United States Department of the Interior

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

May 20, 2013

Memorandum

To: Chief, Marine Mammals Management, Region 7

From: acting Field Supervisor, Fairbanks Fish and Wildlife Field Office Ted Swem

Subject: Biological Opinion for Polar Bears and Conference Opinion for Pacific Walrus on the Chukchi Sea Incidental Take Regulations

This document transmits the Fairbanks Fish and Wildlife Field Office's final biological opinion based on our review of regulations authorizing the nonlethal, incidental, unintentional take of small numbers of polar bears (*Ursus maritimus*) and Pacific walruses (*Odobenus rosmarus divergens*) during oil and gas industry activities in the Chukchi Sea and adjacent western coast of Alaska. This document examines the effects of the Regulations and subsequent issuance of Letters of Authorization in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.).

Based on the information provided on the Regulations, and other relevant information currently available, we have determined that it is unlikely that the action will violate section 7(a)(2) of the Act. 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.

Biological Opinion for Polar Bears (*Ursus maritimus*) and Conference Opinion for Pacific Walrus (*Odobenus rosmarus divergens*) on the Chukchi Sea Incidental Take Regulations

Prepared by:
U.S. Fish and Wildlife Service
Fairbanks Fish and Wildlife Field Office
110 12th Ave, Room 110
Fairbanks, Alaska 99701

May 20, 2013

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Introduction

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq*., ESA), regarding effects to the polar bear (*Ursus maritimus*) of the Service's proposed Action (Action) related to proposed incidental take regulations (Regulations) for oil and gas exploration activities in the Chukchi Sea and adjacent northern coast of Alaska. The Action is described in detail in the section of this document captioned "Proposed Action." Because the Pacific walrus (*Odobenus rosmarus divergens*; walrus) is a candidate species under the ESA and Service policy requires intra-Service conference on candidate species, this document also serves as a conference opinion on the effects of the proposed Action on the Pacific walrus. In the interest of simplicity, we are hereafter referring to the Biological Opinion and Conference Opinion collectively as the "BO."

On October 29, 2009, the Service proposed critical habitat for polar bears (74 FR 56058). A final rule designating critical habitat was issued on December 7, 2010 (75 FR 76086). On January 11, 2013, the final rule was vacated and remanded to the Service by the U.S. District for the District of Alaska in *Alaska Oil and Gas Association et al. v. Salazar, et al.* (D. Alaska)(3:11-cv-00025-RRB). The Service filed a motion for reconsideration of the District Court's decision. The motion was denied on May 15, 2013. Thus, at this time, there is no critical habitat designated for polar bears.

Background on Section 101(a)(5) of MMPA

The Service has responsibility for managing take of polar bears and walruses under the MMPA and ESA. Section 101(a)(5) of MMPA (16 U.S.C. § 1371(a)(5)(A)) allows for regulations to be promulgated for up to a 5-year period for the nonlethal, unintentional incidental take of small numbers of marine mammals in certain circumstances. Specifically, for the Service to consider issuing such regulations to allow incidental take under the MMPA, a written request by U.S. citizens engaged in a specified activity (other than commercial fishing) in a specified geographic region must be submitted to the Service with information on the activity as a whole and impacts of the potential take of marine mammals from them. The Service evaluates the potential impacts resulting from these activities. If the Service finds the total taking expected from the activities (in this case, all oil and gas exploration activities during the duration of the Regulations) will: (1) impact only small numbers of animals, (2) have a negligible impact on these species, and (3) will not have an unmitigable adverse impact on the availability of these species for subsistence use by Alaska Natives, the regulations may be issued that establish permissible methods of taking and other means of having the least practicable adverse impact on the species.

The AOGA Petition

On January 31, 2012, AOGA submitted a petition for incidental take regulations to provide authorization for non-lethal incidental take of small numbers of walruses and polar bears from oil and gas exploration (Industry) activities in the Chukchi Sea area (Figure 1) from 2013–2018. Anticipated Industry activities specified in the petition included new and ongoing offshore and onshore exploration. The Marine Mammals Management Office (MMM) reviewed AOGA's application and concluded that Industry activities within the Chukchi Sea geographical region would impact only small numbers of walruses and polar bears, have a negligible impact on these species, and the total expected takings would not have an unmitigable adverse impact on the availability of walruses and polar bears for subsistence use by Alaska Natives (78 FR 1942: 1978-1981).

History of Chukchi Sea ITRS

Similar regulations for the Chukchi Sea and adjacent northern coast of Alaska were in place from 1991 to 1996 and 2006 through 2013 (78 FR 1942). These regulations have provided Industry the ability to obtain letters of authorization (LOAs) for incidental take of walruses and polar bears during specific oil and gas exploration activities. As in the past, the LOAs under the Regulations would contain project-specific mitigation measures and would be valid for a specified period not to exceed one year.

Relationship of ESA to MMPA

Section 7(o)(2) of ESA allows for exemptions, under certain circumstances, to the section 9 take prohibitions for endangered and threatened species incidental to otherwise lawful activities that have Federal involvement or control. If a marine mammal species is listed as endangered or threatened under the ESA, the requirements of both MMPA and ESA must be met before the incidental take under the ESA can be authorized. For the Service to exempt incidental take under ESA, the Service must conclude that the Federal action (1) is not likely to jeopardize listed species or destroy or adversely modify designated critical habitat, (2) results from an otherwise lawful activity, and (3) is incidental to the purpose of the action. The proposed Regulations would allow LOAs under the MMPA to be issued for the nonlethal, unintentional incidental take of small numbers of Pacific walruses and polar bears for activities associated with oil and gas exploration in the Chukchi Sea and adjacent coastal areas.

MMPA Terms:

Definitions of key terms used in this BO are listed below. Additional definitions for MMPA terms can be found in 50 CFR Part 18; additional definitions for ESA terms can be found at 50 CFR §402.

Incidental, but not intentional, taking - means takings which are infrequent, unavoidable, or accidental. This does not mean that the taking must be unexpected.

Negligible impact – is 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.

Take – means to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal. For activities other than military readiness activities or scientific research conducted by or on behalf of the Federal government, the MMPA defines harassment as any act of pursuit, torment, or annoyance which: (1) has the potential to injure a marine mammal or marine mammal stock in the wild (the MMPA calls this Level A harassment); or (2) 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 (the MMPA calls this Level B harassment).

Unmitigable adverse impact - means 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.

ESA Terms:

Incidental take – refers to takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant.

Jeopardize the continued existence – means 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.

Listed species – means any species of fish, wildlife or plant which has been determined to be endangered or threatened under section 4 of the Act. Listed species are found in 50 CFR. 17.11-17.12.

May affect – the appropriate conclusion when a proposed action may pose any effects on listed species.

Take – means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct. Harm is further defined by the Service as an act which actually kills or injures wildlife, and may include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Harass is defined by the Service as 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.

Threatened species – means any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

The Proposed Action

This section provides a description of the proposed Action evaluated in this BO. The proposed Action consists of the promulgation of Regulations under section 101(a)(5) of the MMPA (78 FR 1942) and LOAs that may be issued pursuant to these Regulations for the non-lethal, unintentional incidental take of polar bears and walruses. Activities authorized by LOAs must meet the requirements specified in the Regulations, including permissible methods by which polar bears and walruses may be taken, mitigation measures to ensure the least practicable adverse impact on the species and the availability of these species for subsistence uses, and requirements for monitoring and reporting. As a result, the proposed Action evaluated in this BO includes consideration of these requirements.

The Regulations and associated LOAs covered in the proposed Action here would authorize the incidental take of polar bears and walruses under the MMPA. However, the proposed Action would not permit, fund or otherwise authorize the Industry activities themselves. Such activities would require appropriate Federal and/or State permits or other authorizations before they may proceed. For example, the activities may require permits or other authorizations from the Bureau of Ocean Energy Management (BOEM), Bureau of Safety and Environmental Enforcement (BSEE), the Army Corps of Engineers (USACE), the Bureau of Land Management (BLM) and/or the Environmental Protection Agency (EPA).

The description of the proposed Action in this BO includes information from the proposed Regulations (78 FR 1942), subsequent revisions to the proposed Regulations, the Service's draft Environmental Assessment for the proposed Regulations (78 FR 1942), related BOs issued to permitting agencies, and other documents and communications.

Information Required to Obtain a Letter of Authorization

If the Service issues Regulations, Industry operators would have to apply for LOAs to receive incidental take authorization for polar bears and walruses. To obtain an LOA, an applicant must provide specific information to the Service, including:

1) A description of the activity, the dates and duration of the activity, the specific location, and the estimated area affected by that activity, i.e., a Plan of Operation;
2) A site-specific plan to monitor and mitigate the effects of the activity on polar bears and Pacific walruses that may be present during the ongoing activities (i.e., marine mammal monitoring and mitigation plan). The monitoring program must document the effects to these marine mammals and estimate the actual level and type of take. The monitoring requirements provided by the Service will vary depending on the activity, the location, and the time of year;
3) Site-specific polar bear and/or walrus awareness and interaction plan. An interaction plan for each operation will outline the steps the applicant will take to limit animal-human interactions, increase site safety, and minimize impacts to marine mammals;
4) A record of community consultation or a Plan of Cooperation (POC) to mitigate potential conflicts between the proposed activity and subsistence hunting, when necessary; and
5) Applicants must consult with potentially affected subsistence communities along the Chukchi Sea coast (Point Hope, Point Lay, Wainwright, and Barrow) and appropriate subsistence user organizations (the Eskimo Walrus Commission (EWC) and the Alaska Nanuuq Commission) to discuss the location, timing, and methods of proposed operations and support activities and to identify any potential conflicts with subsistence walrus and polar bear hunting activities in the communities. Applications for LOAs must include documentation of all consultations with potentially affected user groups and a record of community consultation. Documentation must include a summary of any concerns identified by community members and hunter organizations, and the applicant's responses to identified concerns. Mitigation measures are described in § 18.118.

Specific Measures of LOAs

The Service requires mitigation, monitoring, and reporting measures be conducted by LOA holders. These measures can be found in the proposed Regulations and subsequent revisions to them.

In addition to the measures referenced above, the MMM considers the area delineated in Figure 1, the Hanna Shoal Walrus Use Area (HSWUA), as a core area defined by both foraging and occupancy patterns of the Pacific walrus in summer and fall (Brueggeman et al. 1989, 1990, 1991; MacCracken 2012, Jay et al. 2012). For the purposes of these ITRs, the MMM delineated the HSWUA by use patterns of Pacific walruses as described in Jay et al. (2012). The designation of the HSWUA is intended to trigger additional scrutiny of activities that may occur in the HSWUA. The MMM may determine that additional mitigation measures, such as seasonal restrictions, reduced vessel traffic, or rerouting vessels may be necessary for activities within the HSWUA to minimize potential disturbance and ensure consistency with the MMPA mandates that only small numbers of walruses be affected with a negligible impact on the stock. As individual LOA applications are received, the MMM will examine the proposed activities in light of the boundaries of the HSWUA, the nature and timing of the activities, and other available information. If the MMM determines that the proposed activity is likely to negatively impact more than small numbers of walruses, it will include in the LOAs appropriate additional mitigation and monitoring measures to ensure that the small numbers and negligible impact standards will be achieved. The MMM will make those determinations on a case-by-case basis.

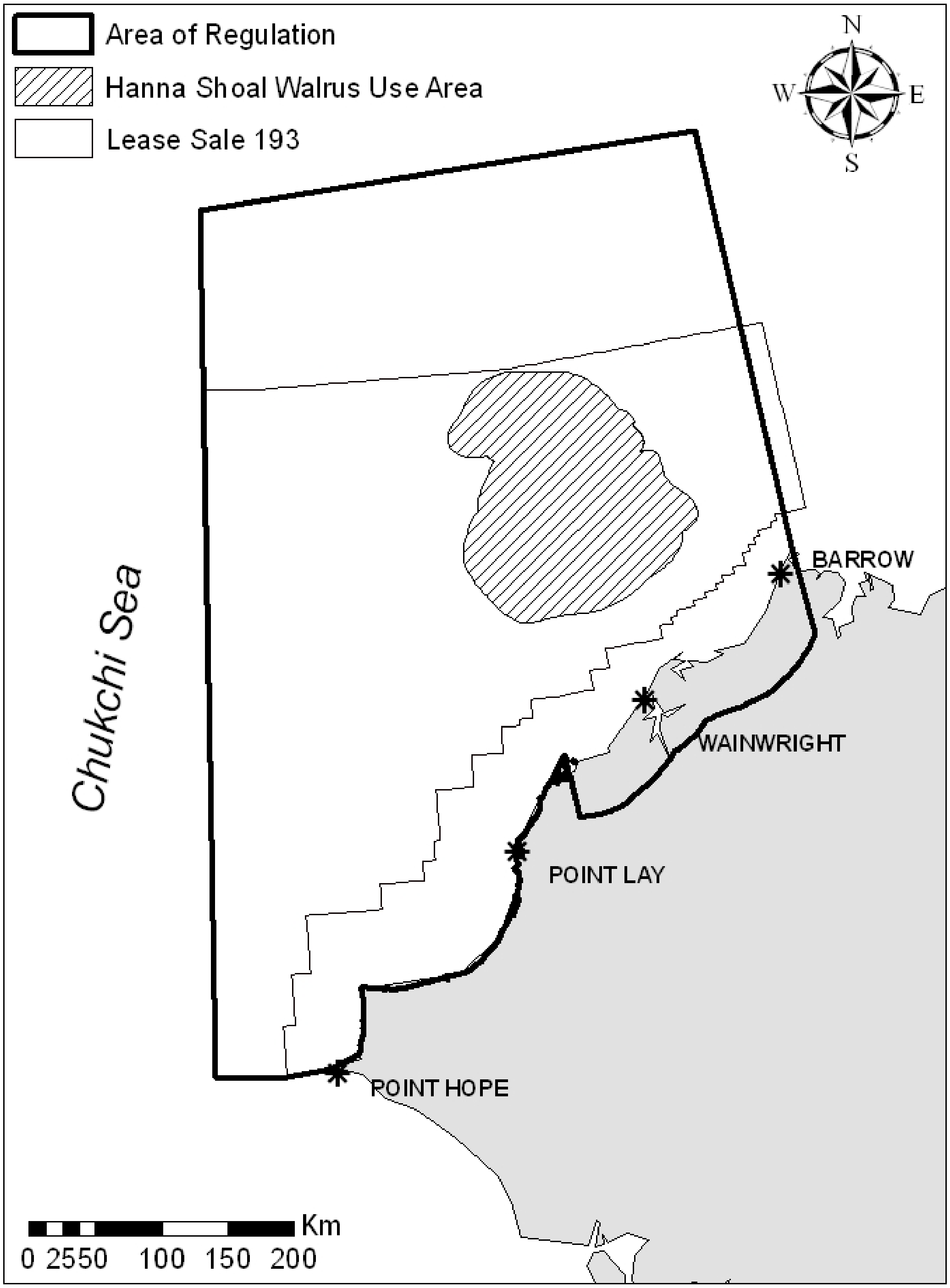

Figure 1. Action area showing Hanna Shoal Walrus Use Area based on Jay et al. (2012). Image from 78 FR 1942.

Types of Industry Activities that may Receive LOAs

Exploratory activities and activities supporting exploration would be eligible to receive LOAs under the Regulations, as are activities conducted in the Barrow Gas Fields. AOGA provided an estimate of the number of types of activities (AOGA 2012) projected to occur during the 5 year regulatory period. Most of these activities have been previously described in the Biological

Opinion and Conference Opinion for Oil and Gas Activities in the Beaufort and Chukchi Sea Planning Areas on Polar Bears (*Ursus maritimus*), Polar Bear Critical Habitat, Spectacled Eiders (*Somateria fischeri*), Spectacled Eider Critical Habitat, Steller's Eiders (*Polysticta stelleri*), Kittlitz's Murrelets (*Brachyramphus brevirostris*), and Yellow-billed Loons (*Gavia adamsii*) (mostly offshore activities; USFWS 2012a) and the Biological Opinion for the National Petroleum Reserve – Alaska Integrated Activity Plan 2013 (mostly terrestrial activities; USFWS 2013a). The Service also describes exploratory activities in the proposed Regulations (78 FR 1942). Please see the BOs described above and the proposed Regulations for further details regarding these activities. We summarize these activities, in sections for offshore and onshore activities, as described in the proposed Regulations (78 FR 1942).

Offshore Activities

Exploratory drilling, seismic surveys, geotechnical surveys, shallow hazards surveys, and environmental studies may be conducted annually in the Chukchi Sea and adjacent coastal areas from June 11, 2013, to June 11, 2018. This period contains the entire open water seasons of 2013 to 2017, but terminates before the start of the 2018 open water season.

Exploratory Drilling

Up to three operators may drill up to eight wells annually. Each drilling operation would be accompanied by several support vessels and aircraft.

Seismic Operations

Up to two seismic survey programs (2D or 3D) could operate annually during the open water season. Each seismic survey vessel would likely be accompanied by one to three support vessels. Helicopters may also be used for vessel support and crew changes.

