BIOLOGICAL OPINION

FOR

National Petroleum Reserve-Alaska Integrated Activity Plan

Consultation with:

Bureau of Land Management

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1.0 INTRODUCTION

This document transmits the U.S. Fish and Wildlife Service's (Service or USFWS) biological opinion (BO) in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.), on the effects of the Bureau of Land Management's (BLM) Integrated Activity Plan (IAP) for the National Petroleum Reserve-Alaska (NPR-A). The genesis of the proposed IAP (referred to as the Proposed Action in this BO) is summarized below.

In 2020, the BLM published the National Petroleum Reserve-Alaska Final Integrated Activity Plan Environmental Impact Statement (2020 IAP/EIS [BLM 2020]). A revision of the 2012 NPR-A Integrated Activity Plan Environmental Impact Statement (2012 IAP/EIS [BLM 2012]), the 2020 IAP/EIS was developed to determine the appropriate management of all BLM-managed lands in the NPR-A in a manner consistent with existing statutory direction and Secretary's Order 3352 (SO 3352).

The 2020 IAP/EIS analyzed four action alternatives (Alternatives B, C, D, and E) and a No Action alternative (Alternative A) which would provide for management of the NPR-A consistent with the IAP approved in the 2013 NPR-A IAP Record of Decision (2013 IAP/ROD [BLM 2013]). The 2020 IAP/ROD signed on December 31, 2020, adopted Alternative E as analyzed in the 2020 IAP/EIS.

On April 16, 2021, Secretary of the Interior, Deb Haaland, issued Secretary's Order 3398, which, in relevant part, revoked SO 3352. The Department identified the 2020 IAP as one such policy warranting review under Secretary's Order 3398 and subsequently directed the BLM to conduct an evaluation of the 2020 IAP/EIS, associated subsistence evaluation, and existing biological opinions for the purposes of the Department potentially adopting, in a new ROD, a different alternative.

The BLM has identified Alternative A, the No Action alternative as analyzed in the 2020 IAP/EIS, as its preferred alternative, and that is the proposed action evaluated in this BO. Upon implementation, BLM's proposed action would return the management of NPR-A to the 2012 NPR-A Integrated Activity Plan with its implementing 2013 Record of Decision.

The IAP would designate major land use allocations for BLM-managed lands within the NPR-A, including designating which lands are open to oil and gas leasing, and would set forth lease stipulations and required operating procedures to ensure that oil and gas operations are conducted in a manner that minimizes adverse impacts to the land, resources, land uses, and users. The IAP would also provide opportunity, subject to future analysis and decision, for onshore infrastructure (e.g., pipelines) to accommodate the transfer of oil and gas resources from the Chukchi and Beaufort seas to the Trans-Alaska Pipeline System or a future gas pipeline on the North Slope.

The IAP also addresses non-oil and gas related activities such as research activities including archeological / geological / soil sampling and collection and associated transportation via aircraft and boats, recreation and film permits and land-based travel and camping, community overland moves, excavation and solid and hazardous waste removal. The new ROD would authorize lease sales, but would not authorize any on-the-ground activity associated with the exploration or development of oil and gas resources, or other land authorizations, in the NPR-A.

This BO evaluates the potential impacts of the IAP (the proposed action) to species listed as threatened or endangered and to critical habitat designated under the ESA. The ESA establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitats on which they depend. Section 7(a)(2) of the ESA states that Federal agencies must ensure that their activities are not likely to:

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

Federal agencies fulfill this obligation by consulting with the Service or National Marine Fisheries Service (NMFS), depending on the species potentially affected (50 C.F.R. §402.14(a)). If a Federal action agency determines that an action "may affect, but is not likely to adversely affect" endangered species, threatened species, or designated critical habitat and the consulting agency (the Service or NMFS, as appropriate) concurs, consultation concludes informally (50 C.F.R. §402.14(b)). In the event of a determination that one or more listed species or designated critical habitat are "likely to be adversely affected" by the action, formal consultation is required. In this case, the BLM determined that one or more listed species would likely be adversely affected by the IAP, and reinitiated formal consultation.

This BO, which analyzes the effects of BLM implementing an IAP described as Alternative A of its 2020 IAP/EIS, was developed in accordance with section 7(a)(2) of the ESA (16 U.S.C. 1536 (a)(2)), associated implementing regulations (50 C.F.R. Part 402, including updates that became effective October 28, 2019 [84 FR 44976]), and Service policies and guidance. The consultation addresses potential effects of activities which could be authorized under the IAP on threatened spectacled eiders (*Somateria fischeri*), Alaska-breeding Steller's eiders (*Polysticta stelleri*), polar bears (*Ursus maritimus*), and northern sea otters (*Enhydra lutris kenyoni*), and areas designated as critical habitat for these four species, as appropriate.

