disturbance during den detection surveys;
4. Incidental disturbance of polar bears during captures and biopsy work (e.g., polar bears observed but not pursued during capture and biopsy runs).

This information will be used during future section 7 consultations and in management decisions as we work to improve our understanding of the potential impacts of research on polar bears.

11. REINITIATION NOTICE

This concludes formal consultation on the proposed action. As provided in 50 CFR 402.16, initiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) if:
1) 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;
2) The proposed action is subsequently modified in a manner that causes an effect to listed species or critical habitat not considered in this opinion; or
3) A new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending re-initiation of consultation.
12. LITERATURE CITED