Shallow Hazard Surveys

Up to two operators may conduct four to seven shallow hazards surveys annually.

Marine Geophysical Surveys

These surveys use the same types of remote sensing geophysical equipment as shallow hazards surveys, but are conducted for different purposes in different areas and often lack a seismic (airgun) component. Geophysical surveys include ice gouge, strudel scour, and other bathymetric surveys (e.g., platform and pipeline surveys). Up to two operators may conduct two geophysical surveys, including ice gouge, strudel scour, and bathymetry surveys annually.

Geotechnical Surveys

Up to two operators may conduct up to two geotechnical surveys annually.

Offshore Environmental Studies

Offshore environmental studies may include: ecological surveys of the benthos, plankton, fish, bird, and marine mammal communities; acoustical studies of marine mammals; sediment and water quality analysis; and physical oceanographic investigations of sea ice movement, currents, and meteorology. Bird and marine mammal surveys could be conducted from vessels. Vessels would slowly travel along transects while observers conduct surveys. Marine mammal surveys may also be conducted from fixed wing aircraft as part of the mandatory marine mammal monitoring programs associated with seismic surveys and exploration drilling. Various types of buoys could be deployed for data collection.

Onshore Activities

Exploratory Activities
No exploration drilling, seismic surveys, or shallow hazard surveys are expected onshore. However, up to two geotechnical surveys conducted by up to two operators could occur annually in winter. Onshore geotechnical surveys will likely take place in winter. Rotary drilling equipment will be wheeled, tracked, or sled mounted. Additionally, offshore exploration drilling programs may require onshore support facilities for aircraft (e.g., for serving crew changes, search and rescue, and/or re-supply functions) and vessels where they can access the shoreline.

Onshore Environmental Studies
Onshore environmental studies could include: hydrology studies; habitat assessments; fish and wildlife surveys; and archaeological resource surveys. These studies generally would be conducted by small teams based out of Chukchi Sea communities, and would travel by helicopter. Most surveys would be conducted on foot or from the air. Small boats may be used for hydrology studies, fish surveys, and other studies in aquatic environments. Up to two environmental studies may occur annually in spring, summer, or fall.

Barrow Gas Fields
The North Slope Borough (NSB) operates the Barrow Gas Fields located south and east of the city of Barrow. The Service anticipates the NSB to maintain an active presence in the gas fields during the timeframe of the Regulations.

The Action Area

The Action Area (Figure 1) is the geographic region of the proposed Action (i.e., the area covered by the proposed Regulations, which is the Chukchi Sea Area of Regulation and adjacent coastal areas), and all area to be affected directly or indirectly by the proposed Action.

Status of the Species

This section presents biological and ecological information relevant to formation in this BO.

Climate Change

Our BO considers ongoing and projected changes in climate using terms as are defined by the Intergovernmental Panel on Climate Change (IPCC). “Climate” refers to the mean and variability of different types of weather conditions over time, with 30 years being a typical period for such measurements, although shorter or longer periods also may be used (IPCC 2007, p. 78). The term “climate change” thus refers to a change in the mean or variability of one or more measures of climate (e.g., temperature or precipitation) that persists for an extended period, typically decades or longer, whether the change is due to natural variability, human activity, or both (IPCC 2007: 78). Results of scientific analyses presented by the IPCC show that most of the observed increase in global average temperature since the mid-20th century cannot be explained by natural variability in climate, and is “very likely” (defined by the IPCC as 90 percent or higher probability) due to the observed increase in greenhouse gas (GHG) concentrations in the atmosphere as a result of human activities, particularly carbon dioxide (CO_2) emissions from use of fossil fuels (IPCC 2007: 5-6 and figures SPM.3 and SPM.4; Solomon *et al*. 2007: 21–35). Various types of changes in climate can have direct or indirect effects on most species. These effects may be positive, neutral, or negative, and they may change over time, depending on the species and other relevant considerations, such as the effects of interactions of climate with other variables (e.g., habitat fragmentation) (IPCC 2007: 8–14, 18–19). In our BO, we use our expert judgment to weigh relevant information, including uncertainty, in our consideration of climate change.

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

Historically, sea ice has protected shorelines from erosion; however, this protection has decreased as sea ice decreases in extent and duration. With the reduction in summer sea ice, the frequency and magnitude of coastal storm surges has increased. These can cause breaching of lakes and inundation of 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). Coupled with thawing permafrost, the inundation of the shoreline due to lack of sea ice has significantly increased coastal erosion rates (USGS 2006), potentially reducing the quality or quantity of habitats such as bluffs with vegetation that catch snow in which polar bears den and beaches where walruses haul out during periods of low sea ice along the Chukchi Sea.

Regional-scale environmental shifts may be underway in the Chukchi and the Bering seas that may affect polar bear and walrus populations. Ice thickness generally increases from the Siberian Arctic to the Canadian Archipelago, due mostly to convergence of drifting sea ice (Walsh 2005). Rothrock et al. (1999; cited in Walsh 2005) found a decrease of about 40% (1.3 m) in the sea-ice draft (which is proportional to thickness) in the central Arctic Ocean by comparing sonar data obtained from submarines during two periods: 1958–1976 and 1993–1997. Wadhams and Davis (2000; cited in Walsh 2005) provide further submarine-measured evidence of reductions in sea ice thickness in the Arctic Ocean. Satellite imagery has documented a downward trend in September sea ice extent (historically when sea ice extent is at its minimum; Figure 2, NSIDC 2012). From 1979 through 2009, satellite data from 10 Arctic regions indicated that nine of 10 regions experienced trends towards earlier spring melt and later autumn freeze onset (Markus et al. 2009). For the entire Arctic, the melt season length had increased by about 20 days during this period (Markus et al. 2009). The Chukchi/Beaufort seas region, which is within the range of polar bears and walruses, has experienced a strong trend toward later autumn freeze-up date and longer ice-free seasons (Markus et al. 2009). Such changes in sea ice extent and duration will likely affect polar bear and walrus population trends. Details regarding the status of polar bears and walruses in light of climate change are presented below in the sections specifically for these species.

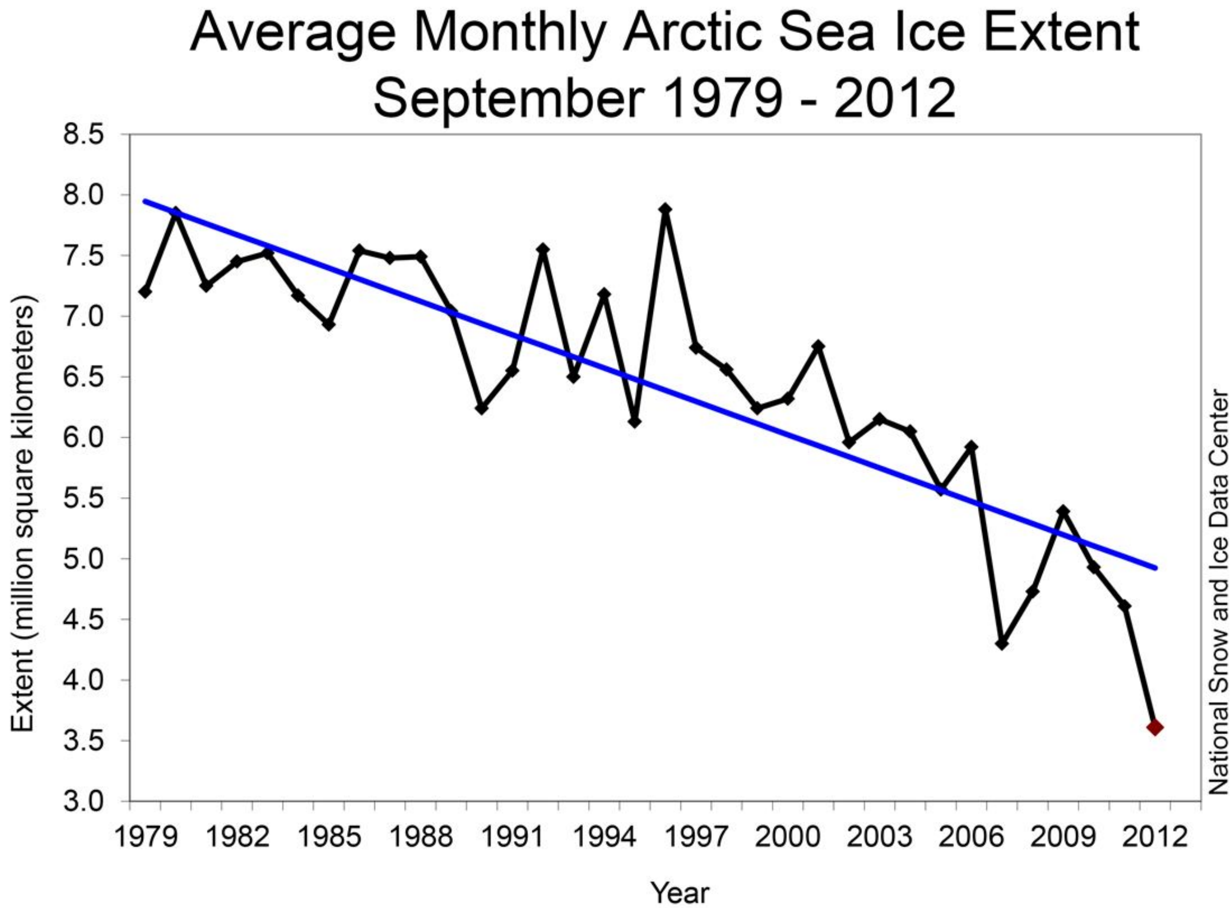

Figure 2. Average September arctic sea ice extent from 1979 through 2012 showing a 13.0% decline per decade. From NSIDC (2012). [http://nsidc.org/arcticseaicenews/asina/2011/100411.html, accessed 10/03/2012]

Polar Bears

Status and Distribution

Due to threats to its sea ice habitat, on May 15, 2008 the Service listed the polar bear as threatened (73 FR 28212) throughout its range under the ESA. In the U.S., the polar bear is also protected under the MMPA and the Convention on International Trade in Endangered Species of Wildlife Fauna and Flora (CITES) of 1973.

Polar bears are widely distributed throughout the Arctic where the sea is ice-covered for large portions of the year (Figure 3). The number of polar bears 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 indicates that the estimate of the worldwide polar bear population was made with known uncertainty.

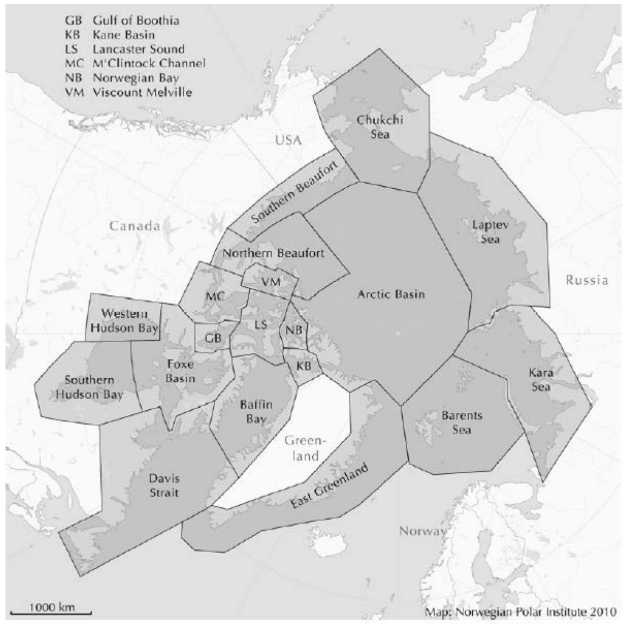

Figure 3. Distribution of polar bear stocks throughout the circumpolar basin (from Obbard et al. 2010).

Life History

For a complete life history of the polar bear, please see 73 FR 28212. We briefly describe the polar bear's life history below.

Most stocks use terrestrial habitat partially or exclusively for maternity denning; therefore, females must adjust their movements to access land at the appropriate time (Stirling 1988, Derocher et al. 2004). Most pregnant female polar bears excavate dens in the fall-early winter period (Harington 1968, Lentfer and Hensel 1980, Ramsay and Stirling 1990). 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 on sea ice (Schliebe et al. 2006: 30). Polar bears give birth in the dens during midwinter (Kostyan 1954, Harington 1968, Ramsay and Dunbrack 1986). Family groups emerge from dens in March and April when cubs are approximately three months old (Schliebe et al. 2006: 30).

Polar bears are characterized by a late age of sexual maturity, small litter sizes, and extended parental investment in raising young, factors that combine to contribute to a very low reproductive rate (Schliebe et al. 2006: 17). Females may give birth for the first time at age four to six depending on local conditions such as seal abundance (Schliebe et al. 2006: 17-18), and litters per female varies from 0.25 to 0.45 per adult female (Schliebe et al. 2006: 19-20). Likewise, litter size and production rate vary geographically with hunting pressure, environmental factors and other population perturbations. Two-cub litters are most common (Schliebe et al. 2006: 19). Body weights of mothers 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, 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).

Sea ice provides a platform for hunting and feeding, seeking mates and breeding, denning, resting, and long-distance movements. Ringed seals are polar bear's primary food source, and areas near ice edges, leads, or polynyas where ocean depth is minimal are the most productive hunting grounds (Durner et al. 2004). While polar bears primarily hunt seals, they may occasionally consume other marine mammals (73 FR 28212); for example, bowhead whale carcasses have been available as a food source on the North Slope since the early 1970s (Koski et al. 2005) and may affect local polar bear distributions. 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; Schliebe et al. 2008). Record numbers of polar bears were observed in 2012 in the vicinity of the bowhead whale carcass "bonepile" on Barter Island; the USFWS observed a minimum, maximum, and average of 24, 80, and 52 bears respectively (USFWS 2012b). The high number of bears on/near Barter Island compared to other areas is thought to be due in part to the proximity to the ice edge and high ringed seal densities (Schliebe et al. 2008), the whale harvest at Kaktovik is lower than that at Barrow or Cross Island. The use of whale carcasses as a food source likely varies among individuals and years. Stable isotope analysis of polar bears in 2003 and 2004 suggested that bowhead whale carcasses comprised 11%-26% (95% CI) of the diets of sampled polar bears in 2003, and 0%-14% (95% CI) in 2004 (Bentzen et al. 2007). Because polar bears depend on sea ice to hunt seals, and temporal and spatial availability of sea ice will likely decline, polar bear use of whale carcasses may increase.

Range-wide Threats, Stressors, and Uncertainties

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). 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). Arctic summer sea ice reached its lowest average extent in 2012 and has declined 13% per decade since 1979 (NSIDC; Figure 2). The loss rate of ice thickness is increasing (Haas et al. 2010), and trends in arctic sea ice extent and area (see http://nsidc.org/arcticseaicenews/faq/#area_extent for explanation of these terms) are negative (-12.2% and -13.5% per decade, respectively; Comiso 2012). Declines in sea ice are more pronounced in summer (Figure 2) than winter (NSIDC 2011a, b). 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 cause 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 affect seal abundances, the polar bear's main food source (Kingsley 1979, DeMaster et al. 1980, Amstrup et al. 1986, Stirling 2002). 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. However, threats to polar bears will likely occur at different rates and times across their range, and uncertainty regarding their prediction makes management difficult (Obbard et al. 2010).

As stated above, the polar bear depends on sea ice for its survival, and loss of sea ice due to climate change is its largest threat worldwide, although polar bear subpopulations face different combinations of human-induced threats (Obbard et al. 2010). The largest human-caused loss of polar bears is from subsistence hunting of the species, but for most subpopulations where subsistence hunting of polar bears occurs, it 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). Because uncertainty exists regarding the numbers of bears in some stocks and how human activities interact to ultimately affect the world-wide polar bear population, conservation and management of polar bears at the world-wide population level is challenging.

Summary
The world-wide polar bear population is likely to face future declines. While polar bears face direct threats from humans, the main threat to their population is loss of sea ice habitat due to climate change.

Pacific Walruses

Abundance and Distribution

The Pacific walrus is a social and gregarious pinniped that mainly inhabits the shallow Continental Shelf waters of the Bering and Chukchi seas (Fay 1982: 7–21, Figure 1 in Garlich-Miller et al. 2011). Pacific walruses are ecologically distinct from other walrus populations, primarily because they undergo significant seasonal migrations between the Bering and Chukchi seas and principally rely on broken pack ice habitat to access offshore breeding and feeding areas (Fay 1982: 279). Waters deeper than 100 m (328 ft.) and the extent of the pack ice are factors that limit distribution to the north (Fay 1982: 23). Unlike other pinnipeds, walruses are not as adapted for a pelagic existence and must haul out on ice or land regularly to rest between feeding bouts (Ray et al. 2006, 76 FR 7634: 7638). Groups may range from fewer than 10 to more than 1,000 animals (Gilbert 1999: 75–84, Ray et al. 2006: 405).