Programmatic Consultations
The Service and the NMFS have developed techniques to streamline the procedures and time involved in consultations for broad agency programs or numerous similar activities with predictable effects on listed species and critical habitat. Some of the more common of these techniques and the requirements for ensuring that streamlined consultation procedures comply with section 7 of the ESA and its implementing regulations are discussed in a memorandum jointly issued by the NMFS and the Service on October 11, 2002.

Programmatic consultations can be used to evaluate potential effects of 1) multiple similar, frequently occurring or routine actions expected to be implemented in particular geographic areas, 2) a proposed program, plan, policy, or regulation providing a framework for future actions, and 3) incremental step actions expected to be implemented in the future, where specifics of individual activities are not definitively known at the time of the initial consultation. The programmatic approach is well suited for the IAP because the IAP is projected to last decades and may facilitate actions that would occur in sequential stages (oil and gas exploration, development, production, and abandonment) that will differ in their impacts and for which the likelihood, location, and specifics are currently uncertain, and because precisely evaluating impacts is complicated by possible future changes in the abundance, distribution and status of listed species.

A programmatic consultation should identify project design criteria (PDCs) or standards that will be applicable to future projects implemented under the program. The PDCs serve to prevent adverse effects to listed species, or to limit adverse effects to predictable levels to ensure the action will not jeopardize the continued existence of listed species or destroy or adversely modify critical habitat, whether actions are considered individually or collectively at the program level. Under a programmatic consultation, step-down consultations are needed for actions that cannot be specifically described at the time of initial consultation and for those that cannot meet the PDCs.

The following elements should be included in a programmatic consultation to ensure its consistency with section 7 of the ESA and its implementing regulations:

1. The PDCs to prevent or limit future adverse effects on listed species and designated critical habitat;
2. Description of the manner in which activities to be implemented under the programmatic consultation may adversely affect listed species and critical habitat and evaluation of expected level of adverse effects from covered projects;
3. Process for evaluating and tracking expected, and actual aggregate (net) additive effects of all projects expected to be implemented under the programmatic consultation. The programmatic consultation document must demonstrate that when the PDCs are applied to each project, the aggregate effect of all projects would not jeopardize listed species or destroy or adversely modify critical habitat;
4. Procedures for streamlined step-down consultation. As discussed above, if an approved programmatic consultation document is sufficiently detailed, step-down consultations ideally will consist of certifications and concurrences between action agency biologists and consulting agency biologists. An action agency biologist or team will provide a description of a proposed project and a certification that it will be implemented in accordance with the PDCs. The action agency also provides a description of anticipated project-specific effects and a tallying of net effects to date resulting from projects implemented under the program, and certification that these effects are consistent with those anticipated in the programmatic consultation. The consultation agency biologist reviews the submission and provides concurrence, or adjustments to the project necessary to bring it into compliance with the programmatic consultation. The project-specific consultation process must also identify any effects not considered in the programmatic consultation. Finally, project-specific consultation procedures must provide contingencies for proposed projects that cannot be implemented in accordance with the PDCs; full stand-alone consultation may be performed on these projects if they are too dissimilar in nature or in expected effects from those projected in the programmatic consultation document;
5. Procedures for monitoring projects and validating effects predictions; and,
6. Comprehensive review of the program, generally conducted annually.

In a tiered approach, this programmatic consultation establishes a framework of analysis and standards that allow future step-down consultations (as needed) at the stage of implementing or authorizing individual activities to be more effective and efficient. The Services promulgated changes to the section 7(a)(2) implementing regulations (80 FR 26832, May 11, 2015; ITS rule) that define two types of programmatic actions addressing certain types of policies, plans, regulations, and programs. Under a framework programmatic action such as the IAP evaluated here, take of ESA-listed species would not occur unless and until those future actions are authorized, funded, or carried out and subject to step-down consultation, which may include an incidental take statement (ITS), as appropriate. This is in contrast to a mixed programmatic action and consultation, which combines approval of actions that will not be subject to further ESA section 7(a)(2) consultation and approval of a framework for the development of future actions that are authorized, funded, or carried out at a later time. Thus, this BO applies the framework programmatic consultation approach and does not contain an ITS.

2.0 PROPOSED ACTION

2.1 Area Available for Leasing

Under the proposed action approximately 11.8 million acres (52 percent) of the NPR-A's subsurface estate open to oil and gas leasing would be available for leasing, including some lands closest to existing leases centered on the Greater Mooses Tooth and Bear Tooth units and Umiat (Figure 2.1; Table 2.1). The remaining 11 million acres (48 percent) would be closed to oil and gas leasing. Within the lands made unavailable, oil and gas drilling would be prohibited except where valid existing leases already occur. Any such existing leases would remain valid until they expire or are relinquished, and they would be subject to stipulations and BMPs, as appropriate, applicable to the area and activity under review (e.g., exploratory drilling or production pad construction).