Based on harvest data from the 18th and 19th centuries, Fay (1982: 241) speculated that the pre-exploitation population was at least 200,000 animals. Since then, the population size has likely fluctuated in response to varying levels of human exploitation. Large-scale commercial harvests are believed to have reduced the population to 50,000–100,000 animals in the mid-1950s (Fay et al. 1997: 539). The population size apparently increased rapidly during the 1960s and 1970s in response to harvest regulations that limited take of females (Fay et al. 1989: 4). Population estimates from 1975 and 1990 obtained via aerial surveys ranged from 201,039 to 290,000 individuals. A 2006 survey in Bering Sea pack ice resulted in an estimate of 129,000 walruses (95% CI: 55,000-507,000; Speckman et al. 2011) in the survey area. However, uncertainty exists regarding the accuracy of this estimate because weather difficulties forced the early termination of this survey. Differences in survey methods among years preclude establishing a trend in population estimates (76 FR 7634: 7639, Speckman et al. 2011).

Pacific walruses are highly mobile, and their distribution varies in response to variations in seasonal and inter-annual sea-ice cover. During the January to March breeding season, walruses congregate in Bering Sea pack ice where open leads (fractures in sea ice caused by wind drift or ocean currents), polynyas (enclosed areas of unfrozen water surrounded by ice), or thin ice allow access to water (Fay 1982: 21, Fay et al. 1984: 89–99). Breeding aggregations have been reported southwest of St. Lawrence Island, Alaska, south of Nunivak Island, Alaska, and south of the Chukotka Peninsula in the Gulf of Anadyr, Russia (Fay 1982: 21, Mymrin et al. 1990: 105–113, Figure 1 in Garlich-Miller et al. 2011). As the Bering Sea pack ice deteriorates in spring, most of the population migrates north through the Bering Strait to summer feeding areas over the continental shelf in the Chukchi Sea. However, several thousand animals, primarily adult males, remain in the Bering Sea during summer months, foraging from coastal haulouts in the Gulf of Anadyr, Russia, and Bristol Bay, Alaska (Figure 1 in Garlich-Miller et al. 2011).

Summer distribution in the Chukchi Sea varies annually depending upon the extent of sea ice. When broken sea ice is abundant, walruses are typically found in patchy aggregations over continental shelf waters. Summer concentrations have been reported in loose pack ice off the northwestern coast of Alaska, between Icy Cape and Point Barrow, near Wrangel Island, and along the coast of Chukotka, Russia (Fay 1982: 16–17, Gilbert et al. 1992: 1–33, Belikov et al. 1996: 267–269). In years of low ice concentrations in the Chukchi Sea, some animals range east of Point Barrow into the Beaufort Sea; walruses have also been observed in the Eastern Siberian Sea in late summer (Fay 1982: 16–17, Belikov et al. 1996: 267– 269).

The pack ice of the Chukchi Sea usually reaches its minimum extent in September. In years when the sea ice retreats north beyond the continental shelf, walruses congregate in large numbers (up to several tens of thousands of animals in some locations) at terrestrial haulouts along the northern coast of the Chukotka Peninsula, Russia and northwestern Alaska (Fay 1982: 17, Belikov et al. 1996: 267–269, Kochnev 2004: 284–288, Ovsyanikov et al. 2007: 1–4, Kavry et al. 2008: 248–251). In late September and October, walruses that summered in the Chukchi Sea typically move south in advance of the developing sea ice. Satellite telemetry data indicate male walruses that summered at coastal haulouts in the Bering Sea also move northward towards winter breeding areas in November (Jay and Hills 2005: 197). The male walrus' northward movements appear to be driven primarily by the presence of females at that time of year (Freitas et al. 2009: 248–260).

Foraging Behavior and Diet

Although walruses are capable of diving to depths of more than 250 m (820 ft) (Born et al. 2005), they usually forage in waters 80 m (262 ft) deep or less (Fay and Burns 1988, Born et al. 2003, Kovacs and Lydersen 2008), presumably because of higher productivity of benthic foods in shallow waters (Fay and Burns 1988, Carey 1991, Jay et al. 2001, Grebmeier et al. 2006 a, b). Walruses make foraging trips that range from a few hours up to several days from land or ice haulouts (Jay et al. 2001, Born et al. 2003, Ray et al. 2006, Udevitz et al. 2009). Walruses tend to make more frequent but shorter trips, both in duration and distance, when using sea ice as a foraging platform compared to terrestrial haulouts (Udevitz et al. 2009). Satellite telemetry data from walruses using Bering Sea ice indicated that walruses spent 46 hours on average in the water between bouts of rest on the ice (Udevitz et al. 2009). Male walruses appear to have greater foraging endurance than females, with such excursions from land haulouts lasting up to 142 hours (Jay et al. 2001).

Pacific walruses are primarily benthic foragers. Stomachs of some walrus included over 60 benthic invertebrate genera (e.g., Fay et al. 1984, Bluhm and Gradinger 2008). Early interpretations of walrus stomach contents indicated walrus feed primarily on benthic bivalves; food items other than clams were suggested to be opportunistically consumed while clams were preferred (citations within Sheffield and Grebmeier 2009: 762). However, non-mollusc taxa were likely misrepresented due to digestion and other biases such as sample size (Sheffield and Grebmeier 2009: 766). Examination of fresh stomachs from 1975 to 1985 suggested no difference between the proportion of stomachs containing mostly bivalve and non-bivalve prey (Sheffield and Grebmeier 2009). Bivalves, gastropods (snails and slugs), and polychaete worms occurred most frequently in stomachs from the Bering and Chukchi seas, although bivalves and gastropods occurred more frequently in stomachs from the Bering Sea and Chukchi Sea, respectively, most likely due to their differential variability at these locations (Table 4 in Sheffield and Grebmeier 2009). Male and female walruses consumed essentially the same prey when at the same location (Table 5 in Sheffield and Grebmeier 2009).

Walrus Communication/Hearing

Walrus use airborne and underwater vocalizations for communication (Fay 1982). They likely use underwater sounds to aid in navigation, social communication, and possibly predator avoidance (Garlich-Miller et al. 2011: 70). The communication range for walrus is likely 1-12 kHz (underwater hearing tests at frequencies from 0.125 kHz–32 kHz on one walrus subject found its best hearing ranged from 1–12 kHz with maximum sensitivity occurring at 12 kHz at 67 dB re: 1 μPa, range 63-96 dB re: 1 μPa; Kastelein et al. 2002). Base frequencies for most underwater walrus sounds occur at 400-1200 Hz (or 0.4-1.2 kHz; Richardson et al. 1995). Southall et al. (2007) suggest that auditory injury to pinnipeds in the water may occur at a sound level of 218 db re: 1 μPa. However, exposure to these levels could only occur if a walrus was near (e.g., 1-3 meters) the sound source, and permanent threshold shifts (PTS) to hearing would only occur if it remained near the source for an extended time.

Kastak et al. (1999) suggested that octave band noise levels below about 60 dB SL (sensation level at center frequency) are unlikely to result in a measurable temporary threshold shift (TTS), but found that moderate exposures of 65–75 dB SL reliably produced small amounts of TTS in three pinniped species (4.8 dB in a harbor seal, 4.9 dB in a California sea lion, and 4.6 dB in a northern elephant seal). Recovery to baseline threshold levels was observed in test sessions conducted within 24 hours of noise exposure (Kastak et al. 1999). The Pacific walrus, also a pinniped, may experience similar shifts in hearing.

Range-Wide Threats, Stressors, and Uncertainties

As with the polar bear, the two main stressors for Pacific walruses are loss of sea ice resulting from climate change and subsistence hunting (76 FR 7634, Jay et al. 2011). We discuss these factors and other stressors that may be influencing walruses across their range.

Use of Coastal Haulouts in Summer
While fall migratory aggregations (October-November) have been seen on the Alaskan coast in the past (notably at Cape Lisburne), the summer haulouts are new and have occurred primarily north of Point Lay, presumably due to loss of sea ice (Garlich-Miller et al. 2011: 11). Increased use of coastal haulouts has several consequences. First, increased use of summer land haulouts by adult females and young could result in increased energy expenditures from foraging trips originating from shore and reduced access to preferred feeding grounds (Jay et al. 2011). Second, an increased dependence on coastal haulouts is likely to subject walruses to increased anthropogenic and natural disturbance; exposure to disturbance at coastal haulouts can lead to increased injury and mortality via trampling as walruses stampede into the water following disturbances (76 FR 7634: 7648). Such events have led to the trampling and death of hundreds of walruses in Alaska and thousands in Russia (calves are particularly vulnerable), presumably when herds were disturbed from anthropogenic and predator stimuli (citations within Jay et al. 2011: Kavry et al. 2008, Kochnev et al. 2008, Fischbach et al. 2009). An unusually high number of walruses hauled out and high levels of mortality occurred on the shores of Wrangel Island, Russia (citation within Jay et al. 2011: Ovsyanikov et al. 2008). Predators and human hunters may also indirectly cause calves to be crushed and die by causing stampedes (76 FR 7634: 7648). Third, as they become increasingly dependent on coastal haulouts, walruses will become more susceptible to predation by polar bears (especially on calves) and hunting by humans. Continued loss of sea ice will likely cause walruses to become increasingly dependent on coastal haulouts in the summer and into the fall and early winter.

Reduced Availability of Benthic Prey
Shifts in marine species composition – Traditionally, nutrients from the Pacific flow across the shallow, often ice-covered Chukchi Sea shelf, and this nutrient influx supports high primary production associated with the edge-ice. Because pelagic secondary consumers generally do not directly consume this primary production, it settles to the underlying benthos, becoming available to benthic organisms, and thus generating a rich macrobenthic community in a relatively short and efficient food chain (Grebmeier 1993, Highsmith and Coyle 1992, Grebmeier and Cooper 1995). Therefore, this Arctic ecosystem supports large populations of benthic-feeding marine mammals and birds, including walruses (Oliver et al. 1983, Oliver and Slattery 1985, Hunt 1991, Grebmeier and Harrison 1992, Highsmith and Coyle 1992, Grebmeier and Dunton 2000, Moore 2008, Lovvorn et al. 2009, Moore 2010, Grebmeier 2012). However, recent changes in the timing of sea ice formation and melt coupled with increasing seawater temperatures are thought to have caused shifts in marine species composition; these changes may subsequently cause major changes in the arctic marine ecosystem that will likely affect walrus prey (Grebmeier 2012).

Benthic biodiversity, community composition, and biomass in the Arctic are changing, interpreted in light of climate warming (Bluhm and Grebmeier 2011, Grebmeier 2012). In some Arctic regions communities are changing from longer-lived and slower-growing species to faster-growing more temperate species, indicating increasing water temperatures (Bluhm and Grebmeier 2011). Similarly, several benthic species have extended their range northward, likely due to the warming environment (Bluhm and Grebmeier 2011). As walruses are benthic foragers in this area, such changes will likely affect prey availability for walruses.

Recent ecosystem changes in the northern Bering Sea (e.g., decline in primary production: Lee et al. 2011; declining carbon supply to sediments: Grebmeier et al. 2006b, Grebeimer et al. 2012) are thought to be influencing a shift in benthic biomass and community composition, including declines in dominant clam populations (Figure 4, Doney et al. 2012, Grebmeier et al. 2006b, Grebeimer et al. 2012, Bluhn and Grebmeier 2011), an important food source for walruses. Additionally, a decrease in ice may allow new top predators (i.e., fish; Bluhm et al. 2011: 242) and thus additional species that may compete with walruses for a declining food resources in northern regions (Grebmeier et al. 2010, Grebmeier 2012: 70).

While studies of the changes occurring in the Chukchi Sea are ongoing, known reductions of sea ice during the summer will likely alter the benthic ecosystem and thus affect food resources important to Pacific walruses. If the Bering and Chukchi seas switch from a benthic-dominated to a pelagic-dominated system as currently thought (Greibmeier 2012, Gradinger 2010, Bluhm and Gradinger 2008, Gradinger 2008, Bluhm and Gradinger 2009), walrus may experience food shortages, exacerbated by walruses concentrated close to shore instead of dispersed over ice. Uncertainty, however, makes predicting effects of changes in benthic prey on walrus populations, if they occur at all, difficult (Jay et al. 2011, Sigler et al. 2011, Stabeno et al. 2012).

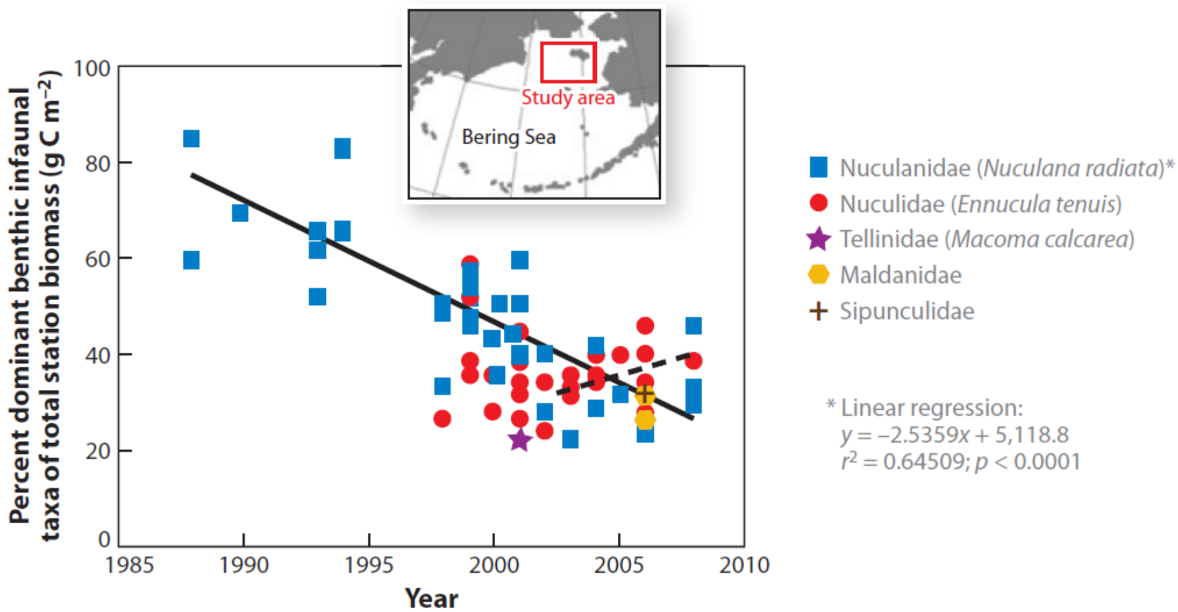

Figure 4. Decline in the dominant nuculanid bivalve, *Nuculana radiata*, at five time-series sites in the northern Bering Sea as part of the Distributed Biological Observatory Initiative (Grebmeier et al. 2010). Beginning in 2003 (dashed line) there is a general, albeit not statistically significant, trend upward in biomass of the smaller nuculid bivalve (*Ennucula tenuis*). From Figure 6 in Grebmeirer et al. (2012).

Acidification of northern waters — Besides increasing ocean temperatures (Bindoff et al. 2007), rising atmospheric CO_2 results in increased oceanic CO_2 uptake; this uptake of CO_2 by the oceans is the predominant factor driving ocean acidification (Dore et al. 2009, Doney et al. 2012). Sea-surface pH has dropped by an estimated 0.1 pH units since the preindustrial era, a 26% increase in acidity over the past 150 years, mostly in the past several decades. Sea-surface pH is projected to decline by an additional 0.2–0.3 pH units over this century (Feely et al. 2009 cited in Doney et al. 2012). Polar regions may be especially sensitive because of a transition to undersaturated conditions for aragonite (a form of calcium carbonate) in surface water within the next several decades (Steinacher et al. 2009 cited in Doney et al. 2012).

Ocean acidification can cause several chemical changes in the ocean: elevated aqueous CO_2 and total inorganic carbon, and reduced pH, carbonate ion, and calcium carbonate saturation states (Doney et al. 2009). By lowering carbonate ion levels and increasing carbonate solubility, ocean acidification is thought to increase the energetic cost of calcification (Fabry et al. 2008). Observations of mostly negative effects of higher CO_2 on calcification rates for several marine invertebrate species support this hypothesis (Kroeker et al. 2009 and Hofmann et al. 2010, cited in Doney et al. 2012). Acidification, therefore, could negatively impact biogenic habitats (e.g., coral reefs, oyster beds) and other food webs (e.g., those of pteropods and other mollusks; Doney et al. 2012). For some taxa, including some mollusks, lower pH reduces the oxygen-binding capacity of respiratory proteins (e.g., hemocyanin), limiting aerobic activity unless acclimation or behavioral changes can compensate for respiratory loss (Doney et al. 2012). Thus, acidification and hypoxia may have synergistic effects (Doney et al. 2012). Immersion in more acidic waters can also disturb the internal acid-base balance of organisms, which in turn can affect several metabolic processes (Portner 2010 cited in Doney et al. 2012) in less physiologically flexible taxa (e.g., sea urchins; Doney et al. 2012).

Because walruses are benthic foragers and ocean acidification may reduce their prey base (e.g., acidification may reduce mollusk populations because they are not able to obtain enough calcium to build shells), ocean acidification may negatively impact the walrus population. However, predicting climate-mediated changes at the community level, such as those caused by ocean acidification, can be difficult due the complexity of food webs (Doney et al. 2012). Thus, potential effects to top predators such as walruses are unclear.

Subsistence Harvest

Pacific walruses have been an important subsistence resource for coastal Alaskan and Russian Natives for thousands of years (Ray 1975), and its harvest is likely to continue into the foreseeable future (76 FR 7634: 7673). The Pacific walrus population has experienced an estimated annual harvest of 3,200 to 16,100 animals from 1960 through 2000 (mean: 6,993; Angliss and Allen 2009: 236). However, harvest estimates have declined, and recent harvest estimates are lower than historical levels, as demonstrated in a lower five-year mean from 2006 through 2010 (4,852 $\pm$ 346 SE; Table 1, Service data) than the full data range. It is not known whether lower harvest levels reflect changes in walrus abundance or hunting effort. Factors affecting harvest levels include the cessation of Russian commercial walrus harvests after 1991, changes in political, economic, and social conditions of subsistence hunters in Alaska and Chukotka, and the effects of variable weather and ice conditions on hunting success (Angliss and Allen 2009).

In 1997, a Cooperative Agreement was developed between the USFWS and the Alaska Eskimo Walrus Commission (EWC) to facilitate the participation of subsistence hunters in activities related to the conservation and management of walrus stocks in Alaska (Angliss and Allen 2009). Specific activities carried out under this agreement have included the strengthening and expansion of harvest monitoring programs in Alaska and Chukotka as well as efforts to develop locally based subsistence harvest regulations (Angliss and Allen 2009). For example, with an interest in reviving traditional practices, advancing the idea of self-regulation of the subsistence harvest, and initiating a local management infrastructure due to concern about changing sea-ice dynamics and the walrus population, the Native Villages of Gambell and Savoonga on St. Lawrence Island formed Marine Mammal Advisory Committees (MMAC) in 2010, and implemented local ordinances establishing a limit of four or five walruses per hunting trip. Walruses that are struck and lost (wounded and not retrieved), as well as calves, do not count against this limit. In addition, there is no limit on the number of trips, so the effectiveness of this ordinance in limiting total harvest is dependent on the total number of hunting trips. Factors such as subsistence needs, social mores, distance of walruses from the village, weather, success of previous trips, needs of immediate and extended family members, and monetary cost of making a trip all play a part in the number of trips a hunting party makes. However, it is rare for hunting captains and crew to make more than two trips in a day (Service, unpublished data). The spring hunting season of 2010 was the first to have the trip-limit ordinances in place and we estimate an average compliance rate of 94 percent from 2010-2012. However, no Statewide harvest quotas exist in Alaska at this time.

Subsistence harvest reporting in the U.S. is required under section 109(i) of the MMPA and is administered through a Marking, Tagging, and Reporting Program (MTRP; 50 CFR 18.23(f)). Compliance rates vary annually with estimates from 60 to 100 percent. Based on data collected through the MTRP, the sex-ratio of the reported U.S. walrus harvest over this period was approximately 1.3 males for every female (USFWS 2013c). The Russian reporting program, administered through the Russian Agricultural Department, has traditionally been conducted by village hunting teams. However, unaffiliated hunting has increased, and no mechanism exists for these individuals to report their harvest, which creates a harvest rate with an unknown negative bias (76 FR 7634: 7634). Additionally, Russians do not adjust harvest estimates for animals struck and lost. The Service uses a 42% correction factor to estimate total subsistence harvest levels that includes struck and lost estimates for both countries (76 FR 7634: 7634). The sex-ratio of the reported Russian walrus harvest was approximately 3.1 males per female (USFWS 2013c).

The Service has adopted the average annual harvest over the past five years as a representative estimate of current harvest levels in Alaska and Chukotka (USFWS 2013c). Harvest mortality levels from 2006 to 2010 are estimated at 3,828-6,119 walruses per year (Table 1) which includes adjusting for animals mortally wounded but not retrieved and required harvest reporting non-compliance rates These harvest levels are approximately 4% of the minimum population estimate of 129,000 animals (Speckman et al. 2011). However, uncertainty regarding the population status and trend makes it difficult to quantify appropriate removal levels (Garlich-Miller et al. 2011). Jay et al. (2011) used Bayesian network modeling to determine that, along with the loss of sea ice, harvest will likely cause a “worsening condition” (i.e., change the walrus population “state” from robust or persistent to vulnerable, rare, or extirpated) for the Pacific walrus population. Harvest is likely to continue at or near current levels, despite population declines in response to loss of summer sea ice (76 FR 7634: 7657).

Table 1. Mean estimated annual harvest (standard error) harvest of Pacific walruses, 2006-2010. Russian harvest information was provided by ChukotTINRO and the Russian Agricultural Department. United States harvest information was collected by the U.S. Fish and Wildlife Service, and adjusted for unreported walruses using a mark-recapture method. Total harvest includes a struck and lost factor of 42% (Fay *et al*. 1994).

Year	Total harvest	United States harvest	Russian harvest
2006	4,022(157)	1,286(91)	1,047
2007	6,119(127)	2,376(74)	1,173
2008	3,828(185)	1,442(107)	778
2009	5,547(654)	2,123(379)	1,110
2010	4,716(308)	1,682(178)	1,053
Five year mean	4,852(346)	1,782(200)	1,032(67)

Other Influences

Walrus Research

As with polar bears, DMA permits walrus research under the MMPA. Currently, the DMA permits researchers to: capture walruses for the purpose of taking tissue samples and attaching satellite telemetry tags; remotely collect tissue samples and attach satellite telemetry to walrus using small harpoon using a crossbow; and survey Pacific walrus population from aircraft and vessels. Typically, DMA allows between one and six deaths annually for each permit (currently, there are three active permits). Permits contain measures to minimize effects of research activities (e.g., to avoid causing stampedes at haulouts).

Disease

Walruses have a variety of viral, bacterial, and parasitic infections. Increased use of terrestrial haulouts may escalate the risk of transmission of disease (Garlich-Miller et al. 2011). For example, beginning in 2011, about 6% (Garlich-Miller et al. 2011) of 300 live walruses presented with unusual ulcerative lesions of the skin of unknown etiology. Most (11/17; 65 %) were sub-adults (2-6 years old), the other six animals were adults (Garlich-Miller et al. 2011). In general, the animals with skin lesions appeared to be otherwise robust, active and healthy (Garlich-Miller et al. 2011). How many may died from this condition is unknown, but at the Point Lay haulout in September 2011, fourteen of nineteen (74%) fresh or moderately decomposed carcasses exhibited these lesions. This outbreak also affected ice seals, which are managed by the National Oceanic and Atmospheric Administration (NOAA). The Service and NOAA deemed this infection as an “Unusual Mortality Event” (UME) in a joint press release dated December 20, 2011, updated on February 1, 2012. http://alaska.fws.gov/fisheries/mmm/walrus/disease_investigation.htm. While the cause of this ailment was unknown, radiation from the March 2011 Fukushima Daiichi nuclear power plant accident in Japan was determined not to be a contributing factor (joint press release on February 17, 2012 http://alaska.fws.gov/fisheries/mmm/walrus/disease_investigation.htm). Despite these unusual mortality events, however, we have no information suggesting that disease poses a population-level threat to Pacific walruses. In addition, the syndrome appears to have run its course and died out. Far fewer seals with the symptoms of the syndrome were observed in 2012 and no walruses with lesions were seen, but as noted, coastal haulouts did not form in the United States or Russia in 2012. The UME on-site coordinators anticipate requesting that the UME working group remove the Pacific walrus from the list of species affected.

Pollution and Contaminants
Oil and gas activities, commercial fisheries interactions, shipping, oil spills, and icebreaking activities do not currently appear to threaten Pacific walruses, and they are not likely to pose a significant risk in the foreseeable future (76 FR 7634: 7671).

Other Activities
Human activity in walrus habitat could impact walruses. For example, noise from aircraft may disturb walruses at haulouts, possibly causing stampedes. Underwater noise, such as open-water seismic exploration that produces underwater sounds (e.g., with air gun arrays), may potentially affect marine mammal hearing and/or communication. Oil and gas activities are a source of human disturbance in walrus habitat. While modeling exercises (Jay et al. 2011, MacCracken et al. 2013) did not identify activities such as ship and air traffic as stressors strongly influencing modeled outputs, this small influence was likely due to the low levels of these activities at that time (Jay et al. 2011, MacCracken et al. 2013).

Summary
The Pacific walrus ranges across the shallow continental shelf waters of the northern Bering Sea and Chukchi Sea, occasionally ranging into the East Siberian and Beaufort Seas. The current estimate of population size is 129,000 (95% CI: 55,000-507,000; Speckman et al. 2011). Factors associated with climate change (i.e., loss of sea ice) and hunting, the main causes of population loss, are likely to continue into the foreseeable future.

Environmental Baseline

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

- Planning area documents and permits issued by BOEM, BSEE, and BLM for Industry-related development;
- The oil and gas lease offerings within the NPR-A managed by the BLM;
- Annual summer programmatic for activities in the NPR-A (e.g., the 2012 summer programmatic BO) for the next five years;
- NPR-A permits for winter travel on- and offshore for non-oil and gas activities for the next five years;
- Research on Federal lands, including research on polar bears and walrus and research funded by the National Science Foundation;
- U.S. Coast Guard operations;

- Passive and preventative deterrence measures;
- Non-federal activities such as snow machine and recreation in the Action Area;
- USACE permits; and
- Incidental and intentional take LOAs previously issued for the incidental take of polar bears and Pacific walruses under the MMPA.

As mentioned previously, most Industry actions would receive a permit from a federal agency (e.g., BOEM, BSEE, BLM, EPA, and/or USACE), and these activities may receive LOAs.

Polar Bears

Typically, most polar bears occur in the active ice zone, far offshore, hunting throughout the year. Bears also spend a limited time on land to feed or move to other areas, although melting sea ice may result in increased numbers of polar bears moving from the offshore ice onto land. Polar bears may also abandon melting sea ice and/or use the terrestrial environment to transit to other areas. If fall storms and ocean currents result in bears coming to land, they may remain along the coast or on barrier islands until the ice returns. Polar bears may travel to land by swimming from remnant ice to terrestrial habitats. Polar bears occasionally den along the Chukchi Sea coast.

Polar bears have recently been documented offshore in the Action Area. National Marine Mammal Laboratory (NMML 2013) aerial surveys recorded 65 sightings of 277 individuals polar bears in the Chukchi and Beaufort seas in all months of the study period (June-October) except June (Figure 5). As some locations were surveyed more than once (e.g., some barrier islands), it is likely that some sightings were repeat observations of the same animal (NMML 2013). Polar bears were observed on the beach or tundra along the coast or on barrier islands from August to October, and were observed on sea ice in September (NMML 2013). They were observed swimming at sea in all months from July to October, generally swimming near sea ice or land (NMML 2013). Exceptions to this include five sightings of five polar bears sighted on 15 Aug, 25 Aug, 5 Sep, 15 Oct, and 18 Oct, that were swimming offshore in open water, with no sea ice in the vicinity of the survey aircraft. These five polar bears were sighted in both seas, from approximately 30-110 km offshore (NMML 2013).

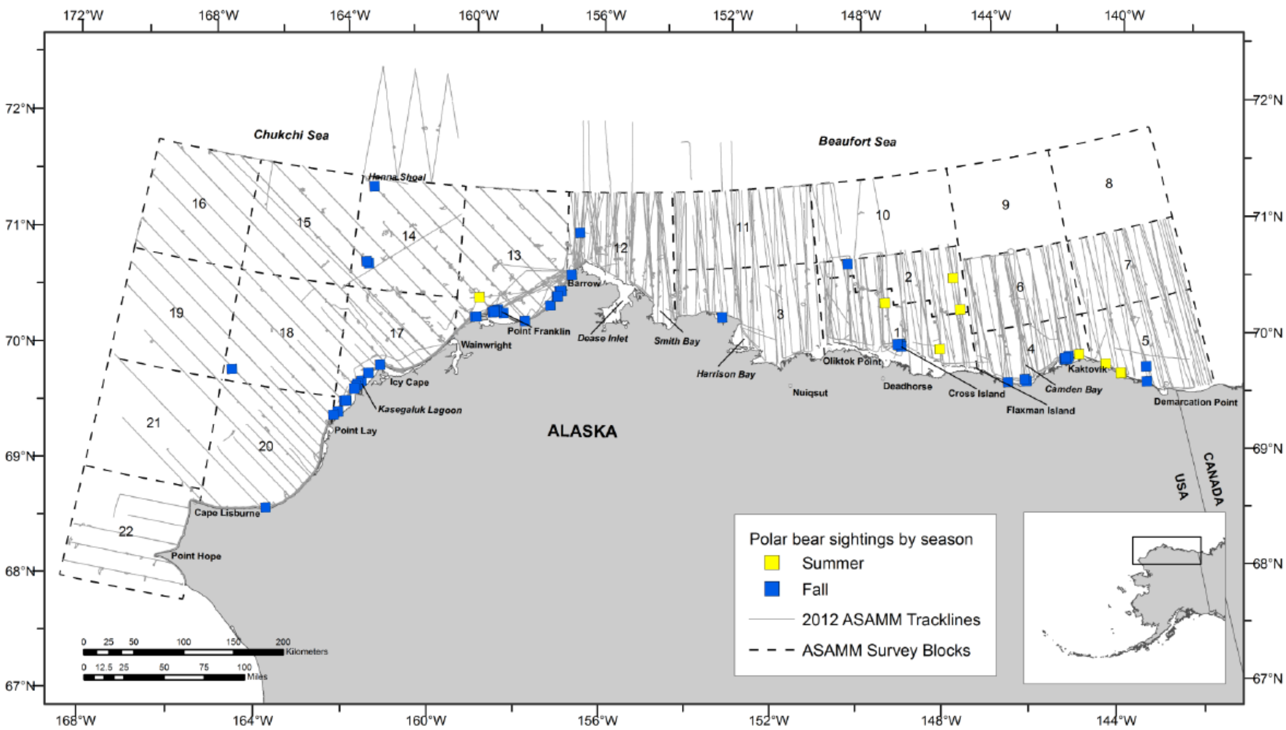

Figure 5. Polar bear sightings by season and transect, circling, and search effort, 2012. Seasons are defined as Summer (June-August) and Fall (September-November). From NMML (2013).

In 2012, MMM issued four LOAs to Industry operators in the Action Area. Industry reported 61 polar bear observations. Of these, eight resulted in behavioral changes classified as Level B MMPA take; seven resulted from vessel-based activities and one from aircraft-based activities. Most takes from vessel-based activities were associated with exploratory drilling operations, while the take from aircraft-based activities was associated with an environmental study.

Polar bears in the Action Area are managed as part of the Alaska-Chukotka (A-C), formerly known as the Chukchi/Bering sea stock, and southern Beaufort Sea (SBS) stocks/populations (Table 2, Figure 6). Therefore, we briefly discuss the status of these two stocks.

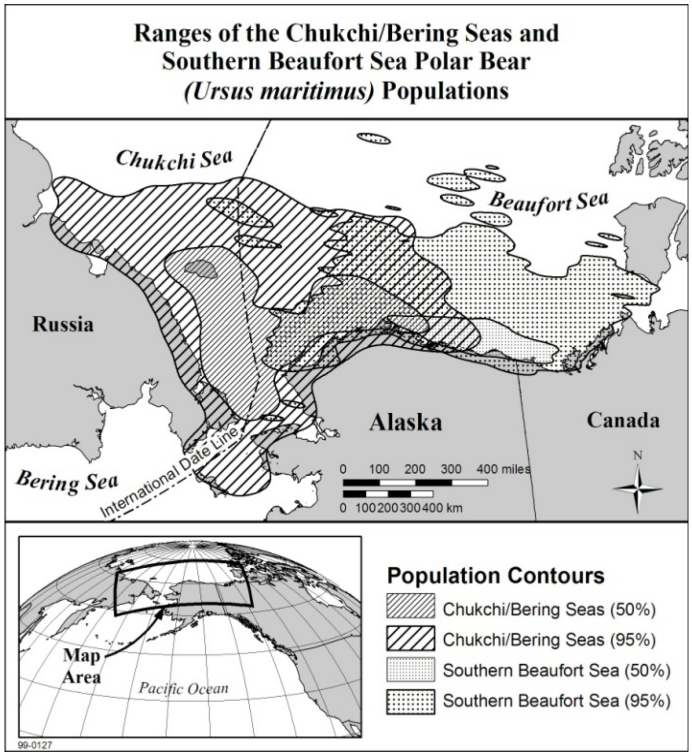

Figure 6. Ranges of Alaska polar bear stocks (73 FR 28212).

Alaska-Chukotka Stock

The A-C stock is widely distributed on the pack ice of the northern Bering, Chukchi, and eastern Siberian seas (Figure 6; Garner et al. 1990, Garner et al. 1994, Garner et al. 1995). The constant movement of pack ice influences the movement of polar bears, and this makes obtaining a reliable population size estimate from mark and recapture studies challenging. For example, polar bears of this stock move south with advancing ice during fall and winter and north in advance of receding ice in late spring and early summer (Garner et al. 1990). Experts estimate the stock to number approximately 2,000 polar bears (Aars et al. 2006). Currently, the Polar Bear Specialist Group (PBSG) classifies the A-C stock as declining based on reported high levels of illegal killing in Russia, continued legal harvest in the United States, and observed and projected losses in sea ice habitat (Table 2, Obbard et al. 2010).

Southern Beaufort Sea Stock

The SBS is distributed across the northern coasts of Alaska, and the Yukon and Northwest territories of Canada (Table 2). Estimates of the stock size of the SBS 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), 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 SBS is now declining, and Regehr et al. (2006) most recently estimated the SBS to be 1,526 (95% CI 1,211-1,841). The status of this stock is listed as 'reduced' by the IUCN (Obbard et al. 2010) and 'depleted' under the MMPA.

Table 2. Status of polar bear stocks using the Action Area.

	#IUCN Polar Bear Specialist Group			
Subpopulation/stock	**Population status**	**Population trend**	**Population size**	***MMPA Status**
Alaska-Chukotka	Reduced	Declining	Unknown	Depleted
Southern Beaufort Sea	Reduced	Declining	1,526 (95% CI: 1,211 – 1,841)	Depleted

The Polar Bear Specialist Group (PBSG) is a research scientist group under the auspices of the International Union for the Conservation of Nature (IUCN); Obbard et al. (2010)
* Marine mammals listed under the Endangered Species Act are given a "depleted" status under the Marine Mammal Protection Act (MMPA).

Threats and Possible Stressors in the Action Area
The two main stressors in the Action Area for the polar bear are loss of sea ice resulting from climate change and subsistence hunting. We discuss these factors and others that may be affecting the population in the Action Area.

Loss of Sea Ice
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 A-C and the SBS 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). Regehr et al. (2010) found that the vital rates of polar bear survival, breeding rates, and cub survival declined with an increasing number of ice-free days/year over the Continental Shelf, and suggested that declining sea ice affects these vital rates via increased nutritional stress.

Subsistence Harvest
Subsistence hunting of polar bears believed to belong to both the Southern Beaufort Sea and Alaska-Chukotka populations occurs within the Action Area (Table 3). Subsistence hunting of polar bears is managed through international and other agreements. Harvest quotas are set by the Inuvialuit-Inupiat (I-I) Council (Canada-Alaska) and the U.S.-Russia Polar Bear Commission (Commission) for the Southern Beaufort Sea and Alaska-Chukotka polar bear populations, respectively.

Southern Beaufort Sea stock – In 1988 the I-I Council established a sustainable harvest quota for the SBS population of 80 polar bears. In 2010 the Council adjusted the quota downward to 70 polar bears (email T. DeBruyn, August 13, 2010) based on a revised population estimate of 1,526 (Regehr et al. 2006; email T. DeBruyn, August 13, 2010). The reported annual average combined (Alaska-Canada) harvest for the SBS population from 2004 to 2009 was 44, and the 2008/2009 reported harvest for Alaskan North Slope villages was 25 polar bears (DeBruyn et al. 2010).

Alaska-Chukotka stock **–** Russia and the U.S. signed the *Agreement between the United States of America and the Russian Federation on the Conservation and Management of the Alaska-Chukotka Polar Bear Population* (Bilateral Agreement) in 2000 which established the U.S.-Russia Polar Bear Commission (Commission) and provides a common legal, scientific, and administrative framework to manage the shared A-C polar bear population; implementing legislation for the Bilateral Agreement was signed in the U.S. on January 12, 2007. Based upon reliable science and Traditional Ecological Knowledge, in June 2010 the Commission adopted an annual take limit of the A-C polar bear population of 19 females and 39 males (DeBruyn et al. 2010). Harvest will be split evenly between Native peoples of Alaska and Chukotka. The Alaskan share of the harvest is 29 polar bears per year, which is below the average of 37 polar bears harvested each year between 2004 and 2008 (USFWS, unpublished data). From 2008 through 2011, reported annual harvest in the Barrow area ranged from 10 to 14 bears (email T. DeBruyn, November 2, 2012).

Table 3. Reported Pacific walrus and polar bear harvest numbers from 2007 to 2011 in Alaska communities. Walrus harvest numbers are not corrected for the Marine Mammal Marking, Tagging, and Report Rule (50 CFR 18.23; MTRP) compliance rates or struck-and- loss estimates. From 78 FR 1942: 1956.

Community	Pacific Walrus	Polar Bear
Barrow	24	49
Gambell	3,069	9
Kivalina	4	3
Kotzebue	2	3
Little Diomede	166	14
Nome	24	1
Point Hope	25	51
Point Lay	10	2
Savoonga	2,918	16
Shishmaref	52	6
Wainwright	71	4
Wales	41	5

Oil and Gas Activities

Most impacts of oil and gas activities are presented in the *Effects* section of this document. However, some oil and gas exploration in the Action Area permitted by other agencies could occur in places for which seasonal restrictions and other mitigation measures may be required (i.e., HSWUA; Figure 1). Effects on polar bears in these areas would be similar to those in other areas.

Polar Bear Research

Currently, ongoing polar bear research takes place 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 injury to individual polar bears targeted in survey and capture efforts and may incidentally disturb those 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 to five, occur during the life of the permit; permits are typically issued for a five year period.

Other Activities
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. Although difficult to quantify, these disturbances are usually temporary and are not spatially very extensive which likely limits the extent and severity of their impact.

Environmental Contaminants
Exposure to environmental contaminants may affect polar bear survival or reproduction. Three main types of contaminants in the Arctic are thought to pose the greatest potential threat to polar bears: petroleum hydrocarbons, persistent organic pollutants (POPs), and heavy metals. No large oil spills from oil and gas activities have occurred in arctic Alaska to date, but this does not demonstrate that the risk of such a spill is zero. 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). Arctic ecosystems are 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 that favor bioaccumulation and biomagnification. Consistent patterns between OC and mercury contamination and trophic status have been documented in Arctic marine food webs (Braune et al. 2005).

Pacific Walruses

Factors affecting walruses in the Action Area are largely similar to those discussed in the *Status* section. Below, we summarize information specific to the Action Area.

Walruses will most likely occur in the Action Area annually during the open water season (June through October) while swimming/foraging, hauled out on ice, and hauled out on land. The distribution of walruses in the eastern Chukchi Sea where exploration activities may occur is influenced primarily by the location and extent of seasonal pack ice. Previous understanding of walrus migrations and use of the Chukchi Sea generally indicated walruses entered the Chukchi Sea in May as leads formed in sea ice north of the Bering Strait and a major ice flaw formed along the northwestern Alaskan coast and northern Chukotka (Fay 1982 and Fay et al. 1984 cited in Jay et al. 2012). In June, an additional flaw formed along the northern Chukotka coast, and migrating walrus moved northward through the flaw zones. From July through August, walruses continued to move northward into the eastern Chukchi Sea, west through Russia’s Long Strait, and northwestward into waters near Wrangel Island (Fay 1982 and Fay et al. 1984 cited in Jay et al. 2012). As sea ice retreated to its most northern extent in September, walruses occurred along the ice edge over the continental shelf (Fay 1982 and Fay et al. 1984 cited in Jay et al. 2012). In years when the ice edge retreated far to the north, walruses in the western Chukchi Sea often hauled out in large numbers on Wrangel Island (Fay 1982 cited in Jay et al. 2012). In October, walruses migrated southward as sea ice formed, and by November, most occurred south of the Bering Strait (Jay et al. 2012).

Recent (2007 to 2011) changes in Arctic sea ice have altered patterns of walrus migration into and use of the Chukchi Sea (Jay et al. 2012; Figure 8). Recently, Jay et al. (2012) observed walruses further north in the Chukchi Sea in June and July (Figure 8) than was previously observed by Fay (1982) and Fay et al. (1984). This coincides with recent increases in open water and lower sea ice concentrations during these months. Furthermore, in September and October of 2009, 2010, and 2011, Jay et al. (2012) documented walruses foraging nearshore in depauperate prey biomass areas instead of in historical offshore areas. The disappearance of sea ice over the continental shelf likely caused walruses to haul out on shore in large numbers, a behavior that did not commonly occur previously (Fay et al. 1984, cited in Jay et al. 2012). Walruses, however, continued to use Hanna Shoal as a core foraging area (Jay et al. 2012).

Hanna Shoal (Figure 1) has shallow water and moderate to high benthic productivity (Grebmeier et al. 2006, Dunton 2013). Walruses forage there in the tens of thousands (Brueggeman et al. 1989, 1990; MacCracken 2012) from June-October; thus, Hanna Shoal is a core area of foraging (Jay et al. 2012; Figure 8). To establish a standard area of reference for Hanna Shoal, the Service delineated the HSWUA using 50% foraging and occupancy utilization distributions (UDs) from Jay et al. (2012) for June through September (Figure 8).

The NMML has documented walruses during aerial surveys in the Action Area within BOEM leases for the past several years (NMML 2010, 2011, 2012, 2013). In 2013, NMML (2013) documented 11,974 individuals in 447 walrus sightings from June to October, all months of the Chukchi Sea portion of the survey, with largest numbers in July and August (Figure 3. Distribution of polar bear stocks throughout the circumpolar basin (from Obbard et al. 2010).). No walrus haulouts on the northwestern Alaskan coastline were observed in 2012 (NMML 2013) although they were observed at coastal haulouts in previous years (e.g., NMML 2010).

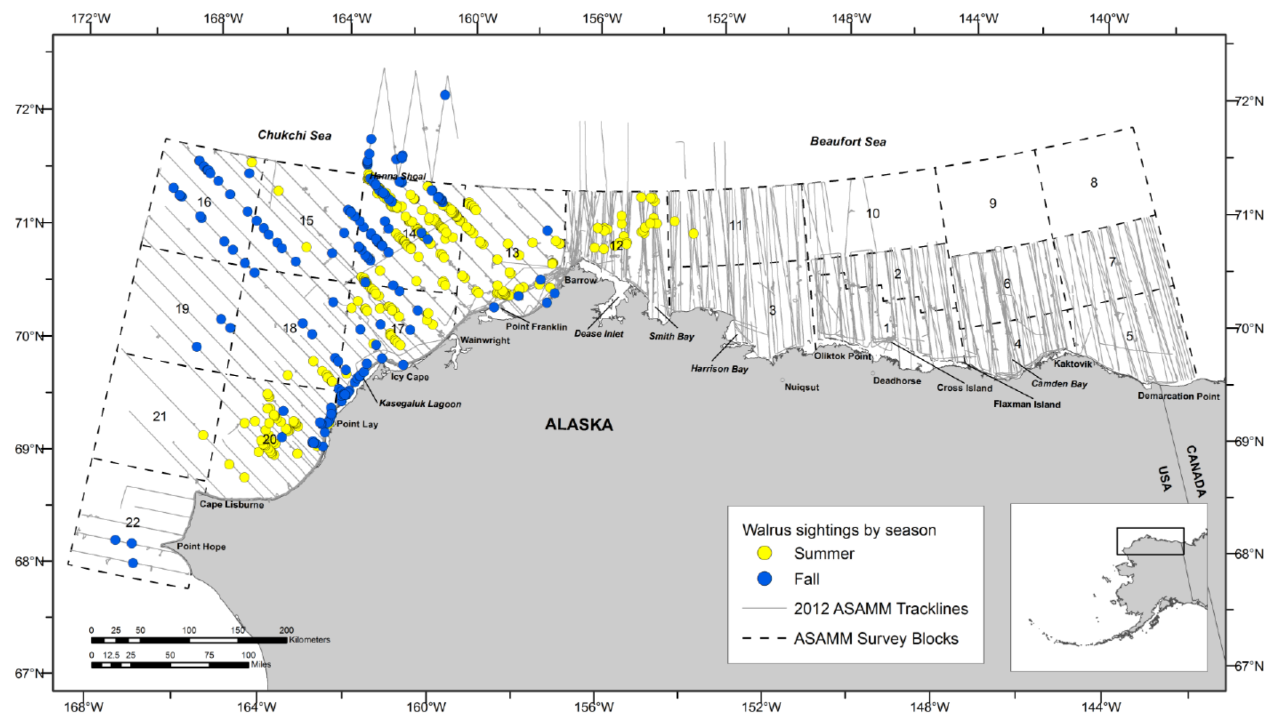

Figure 7. Walrus sightings by season and transect, circling, and search effort, 2012. Seasons are defined as Summer (June-August) and Fall (September-November). From NMML (2013).

Loss of Sea Ice

As previously discussed, loss of sea ice during summer has caused walruses to become increasingly dependent on land-based haulouts. In August of 2007, 2009, 2010, and 2011 the pack ice retreated beyond the continental shelf, and walruses were observed hauled out on land at several locations between Point Barrow and Cape Lisburne in 2007 (Thomas et al. 2009, Clarke et al. 2011). Historical haulouts at Icy Cape have been comprised of a few thousand animals, which is much smaller than recent haulouts near Point Lay. In 2010 and 2011, walruses hauled out about three miles north of Point Lay. In early August 2011 (8-17 August) when sea ice had receded north, walruses started to congregate nearshore; they formed a haulout by mid-August (NMML 2012). In 2011 the haulout formed about a month earlier than in 2010 (MacCraken, USFWS, email pers. comm. 12 January 2012) and remained present into October (6-17October; NMML 2012). In September 2009, a haulout of approximately 2,500-4,000 walruses was documented on land near Icy Cape (NMML 2010, Christman et al. 2010), suggesting a similar scenario to 2007 when pack-ice retreated away from offshore feeding grounds (COMIDA Survey Project: http://www.afsc.noaa.gov/NMML/cetacean/bwasp/flights_COMIDA_1-3.php). A mortality event of 131 animals from unknown causes was documented at the Icy Cape site in 2009; the deaths were due to trampling, most likely due to a stampede due to a disturbance at a large haulout; the haulout was likely caused by the loss of sea ice over the Chukchi Sea continental shelf (Fischbach et al. 2009).

In previous years, other investigators have linked walrus deaths at other Chukchi Sea coastal haulouts to trampling, exhaustion from prolonged exposure to open sea conditions, and separation of calves from their mothers (Fischbach et al. 2009). The potential for mortality events such as that at Icy Cape in 2009 may increase with increasing use of summer haulouts in response to loss of sea ice over the continental shelf. However, haulout monitoring and protection programs have kept disturbances to a minimum and no large mortality events have occurred since 2009.

Subsistence Harvest

On the North Slope of Alaska, reported subsistence harvest numbers vary among villages (Table 3) and years. As summer sea ice in the Chukchi Sea recedes and coastal haulouts form along the Chukchi Sea coast, the increased time walruses spend on land could provide opportunity for additional harvest. However, the EWC passed a resolution in 2008 addressing hunting at these newly forming haulout areas, advising restraint and caution. Haulout monitoring and protection programs have been successful at managing hunting in a way that keeps disturbances to a minimum. About five animals have been harvested from the Point Lay haulout each year, typically as the haulout begins to form and relatively few animals are present.

Oil and Gas Activities

In 2012, MMM issued four LOAs to Industry operators in the Action Area, and Industry reported observations of walruses from vessels and aircraft. From aircraft, Industry reported 34 encounters of 184 walruses, of which nine met the definition of Level B take under the MMPA. From vessels, Industry reported 566 encounters involving 9,809 walrus, of which 164 MMPA met the definition of Level B take. No encounters occurred at terrestrial haulouts in 2012.

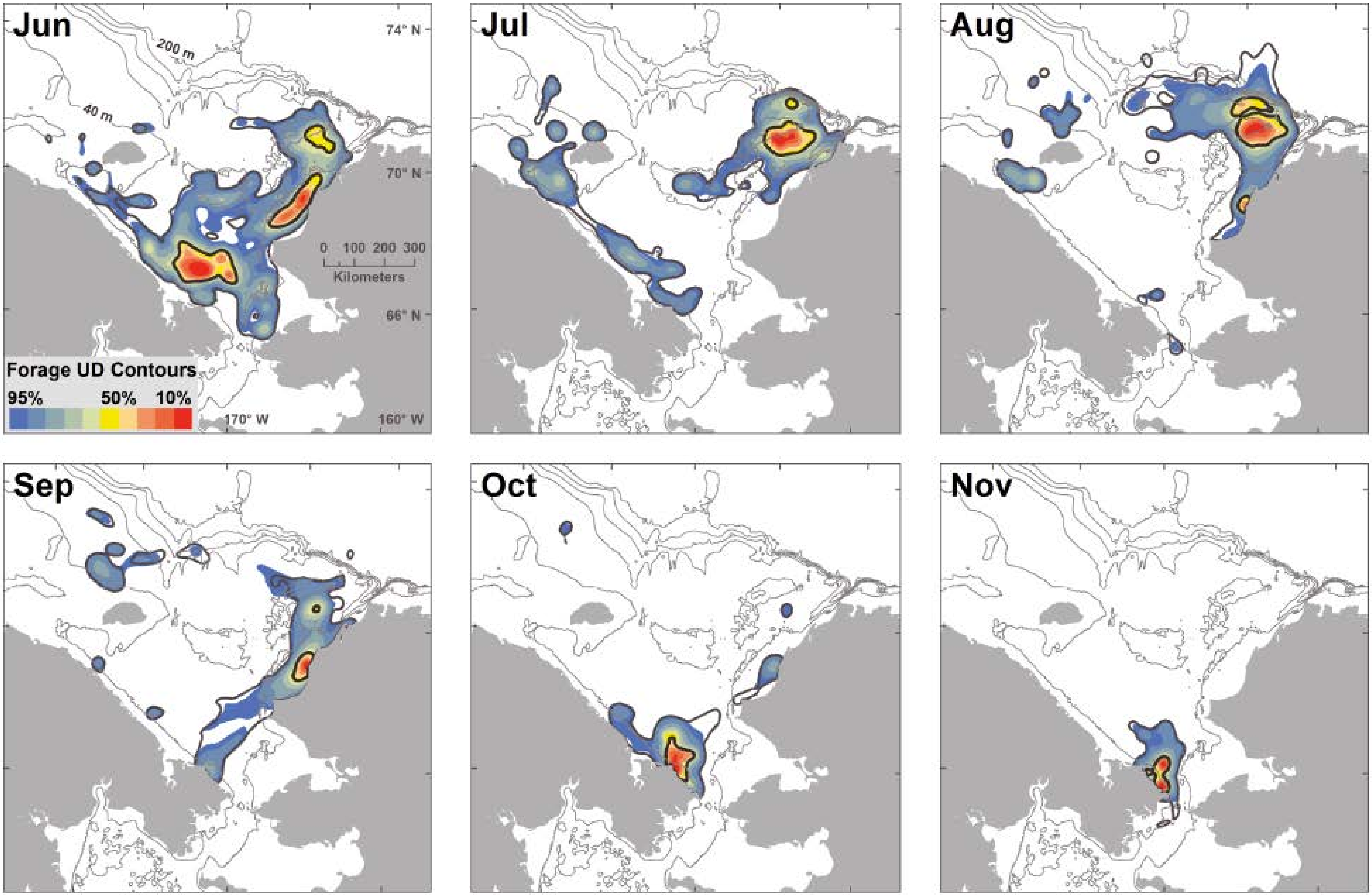

Figure 8. Pacific walrus utilization distribution (UD) estimates for foraging (red to blue ramp contours, 10 to 95% UDs) and occupancy (solid lines, 50 and 95% UDs) in the Chukchi Sea, 2008-2011. From Jay et al. (2012).

Noise

Noise in the Chukchi Sea can originate from natural and man-made sources, and this soundscape can vary with ice coverage. Some sound sources are abiotic (e.g., wind, waves, precipitation, surf, tectonic activity, sea ice) and others biological (e.g., crustaceans, fish, mammals; Bass and Clark 2002, Moore et al. 2012, Roth et al. 2012). Anthropogenic sources of noise in the arctic include vessels (e.g., for shipping and oil and gas activities) and airguns used during seismic surveys (Figure 9). In the Chukchi Sea, seismic activities are likely the greatest contributor to anthropogenic noise, followed by vessels. Airguns used during seismic work were detectable half or more of the time in September and October (Roth et al. 2012). For example, in September and early October 2006 through 2008, mean noise levels were elevated by 2–8 dB above ambient levels from seismic surveys in the Chukchi and Beaufort seas. Airgun signatures varied in intensity, presumably due to the distance between the airgun source and the hydrophone used in this study. The frequency structure of the airgun arrivals also varied, sometimes showing peaks and troughs of energy across the 10–220 Hz band. About 52% of the time airguns had a strong presence (spectral levels elevated by 3–8 dB), and 32% of the time they had a weaker presence (spectral levels elevated by 2–5 dB) relative to periods with no airgun presence (16% of time). To date, limited shipping occurs in the Chukchi Sea due to seasonal constraints such as the formation of winter sea ice.

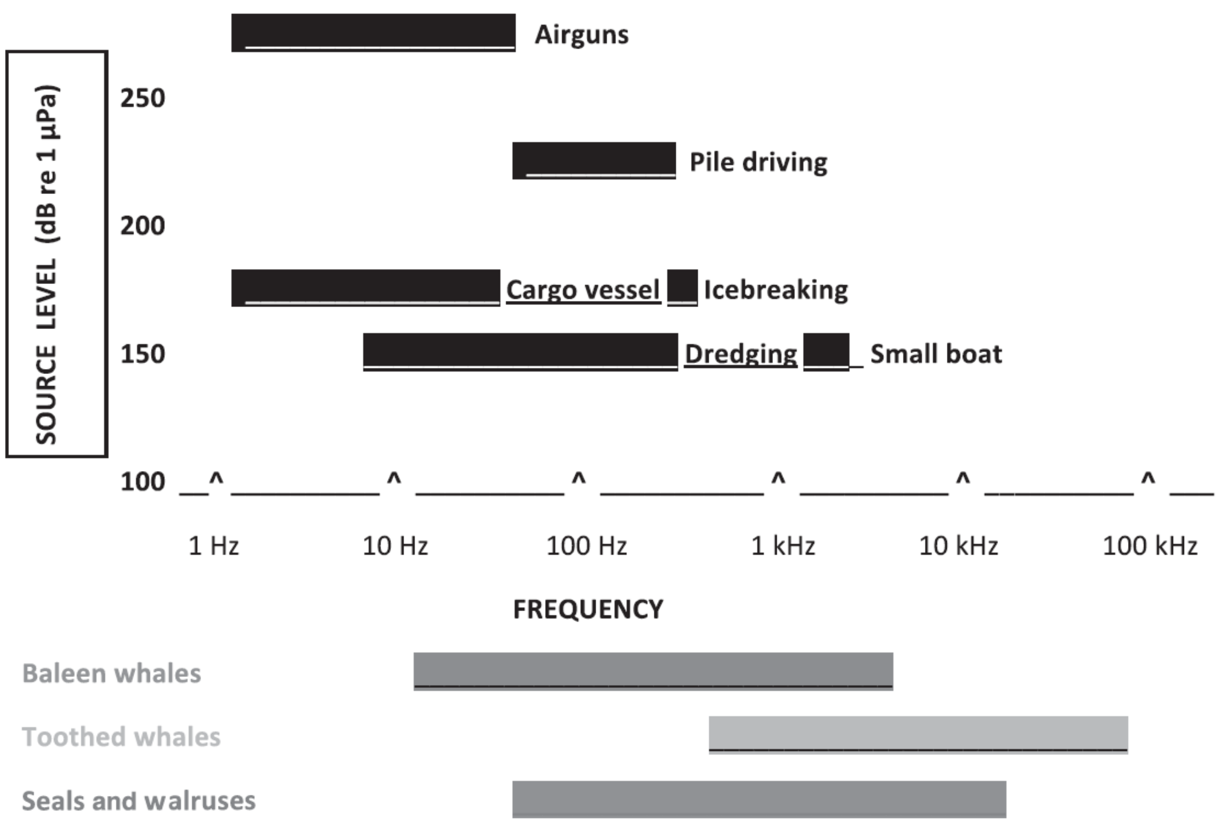

Figure 9. Approximate frequency bands and source levels for common offshore activities in the Arctic (Greene 1995, Hildebrand 2009) relative to frequencies used by Arctic baleen and toothed whales, seals, and walruses. Abbreviations: dB, decibels; Hz, hertz; kHz, kilohertz; µPa, micropascals (from Moore et al. 2012).

Changes in sea ice from climate change will likely affect ambient noise levels in the Action Area. The increase in human activities made possible by loss of sea ice is increasing the level of underwater noise in the Arctic Ocean, including in areas where this level of activity is unprecedented (Moore et al. 2012). While regulation of seismic surveys focuses on minimizing the exposure of marine mammals to acute effects of received sound levels, studies suggest that factors other than received sound level, including the state of animals exposed to different sounds, the type and novelty of a sound, and spatial relations between sound source and receiving animals (i.e., the exposure context) strongly affect the probability of a behavioral response (Ellison et al. 2011). Additionally, the cumulative impacts of sounds from multiple sources may influence the ability of walruses to communicate (Moore et al. 2012). As the Arctic becomes more ice-free, mitigation measures may focus on minimizing chronic as well as acute anthropogenic noise.

Effects of the Proposed Action

This section of the BO analyzes direct, indirect, interrelated and interdependent effects of the proposed Action on polar bears and Pacific walruses.

Direct and Indirect Effects on Polar Bears and Pacific Walruses

As explained previously, the proposed Action, of issuing the Regulations and LOAs issued pursuant to them, does not permit or authorize actual oil and gas activities themselves. The actual oil and gas activities are authorized by other federal agencies and are discussed below in "Effects of Interdependent and Interrelated Actions." With regard the proposed Action, LOAs issued pursuant to the Regulations are required to include mitigation measures to ensure the least practicable impact on the species and the availability of these species for subsistence uses, and requirements for mitigation and monitoring. Thus, the LOAs provide mechanisms for minimizing the effects of oil and gas activities on polar bears and walruses, as well as a venue for monitoring and reporting effects of Industry activities on these species. As a result, the LOAs have the effect of increasing protections and minimizing the impacts of oil and gas activities on polar bears and Pacific walruses. With the limited exception of some marine mammal surveys potentially required for some as LOAs, the issuance of LOAs to Industry would not increase the level of activity in the Action Area.

Interdependent and Interrelated Actions on Polar Bears and Pacific Walruses

Interdependent actions are defined as actions having no independent utility apart for the proposed Action. 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).

We considered all oil and gas activities, which are permitted by other federal agencies such as BOEM, to be interrelated actions. If the oil and gas activities were not permitted under separate authorities, authorization for the incidental take of marine mammals under the MMPA would not be necessary. As a result, we discuss the effects of oil and gas activities for which LOAs may be issued on polar bears and Pacific walruses in the sections below.

Effects of Interdependent and Interrelated Actions on Polar Bears

Typically, most polar bears occur in the active ice zone, far offshore, hunting throughout the year. Bears also spend limited time on land to feed or move to other areas, although melting sea ice may increase the numbers of polar bears moving from offshore ice onto land. Thus, polar bears could occur in the Action Area as they hunt on ice or move to coastal areas. While polar bears usually occur at low densities in the Action Area, their presence makes them susceptible to effects of the proposed Action.

Expected Frequency of Encounters

Human-polar bear interactions could result from exploratory activities receiving LOAs. We expect only occasional encounters between polar bears and activities receiving LOAs because of the spatial separation of most proposed activities and polar bears (most activities will occur when sea ice is absent) and the low density of polar bears in the majority of the Action Area. To illustrate, past seismic operations encountered fewer than 10 polar bears per operation even though surveys took place over thousands of kilometers (78 FR 1942). In 2012, Industry reported 61 polar bear observations in the Chukchi Sea, mostly from vessels associated with an exploratory drilling operation. Thus, we expect polar bear encounters to occur during activities receiving LOAs, with more encounters occurring near the ice edge, ice floes, or barrier islands.

The MMM anticipates that no more than 25 polar bears would be incidentally taken (as defined under the MMPA) annually by Industry activities. While Industry may observe more than 25 bears annually, most of these bears would not be affected and therefore would not meet the definition of take under the MMPA. The majority of these encounters would cause only short-term, minor changes in behavior. However, a small subset of human-polar bear encounters might result in disturbance that causes significant disruption of normal behaviors (e.g., foraging, nursing) which could result in "take" (e.g., harm or the likelihood of injury) as defined under the ESA. We expect very few encounters to result in harm to bears; and, the number meeting the definition of take under the ESA would certainly be less than the number of polar bears meeting the far more inclusive definition of Level B Harassment under the MMPA, which has been predicted to be no more than 25 individuals annually.

Few polar bears den along the Chukchi Sea coast, and the majority of operations would take place outside of the denning season. Therefore, we do not expect Industry operators holding LOAs to encounter polar bear dens during exploratory activities. If an encounter does occur, mitigation measures will likely prevent destruction of dens or early den abandonment. Therefore, we anticipate minor, if any, effects to denning bears from oil and gas activities for which LOAs may be issued. Because we do not expect encounters between Industry and denning bears, our effects analysis below focuses on effects on non-denning bears.

For the purpose of analysis and discussion, we divide the potential effects of industry activities upon polar bears into those caused by land and water operations, aircraft overflights, and seismic operations. We discuss these effects below. Impacts that could result from potential oil spills are discussed separately.

Disturbance Effects on Polar Bears

Disturbance from Land/Water Operations

Activities for which LOAs could be issued may introduce noise or other disturbance from humans on foot and from engines of land vehicles, vessels, ice vehicles, drilling, and ice breaking/ice management. A swimming bear may be able to hear engine noise, and bears on the ice may be able to hear activities near or on the ice, including icebreaking activities. If an encounter between a vessel (not engaged in seismic activities) and a swimming bear occurs, it would most likely result in only a minor disturbance (e.g., the bear may change its direction or temporarily swim faster) as the vessel passes the bear. Icebreaker support for ice breaking or ice management can introduce loud noise into the environment, especially if a ship has to reverse and repeatedly ram thick ice (Davis and Malme 1997). Transient or hunting bears on the ice (e.g., during on-ice surveys) may have their movements or behaviors altered or interrupted by these disturbances.

In extremely rare cases, human- or Industry-bear encounters could cause harm to individual bears. Examples include if a female is separated from her cub(s), or if normal activities such as resting, feeding, or nursing are disrupted to the point that the individuals involved are physiologically impacted. The possibility of harmful impact likely varies with the number, duration, or intensity of the encounters, and the bear's physiological state prior to the encounter. While harm to individual polar bears conceivably could occur, we expect such events to be infrequent because encountering a polar bear at sea occurs infrequently, and polar bears usually have only minor behavioral changes in response to encounters.

Polar bears most likely would respond to disturbances during exploratory activities by moving away from the source of disturbance, whether on foot or by swimming. During 26,029 km of seismic surveys in the Chukchi Sea in 2006, industry encountered four polar bears on/near ice while transiting the survey area (not during surveys; Ireland et al. 2009). Three responded to vessels by moving away. Of four polar bears observed in the Beaufort Sea in 2006 during shallow hazard and site clearance seismic surveys, one was feeding and did not alter its behavior, two (a mother and cub) entered the water, and one was observed already swimming and continued to swim (Funk et al. 2006). In 1990 during marine mammal monitoring during offshore drilling activities by Shell Western E&P, Inc., 25 polar bears were observed on ice between June 29 and August 11. Two approached closer; nine watched, seven slowly moved away, and five did have detectable behavior changes (response was not reported for two). In 2012, four Industry operators received LOAs in the Chukchi Sea area which reported seven responses to their activities by polar bears that meet the MMPA definition of Level B take (about 13% of observed bears). We interpret these reported interactions to indicate that the large majority of Industry- polar bear interactions would result in only minor, short-term behavioral changes.

Disturbance from Aircraft

Extensive or repeated overflights of fixed-wing aircraft for monitoring purposes or helicopters used for re-supply of operations travelling to and from offshore exploratory drilling facilities could disturb polar bears. Such disturbances may increase in coastal habitats as larger numbers of polar bears are present in these areas waiting for ice to return or using the coast for movements. Service polar bear researchers reported that 14.2% to 28.9% of polar bears were observed to change their behavior during aerial surveys conducted at an altitude of 300 feet (Rode 2008, 2009, 2010). Only one Industry-caused Level B take occurred from aircraft in 2012. As with other sources of disturbance, polar bears may respond to aircraft by moving from their original positions (by running, trotting, or walking), or jumping into the water if on land or ice. Fixed-wing aircraft operations during seismic surveys and exploratory drilling operations would likely be limited to marine mammal observation flights that take place at an altitude of 1,500 feet, minimizing impacts on polar bears. The actual number of operations and associated flights would likely be lower than this maximum number. All operators holding LOAs would follow mitigation measures of LOAs. Therefore, given the relatively low number of operations and the size of the Action Area, the low density of polar bears in the Action Area, and mitigation measures, the potential for disturbance of polar bears from aircraft overflights is extremely low. Further, in the event that overflights do encounter polar bears, we expect only minor, short-term behavioral changes that will not result in injury.

Noise from Seismic Surveys

Seismic surveys purposefully introduce sound into the aquatic environment at various acoustical levels. Noise produced by seismic activities could elicit several different responses in polar bears. It may act as a deterrent to bears entering the area of operation or attract curious bears. As polar bears normally swim with their heads above the surface, where underwater noises are weak or undetectable (Greene and Richardson 1988, Richardson et al. 1995), it is unlikely these noises would cause auditory impairment or other physical effects; no evidence exists to support the idea that airgun pulses, such as those used during seismic surveys, cause serious injury or death, even from large airgun arrays. Thus, the effects of seismic surveys on polar bears are likely very similar to general effects of disturbance caused by vessels.

The current Regulations require mitigation measures for seismic survey operations. Marine Mammal Observers are required on seismic vessels, who instruct the vessel's captain to power-down or shut-down airgun arrays if polar bears enter the 190 db ensonification zone. This measure significantly reduces the likelihood that injuries might occur. Given the low number of seismic surveys likely to occur, the tendency for seismic surveys to avoid areas and periods of heavy sea ice (the habitat preferred by polar bears), polar bear swimming behavior, and mitigation measures required by current and likely future LOAs, the Service concludes it is unlikely a polar bear would be exposed to strong underwater seismic sounds long enough for significant impacts to occur.

Mitigation Measures

The above examples suggest that Industry would only occasionally encounter polar bears in the Action Area. Impacts from previous activities were likely reduced in part by mitigation measures required of Industry operators holding LOAs under the Chukchi Sea ITRs. The LOAs contain a number of requirements, including the use of marine mammal observers on vessels. Observers ensure vessels remain at least ½ mile from polar bears observed on land or ice and provide the observation data to the Service. Future Industry activities receiving LOAs would require similar mitigation measures to reduce potential impacts and to report encounters. Therefore, we expect impacts on polar bears from these activities to be similar to the minor, temporary impacts of the past.

Historically, to prevent human-polar bear interactions that may lead to severe injury or killing of a bear in defense of human life, Industry has requested and received authorization to deter polar bears away from acoustic equipment (e.g., seismic streamers) or facilities (e.g., exploratory wells on gravel islands). While deterring a polar bear will affect its short-term behavior, it is unlikely to seriously injure or kill the bear. We discuss deterrence further in the *Interrelated and Interdependent Effects* section.

Oil Spills

Oil spills could occur from two sources during exploration – from operational activities and from blowouts (i.e., a well control incident followed by a long-duration flow) at exploratory wells. Spills from operational activities are likely to be small in volume (less than 1,000 barrels). Spills from well blowouts could entail larger volumes. BLM (BLM 2012) and BOEM (BOEMRE 2011) analyzed the likelihood of spills occurring during exploration in the National Petroleum Reserve-Alaska and in the Chukchi Sea (BLM 2012 and BOEMRE 2011, respectively). Small spills were considered to be very likely to occur. Spills described as large (at least 1,000 barrels) or very large (greater than 150,000 barrels) were considered to be extremely unlikely to occur. For example, BOEM estimated the occurrence and frequency of large and very large spills from exploratory and delineation wells in the Chukchi Sea Program Area at 0.003 (mean spill frequency per 1,000 years) and 2.39×10^{-5} (mean spill frequency per well), respectively (BOEMRE 2011).

Although small spills are likely to occur during exploration, such spills would likely encounter only a very small number of individual polar bears. This is because small spills are likely to be contained or weather quickly, and the density of polar bears across the Arctic Outer Continental Shelf is very low. Moreover, if a small spill occurs and a polar bear is nearby, the bear would likely be hazed to keep it away from the spill area, further reducing the likelihood of impacts to polar bears from the spill. Although deterrence could cause stress and disturbance to individual bears, deterrence events would likely be sufficiently infrequent that large numbers of individuals would not be affected. In short, the likelihood of a polar bear coming into contact with a small spill is very low, and if contact did occur, the effects would be short-term and localized.

With regard to spills greater than 1,000 barrels, such spills are considered to be extremely unlikely to occur during exploration. As a result, they cannot be considered reasonably certain to occur and, thus, do not constitute a direct or indirect effect of the action as defined in the ESA. Accordingly, consideration of the effects of spills greater than 1,000 barrels in volume is beyond the scope of the analysis here.

Deterrence Activities and Intentional Take Authorizations

We considered deterrence activities as interrelated to the proposed Action. As explained previously, federal agencies such as BOEM would provide permits to Industry, and without these permits, impacts on polar bears would not occur. The issuance of LOAs pursuant the proposed Regulations evaluated in this BO would require Industry to develop and implement human-polar bear interaction plans; and these plans would likely include polar bear deterrence actions. Deterrence activities are necessary tools to reduce lethal take of polar bears or potential for injury to personnel. While not all incidental Industry-polar bear encounters that are sufficient to meet the definition of Level B harassment under the MMPA culminate in deterrence actions, virtually all intentional deterrence activities commence with incidental Industry-polar bear encounters that meet the Level B harassment definition. Thus, deterrence actions are a component of an overall strategy for conservation of polar bears in connection with oil and gas activities.

The Service authorizes appropriately trained individuals, through the issuance of LOAs, to intentionally take polar bears for the safety of humans and polar bears pursuant to 101(a)(4)(A), 109(h), and 112(c). Intentional-take LOAs allow trained individuals to use other mechanisms (e.g., use of direct contact ammunition from a firearm) to deter polar bears away from human structures and activities. These deterrence activities are necessary tools to prevent the lethal take of polar bears or potential for injury to personnel. Intentional-take LOAs would allow trained individuals to deter polar bears away from infrastructure and personnel, and would allow the Service to require mitigation measures and ensure training in the use of deterrence methods. Authorized methods of deterrence include acoustic (e.g., car horns), visual (e.g., approaching vehicle), and others such as chemical repellants, electric fences, and less-lethal shotgun ammunition.

Effects of deterrence, as authorized in intentional take LOAs, may fall into three categories. First, acoustic and vehicular deterrence methods (starting a vehicle or revving an engine) would usually have only minor effects and are not likely to result in injury to or death of polar bears (75 FR 61631). However, as described above, trained individuals may use mechanisms (e.g., chemical repellants, electric fences, and firearm projectiles such as bean bags, rubber bullets and cracker shells) to harass or deter polar bears away from personnel and equipment. Cracker shell rounds are meant to explode near a bear to redirect it away from humans; they are not meant to contact the bear. If performed correctly, polar bears deterred using cracker shells usually only experience short-term stress similar to acoustic and visual techniques, most bears would experience only minor, temporary, behavioral changes (e.g., running or swimming away). The second category of effects could occur from direct contact projectiles. Bears deterred using direct contact projectiles such as bean bags and rubber bullets would likely experience stress, short-term pain, and injuries such as bruising. The third category of effects could come from inadvertent misuse of firearm projectiles or unpredictable adverse outcomes from approved deterrence methods. In extremely rare circumstances, if performed incorrectly, use of any type of projectile could cause severe injury or death. For example, during a deterrence event associated with an LOA in August 2011, a polar bear was killed when a cracker shell round was mistaken for a rubber bullet (USFWS data).

Most deterrence events would not entail using direct contact projectile rounds (i.e., bean bags or rubber bullets; Table 1). For example, from 2006 through 2010, the entire North Slope oil and gas industry reported sightings of 1,414 polar bears, of which 209 (15%) were intentionally harassed or deterred (C. Perham, pers. communication, email, July 12, 2011). During those events, only 0-5 polar bears were deterred with bean bags and 0-1 with rubber bullets annually. We expect that, while some deterrence actions may be needed on shore, most Industry activities would take place from vessels in open water, which would limit the need for polar bear deterrence. Based on significant history with deterrence actions, we anticipate fewer than 5 polar bears would be subjected to direct contact projectiles annually, with less than one lethally impacted annually. We note that although deterrence activities result in some negative impacts to individual bears on rare occasions, the use of deterrence actions effectively reduces the need for lethal take of polar bears, and thus as a whole contribute to the conservation of polar bears.

Conclusion

While polar bears may be encountered during the proposed Action and Industry activities for which LOAs may be issued, we expect the outcome of most encounters to be minor, short-term changes in behavior. In extremely rare cases, mostly resulting from deterrence actions, human- or Industry-bear encounters could cause harm to individual bears.

Effects of Interdependent and Interrelated Actions on Pacific Walruses

Expected Frequency of Encounters

Industry will likely encounter walruses during the open-water season. Each encounter at sea could range from a few individuals to concentrations of over 1,000 animals. In 2012, for example, four Industry operators reported encountering a total of approximately 10,000 walrus in the Chukchi Sea. The frequency of encounters likely will depend on the location activities relative to ice floes and the summer ice edge.

Activities for which LOAs may be issued may disturb walruses. The responses of walruses to disturbance stimuli are variable, but generally, individual walruses that are hauled out are more sensitive to disturbance than swimming individuals. To reflect the differential response of walruses to disturbance, we have organized this analysis into effects to walruses swimming in open water and those hauled out on land, and ice. Impacts that could result from a potential oil spill are discussed separately.

Effects of Open-water Activities on Walruses

General Noise Disturbance

Noise typically generated by Industry activities (not including seismic activities), whether stationary or mobile, has the potential to disturb walruses. They react variably to noise from vessel traffic; however, qualitative reports suggest that low-frequency diesel engines cause fewer disturbances than high-frequency outboard engines. Underwater noise from vessel traffic and drilling operations may ‘‘mask’’ ordinary communication among individuals. Aircraft such as helicopters also create noise that may disturb swimming walruses. Noise may disturb walruses via displacement from preferred foraging areas, increase stress and energy expenditure, interference with feeding, and masking of communications (76 FR 13454: 13466). However, walruses previously exposed to noise or those intent on staying in a particular area (e.g., to forage) may tolerate noise. Additionally, only a small proportion of Industry-walrus encounters are likely to elicit noticeable behavioral response. In 2012, only 5% of aircraft encounters and 2% of vessel encounters resulted in behavioral changes sufficient to meet the definition of Level B harassment under the MMPA. LOAs issued under these Regulations would require mitigation measures to reduce noise impacts on walruses, such as flight altitude and vessel setback requirements.. The potential for severe or long-term harm to swimming walruses (e.g., permanent separation from a group) will be minimized through mitigation measures in LOAs.

Noise from Seismic Activities

Seismic operations introduce substantial levels of noise into the marine environment. Although the hearing sensitivity of walruses is poorly known, source levels associated with marine 3D and

2D seismic surveys are thought to be loud enough to cause injury through temporary or permanent hearing loss in other pinniped species. Therefore, it is possible that walruses within the 180-decibel safety radius for seismic activities could sustain shifts in hearing thresholds. LOAs issued under these Regulations would require mitigation measures to reduce noise impacts on walruses, such as the power down or shut down of airgun arrays if walruses are detected within the prescribed safety zone of seismic operations. The number of individual walruses affected by seismic operations may be lower than the number of instances that meet the definition of Level B harassment under the MMPA because some individual walrus are may be taken multiple times.

Aerial surveys and vessel-based observations of walruses were carried out in 1989 and 1990 to examine the responses of walruses to drilling operations at three Chukchi Sea drill prospects (Brueggeman et al. 1990, 1991). Aerial surveys documented several thousand walruses in the vicinity of the drilling prospects; most animals (> 90 percent) were closely associated with sea ice. The observations demonstrated that: (1) walrus distributions were closely linked with pack ice; (2) pack ice was near active drill prospects for short time periods; and (3) ice passing near active prospects contained relatively few animals. Thus, the effects of the drilling operations on walruses were short-term, temporary, and in a discrete area near the drilling operations, and the portion of the walrus population affected was small.

Between 2006 and 2011, monitoring by Industry during seismic surveys in the Chukchi Sea resulted in 1,801 observed encounters involving approximately 11,125 individual walruses (Table 4). We classified the behavior of walruses associated with these encounters as: (1) no reaction; (2) attention (watched vessel); (3) approach (moved toward vessel); (4) avoidance (moved away from vessel at normal speed); (5) escape or flee (moved away from vessel at high rate of speed); and (6) unknown. These classifications were based on MMO on-site determinations or their detailed notes on walrus reactions that accompanied the observation. Data typically included the behavior of an animal or group when initially spotted by the MMO and any subsequent change in behavior associated with the approach and passing of the vessel. This monitoring protocol was designed to detect walruses far from the vessel and avoid and mitigate take, not to estimate the long-term impacts of the encounters on individual animals.

Table 4. Summary of Pacific walrus responses to encounters with seismic survey vessels in the Chukchi Sea Oil and Gas Lease Sale Area 193 in 2006-2010 recorded by marine mammal observers.

Walrus reaction	Number of Encounters	Number of Individuals	Mean(SE) individuals/encounter	Mean(SE) meters from vessel
None	955	7,310	8(1.7)	710(24)
Attention	285	1,419	5(1.9)	466(29)
Approach	47	89	2(0.3)	395(50)
Avoidance	435	940	2(0.1)	440(26)
Flee	47	170	4(0.9)	382(56)
Unknown	32	1,197	37(29.0)	558(78)
Total or overall mean	1801	11,125	6(1.1)	582(15)

*standard error

Based upon the transitory nature of seismic vessel activities, past responses of walruses to these activities, and required mitigation measures, we anticipate that most walruses would experience only short-term, non-injurious behavioral responses to seismic activities receiving LOAs under the proposed Regulations. Therefore, it is possible that walruses within the 180-decibel safety radius for seismic activities. However, occasionally some walruses may sustain shifts in hearing thresholds if they enter the 180+ dB ensonification zone. We anticipate injury from seismic noise might occur to low numbers of the walrus population in the Chukchi Sea. Thus, although seismic activities may result in some non-lethal, individual-level effects, they are not expected to cause population-level effects.

Impact to Benthic Prey

Walruses feed primarily on benthic invertebrates. Some dredging, well-drilling, core sampling, and environmental studies of the benthos may take place as part of the proposed Action, and this could bury, displace, or kill the less mobile benthic invertebrates upon which walruses feed. However, the area disturbed by these activities is expected be extremely small relative to the extensive size of the Action Area. Therefore, the effect of the proposed Action on walruses from potential disturbance of benthic prey is expected to be very small.

Effects of Industry Activities on Hauled-out Walruses

Disturbance from Mobile Sources

Support vessels and/or aircraft servicing seismic and drill operations and vessels conducting environmental studies may encounter aggregations of walruses hauled out on sea ice. The sight, sound, or smell of humans and machines could potentially displace these animals from ice haulouts. Walruses are most likely to occur along the edge of the pack ice, and most barges and vessels associated with Industry activities travel in open-water and avoid large ice floes or land where walruses are likely to be found. Therefore, ice management and aircraft flying near ice edges or other haulout areas are the activities most likely to disturb hauled-out walruses.

Reactions of hauled-out walruses to aircraft vary with range, aircraft type, and flight pattern, as well as walrus age, sex, and group size (78 FR 1942: 1960). Disturbance can cause walrus groups to abandon land or ice and flee *en mass* to the water in a “stampede” that can result in trampling injuries or cow-calf separations, both of which are potentially fatal (Garlich-Miller et al. 2011); these events are likely much more severe when walruses are on land than when on ice floes. The implications of interrupting normal behaviors, including resting, varies with an animal's physiological and reproductive condition, so some individuals, including cows with calves, are likely more vulnerable to disturbance (Garlich-Miller 2011). Although the response to noise varies, walruses are probably most susceptible to disturbance by fast-moving and low-flying aircraft (< 457 m above ground level). Fixed-winged aircraft are less likely to elicit a response than helicopter overflights (78 FR 1942: 1960). Walruses are particularly sensitive to changes in engine noise and are more likely to stampede when planes turn quickly or circle overhead (78 FR 1942: 1960). Calves and young animals at the perimeter of the haulouts appear particularly vulnerable to trampling injuries (USFWS 2013b: 41). Males tend to be more tolerant of disturbances than females, individuals tend to be more tolerant than groups, and females with dependent calves are the least tolerant of disturbances (USFWS 2013b: 70). Large aggregations of walrus hauled out on land are especially sensitive to disturbance, and incidences of trampling injuries and cow-calf separations are more likely to increase with group size (Garlich-Miller 2011). Mitigation measures included in LOAs (e.g., minimum altitude and distance requirements from hauled out walruses) will minimize potential effects of disturbance from aircraft. Because we expect that Industry will employ mitigation measures when walruses are encountered, and these measures will be effective at minimizing potential impacts, we expect that effects of these activities on walruses hauled out on ice or land will be minor.

Ice management. Some offshore drilling and seismic operations may involve the use of ice-hardened vessels to manage incursions of sea ice. Ice management operations have the greatest potential for creating disturbances because walruses are more likely to be encountered in sea ice habitats, and ice management operations typically require the vessel to accelerate, reverse direction, and turn rapidly thereby maximizing propeller cavitations and producing significant noise.

Previous monitoring efforts in the Chukchi Sea suggest that icebreaking activities can displace some walrus groups up to several kilometers away; however, most groups of hauled-out walruses showed little reaction beyond 800 m (0.5 mi). The monitoring efforts revealed that effects of drilling operations on walruses were limited in time, geographical scale, and only exposed a small proportion of the total Pacific walrus population (76 FR 13454: 13467). We expect that walruses hauled out on the ice in the Action Area will react similarly, and that mitigation measures required in LOAs will minimize effects of drilling and ice management operations.

Industry infrastructure as attractants. Walruses could be attracted to and haul out on equipment (e.g., transoms of vessels) or infrastructure in the offshore environment. Other marine pinnipeds have entered the "moon pools" (center of drilling vessel that houses the drill) of drilling vessels, and walruses are also capable of entering this area of the vessel. If walruses are attracted to structures, they may subsequently be frightened by the presence of human activity, which can cause a change in behavior from resting to swimming or deserting the area. Alternatively, orphaned calves (caused by natural events) can exhibit curious behavior. They may attempt to haul out on stationary vessels, swim up to vessels, or follow them. Measures included in LOAs are designed to minimize the effects of these types of interactions. Therefore, we expect disturbance of walruses attracted to Industry infrastructure to occur rarely, and when it occurs, will have only a minor effect on the walruses in the Action Area.

Oil Spills

Small spills are likely to occur from oil and gas activities for which LOAs may be issued. In the terrestrial and marine environment, small spills would most likely consist of refined oils/fuels used in routine operations. Small spills in the terrestrial environment are extremely unlikely to reach the coast or the marine environment; small terrestrial spills are therefore unlikely to affect walruses. For marine spills, the likelihood of walruses contacting oil is proportional to the volume and spatial extent of the oil. For small spills, then, the likelihood of exposure, and the number of walruses likely to contact oil if exposure does occur, are low. Walruses may experience irritation of the skin, eyes, etc., but lethal impacts are not expected when spill volumes are low. Therefore, we expect small spills to have minor, if any, impact on walruses.

With regard to spills greater than 1,000 barrels, such spills are considered to be extremely unlikely to occur during exploration. As a result, they cannot be considered reasonably certain to occur and, thus, do not constitute a direct or indirect effect of the action as defined in the ESA. Accordingly, consideration of the effects of spills greater than 1,000 barrels in volume is beyond the scope of the analysis here.

Deterrence Activities and Intentional Take Authorization

Walrus deterrence activities associated with non-Industry and Industry activities may occur in the Action Area and would be permitted pursuant to 101(a)(4)(A), 109(h), and 112(c) of the MMPA, the same regulations that MMM uses to permit intentional take of polar bears. Occasionally, walruses may haul out on vessel transoms or they may enter "moonpools" of drilling vessels. In these cases, walruses may need to be deterred if personnel need access to these areas, or for the safety of the animal. Deterrence may simply require workers to gently nudge walrus (e.g., with a pole) or shout/move towards the animal. Additionally, hauled out walruses on ice that threatens the safety of vessels may need to be deterred during ice management. Likely responses of walruses in these scenarios mentioned above would be short-term behavioral changes (e.g., walruses would swim away) that would affect very few individuals.

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 are not considered in this section because they will require separate consultation under the ESA. In addition to the federally-controlled OCS area, the Action Area is comprised of State waters and adjacent terrestrial areas, the majority of which are federally-managed by the BLM. The following activities are included in this assessment of potential cumulative impacts:

Further Oil and Gas Development

Further oil and gas development, whether 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 under the ESA.

Natural Gas Line

While much of a proposed natural gas 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

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, power lines, communication towers, landfills, and gravel pits and these activities may impact listed species. The scale of impacts will depend not only on the amount of growth, but the location as it relates to habitat.

As the human population grows, so does the probability of human-polar bear encounters and likely subsistence harvest of polar bears.

Commercial Fishing

Reduction in the extent and duration of sea ice may increase the potential for commercial fishing, but the likelihood and magnitude of these activities are unknown at this time. Future commercial fisheries in the Action Area would be adequately be managed by the North Pacific Fisheries Management Council and the National Marine Fisheries Service (NMFS), and the issuance of regulations would require section 7 consultations. These activities, therefore, are not considered cumulative effects. Under the Arctic Fisheries Management Plan, NMFS currently has prohibited all commercial fishing in the Arctic.

Increased Marine Traffic

As the extent of arctic sea ice in the summer has declined, and the duration of ice free periods has increased, interest in shipping within and through arctic waters has increased (Brigham and Ellis 2004). Ships operating, or that could operate in the area, include military vessels, pleasure craft, cruise ships, barges re-supplying communities, scientific research vessels, and vessels related to resource development such as oil, gas, and minerals. The potential increase in the number of vessels operating in arctic waters has been matched by an increase in coastguard activities. The U.S. Coast Guard conducted a number of major exercises in Arctic waters in recent years for which section 7 consultations were conducted.

Increased marine traffic could impact listed and candidate species through disturbance, and more significantly from an accidental fuel spill. However, we have no data on the number of vessels that may operate in these waters in the future and the magnitude of potential risk they pose. In addition, all international commercial shipping currently taking place utilizes the Northern Sea Route in Russian waters, not the Northwest Passage that includes U.S. waters. As more information becomes available, we will amend the environmental baseline and consider these impacts in future section 7 consultations.

Increased Scientific Research
Scientific research across the Arctic is increasing as concern about effects of climate change in the arctic grows. While research is often conducted by universities and private institutions, many activities are funded by the National Science Foundation or operate from U.S. Coast Guard ice breaking vessels and are therefore considered in other section 7 consultations.

Subsistence Harvest
Subsistence harvest of polar bears and walrus are expected to continue in the Action Area in the future. The Service will continue to work with Native groups and others nationally and internationally using the mechanisms described in the *Environmental Baseline* to manage subsistence harvest of these species.

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 listed species (such as oil and gas development and community growth) will require consultation under the ESA.

Conclusion

Section 7(a)(2) of the Act requires Federal agencies to ensure that their activities are not likely to: (1) jeopardize the continued existence of listed species; or (2) result in the destruction or adverse modification of designated critical habitat. In addition, it is Service policy to consider candidate and proposed species when conducting consultation on actions of Service programs. In this case, we have evaluated the proposed action upon polar bears and Pacific walruses to ensure that their continued existence would not be jeopardized.

As explained previously, the proposed Action of promulgating regulations and issuing LOAs for the incidental take of marine mammals under the MMPA does not authorize the underlying oil and gas activities themselves Rather, LOAs require mitigation measures to ensure that impacts to polar bears and walruses from Industry activities are minimized. As a result, the effects of the proposed Action alone are largely beneficial to polar bears and walruses. However, in the interest of ensuring that all relevant effects are captured in our analysis here, we base our conclusion on a comprehensive consideration of the collective effects of the proposed Action, all interdependent and interrelated effects (, including oil and gas activities for which LOAs may be issued), and cumulative effects, when considered against the environmental baseline and status of the species.

Polar Bears
As described previously, we identify a number of mechanisms of potential impacts to polar bears, including disturbance, deterrence and small oil spills. While polar bears may be encountered during Industry activities during the proposed Action, we expect the outcome of these encounters would be non-lethal, minor, short-term changes in behavior. These changes in behavior would meet the definition of Level B harassment under the MMPA, and are estimated to number up to 25 per year. Importantly, however, the vast majority of MMPA takes are not expected to compromise the fitness of the individuals involved, and thus would not influence population-level reproduction, recruitment, or survival.

In some cases (estimated at 15% of polar bear sightings from 2006-2010), intentional harassment or deterrence actions would be required to prevent escalation of Industry-polar bear interactions and minimize the risk of deleterious outcomes for workers or bears. Although not technically part of the proposed Action, we have considered the effects of these deterrence actions as interdependent and interrelated effects of Industry activities associated with the proposed Regulations. Based on several decades of monitoring deterrence actions by Industry personnel pursuant to past Regulations, we anticipate fewer than 5 polar bears would be subjected to direct contact projectiles annually, with less than one killed annually.

We also anticipate that small spills of oil or chemicals within the Action Area may occur. If polar bears contact oil, they may become injured by it. Most spills would be so small that the chance of a polar bear contacting the spilled chemicals is very small. Additionally, given disturbance associated with cleanup and deterrence implemented during spill response, effects related to contacting chemicals would be limited to very low numbers of polar bears.

Collectively, we expect that up to 25 polar bears annually would experience non-lethal, minor, short-term behavioral changes resulting from disturbance, none of which would entail serious injury or death, and no population-level effects to reproduction, recruitment or survival are expected. Intentional harassment and deterrence actions may result in an extremely small number of additional bears (< 5) being hit with direct contact rounds which would cause bruising or other injuries, but lethal effects are not expected. There is a very small risk of exposure to oil or other spilled chemicals, but lethal effects are not expected.

After reviewing the current status of the polar bear the environmental baseline, the effects of the action and interdependent and interrelated effects, documented impacts of past Industry activities on the species, data provided by monitoring programs in the Chukchi Sea gathered from recent studies and requirements in past Regulations, and cumulative effects, it is the Service's biological opinion that the proposed action is not likely to jeopardize the continued existence of the polar bear by directly or indirectly reducing appreciably the likelihood of both survival and recovery of the species in the wild by reducing the reproduction, numbers, or distribution of that species.

Pacific Walruses

As detailed in the *Effects of the Action* section, we identify several potential mechanisms of impacts from Industry activities to walruses (disturbance at terrestrial haulouts, noise from seismic operations, small oil spill in the marine environment). However, a number of factors would reduce potential exposure of walruses. First, authorized activities near coastal haulouts will be very limited. Also, we expect that most walruses in the subset of the overall population in the specified geographic region would be closely associated with broken pack ice during the open-water season. This would limit the exposure of walruses to exploratory operations, as we expect Industry operations to avoid these areas of broken ice cover in order to avoid damaging their equipment. Furthermore, during the open-water season, walruses could also occupy coastal haulouts when ice concentrations are low in offshore regions. Moreover, it is possible that additional mitigation measures, such as seasonal restrictions, rerouting vessels, or reduced vessel traffic may be required for LOAs issued for activities in the HSWUA. Industry requests for incidental take authorization in the HSWUA during seasons of high walrus use would be considered on a case-by-case basis and increased monitoring and mitigation measures may be applied. Thus, based upon our review of the best scientific information available, we conclude that Industry activities would impact a relatively small number of walruses both within the specified geographical region and at the broader population level. The information considered includes the range, distribution, and habitat use patterns of Pacific walruses during the operating season, the relatively small footprint and scope of authorized projects both within the specified geographic region and on a broader scale within the known range of this species during the open-water season. We also considered proposed monitoring requirements and adaptive mitigation measures intended to avoid and limit the number of takes to walruses encountered through the course of authorized activities. Thus, we do not expect these effects from Industry activities will collectively cause population-level impacts.

After reviewing the current status of the Pacific walrus, the *Environmental Baseline* for the Action Area, the *Effects of the Action*, documented impacts of Industry activities on the species; data provided by monitoring programs in the Chukchi Sea gathered from recent studies and requirements in past Regulations, and cumulative effects, it is the Service's biological opinion that the Proposed Action is not likely to jeopardize the continued existence of the Pacific walrus by directly or indirectly reducing appreciably the likelihood of both survival and recovery of the species in the wild by reducing the reproduction, numbers, or distribution of that species.

Comprehensive Ongoing Consultation Process for Oil and Gas Activities in the U.S. Arctic

This consultation evaluating the effects of the five-year ITR regulations and associated LOAs is one in a series of consultations concerning oil and gas activities for OCS waters in the U.S. Arctic and adjacent lands. For example, at the lease sale stage in OCS waters, we conduct consultations that analyze the effects of oil and gas activities through the end point of development, to ensure that lease sales do not go forward in instances in which we can foresee that the sum total of exploration, development, production, and abandonment are likely to jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitat. A similar process applies to long-term land-use planning which sets in motion lease sales and opportunities for subsequent exploration, development and production in NPR-A as managed by the BLM. For OCS waters managed by BOEM and NPR-A lands managed by the BLM, if development and production proposals result from their planning and leasing programs, we again evaluate and conduct consultation as projects are proposed. These project-specific consultations closely examine the particular details of the projects, including the nature, scope and location of the activities, in light of up-to-date evaluations of the status of listed species and critical habitat, to ensure that the specific projects do not jeopardize listed species or destroy or adversely modify critical habitat. Relevant new information, such as oil spill risk assessments, will be included, as appropriate, in upcoming consultations as projects are proposed. This multi-tiered and multi-step consultation process, involving consultations for the various oil- and gas-related authorizations, ensures a dynamic analysis of the potential effects of all oil and gas activities such that a jeopardy/adverse modification determination can be made at any stage if necessary. As a result, this ongoing process provides comprehensive protection for listed species and critical habitat at all stages and ensures that our consultation obligations under the ESA are thoroughly and continually fulfilled. It also creates an overlapping web of consultations and associated documents that address the same oil and gas activities, albeit at differing temporal and spatial scales, occasionally under multiple Federal authorities.

Administration of the Biological Opinion

This BO considers the effects to polar bears and Pacific walruses of the Service's proposed action in connection with proposed Regulations for oil and gas exploration activities in the Chukchi Sea and adjacent northern coast of Alaska. The BO concluded that the sum total of these activities, when considered along with the environmental baseline, status of the species and critical habitat, and cumulative effects would not jeopardize the continued existence of the species. In part, this conclusion relies on the determination that the activities that may be authorized under the Regulations would only result in negligible impacts to small numbers of marine mammals (annually, relatively small numbers of MMPA incidental takes of Pacific walruses and MMPA incidental 25 takes of polar bears). The analysis in this BO predicts the total amount of take expected from the proposed Action based on the best available information.

Upon receipt of a request for an LOA the MMM will:

- Determine whether the request is within the parameters established in the proposed Action.
    - If no, additional evaluation is necessary to determine if LOA/ITS mitigation measures will be sufficient to bring the request within the parameters of the proposed Action.
        - If additional measures are not sufficient and/or cannot be implemented by the applicant, a separate consultation may be required.
        - For requests that fall within the parameters of the proposed Action, the MMM will issue a combined LOA/ITS that will provide incidental take coverage under both Acts. Issuance of the LOA/ITS concludes ESA consultation for that action.
- Each LOA will require applicants to report take of polar bears and walruses to the Service. The report will cover required compliance with the Acts' requirement to monitor take.

Incidental Take Statement

Polar Bears

Traditional Incidental Take Statements (ITS) have three functions. They (1) enumerate take, (2) provide a threshold for re-initiation of consultation, and (3) authorize take while providing reasonable and prudent measures and implementing terms and conditions that minimize take. While we enumerate take of polar bears and provide a threshold for re-initiation of this consultation, we do not authorize take for reasons described below.

The MMM has stated that no more than 25 polar bears (the small number conclusion) will be incidentally taken (as defined under the MMPA) annually. Most of these takes will not rise to the level of ESA take; however, as stated in the *Effects of the Proposed Action* section, an unquantifiable number may experience adverse effects. We are using the MMM's small number conclusion of 25 interactions that meet the definition of MMPA take annually as our index of this unknown number, and will use it as the re-initiation threshold. Take of marine mammals cannot be authorized under the ESA until it is authorized under the MMPA. Thus, consistent with ESA and regulations at 50 CFR §402.14(i), incidental take authorization for marine mammals is not provided until regulations, authorizations, or permits under section 101(a)(5) of the MMPA are in effect. Accordingly, the Service will only authorize incidental take when an LOA authorizing take under the MMPA is issued. Likewise, pursuant to section 101(a)(5) of the MMPA, and as amended in 2007, and implementing regulation at 50 CFR §18.27, and 50 CFR Section 216 and §229, the measures are required to be consistent with the total taking allowable under the MMPA authorization and to effect the least practical adverse impact on the species and its habitat and on the availability of the species for subsistence uses. We adopt these mitigation measures as the reasonable and prudent measures and implementing terms and conditions for this BO. Additionally, monitoring will provide the FWS with information indicating if the level of authorized take is exceeded; thus information obtained during monitoring would provide a mechanism for re-initiation of consultation for the proposed Action. These measures are non-discretionary, and will be binding conditions of any LOA for the exemption in section 7(o)(2) of the ESA to apply.

Pacific Walruses

Because the Pacific walrus is a candidate under the ESA, effects to this species are not defined in terms of take under the ESA as they are for listed species. Thus, we are not providing an ITS and authorization of take for Pacific walruses at this time.

Intentional Harassment of Polar Bears and Walruses

Take authorized via intentional harassment LOAs for polar bears and Pacific walruses will be permitted as needed under separate authority: 101(a)(4)(A), 109(h), and 112(c) of the MMPA. While we consider such take (for polar bears) incidental to otherwise lawful activities, under the ESA, take cannot be authorized until it is authorized under the MMPA; therefore, we are not including an incidental take statement or authorization for polar bears for Industry activities that result in intentional take at this time. Additionally, as stated above, incidental take of Pacific walruses will be authorized under the ESA because Pacific walrus are not listed under the ESA.

Reporting Requirements

To monitor the impact of incidental take, the MMM will provide annual monitoring reports to the FFWFO as specified in the ITS [50 CFR 402.14(i)(3)]. MMM will provide the FFWFO with an annual report containing the location (e.g., vessel and decimal coordinates) where incidental takes of polar bears and walrus occurred with demographic information (e.g., sex and age of bears) and a brief description of the Industry activity that caused the take and the reaction of the bear(s). Please also summarize the total number of takes for that year. The annual report is due by January 15th each year.

Re-initiation Notice

This concludes formal consultation on effects to polar bears on the proposed Action. 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 annual incidental take is exceeded. In this case, if more than 25 polar bears are incidentally taken (defined by MMPA) annually;
(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/or
(4) A new species is listed or critical habitat designated that may be affected by the action.

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