Table 2.1 Acres allocated to leasing for oil and gas exploration in the NPR-A Allocation

Allocation		Acres
Closed to leasing		10,991,000
Open, subject to no surface occupancy		2,489,000
Open, subject to controlled surface use		0
Open, subject to timing limitations		0
Open, subject to standard terms and conditions		9,274,000
	Total Open	**11,763,000**

The lands closed to leasing include a large block of land and waters from Atigaru Point in the east to Utqiagvik in the west. This block includes a wide swath of the Arctic Coastal Plain (ACP), most of the NPR-A's Beaufort Sea coastline, and several biologically significant coastal waterbodies and associated barrier islands (e.g., Elson Lagoon, Dease Inlet, Admiralty Bay, Smith Bay, the Kogru River, and all barrier islands associated with these features). These lands encompass a large amount of important habitat for all five listed species, as well as a substantial proportion of the designated polar bear critical habitat that occurs within the NPR-A. Also closed to leasing are the BLM-managed portions of Kasegaluk Lagoon, Wainwright Inlet/Kuk River, and Peard Bay (barrier islands included), and terrestrial lands within one mile of Peard Bay and Kasegaluk Lagoon. Lands near Teshekpuk Lake would also be unavailable for oil and gas leasing. This would protect crucial areas for sensitive bird populations and for the caribou found in the Teshekpuk Caribou Herd (TCH) and Western Arctic Caribou Herd (WAH).

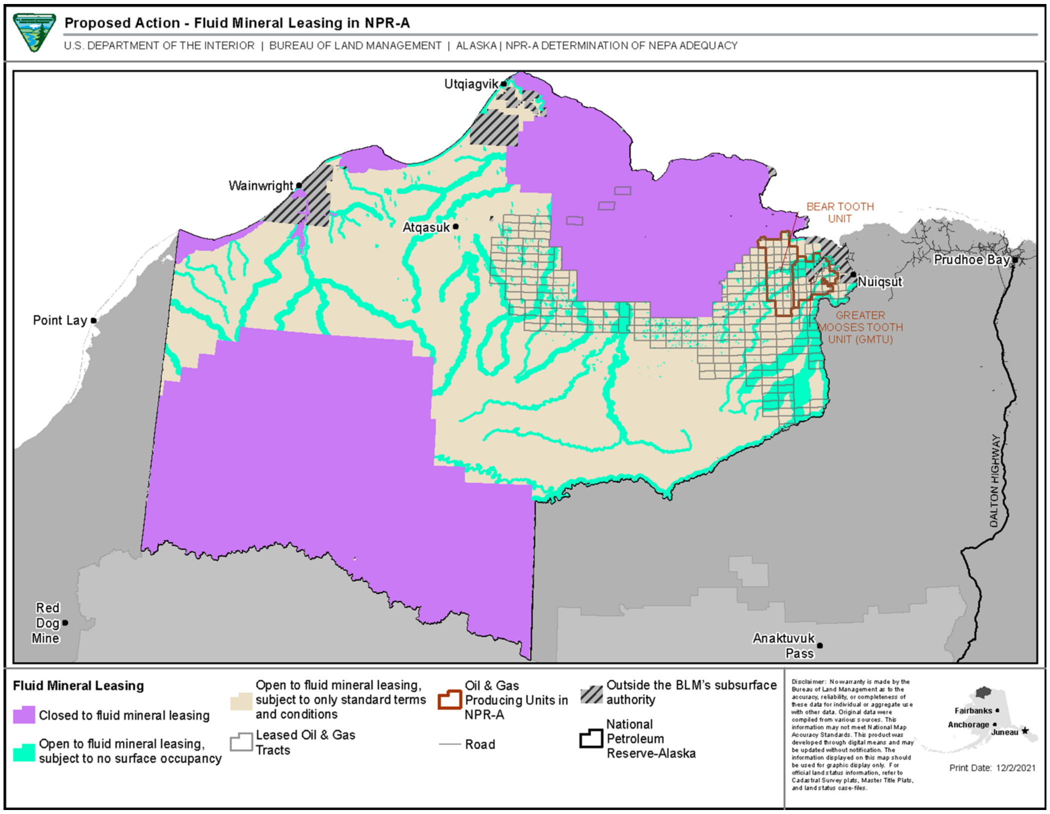

Figure 2.1 – Map of Areas Available for Fluid Mineral Leasing in NPR-A under the Proposed Action

Under the proposed action, construction of new infrastructure, including pipelines and other infrastructure necessary for offshore development, would be allowed in approximately 11 million acres. New infrastructure would be prohibited on approximately 8.3 million acres. Areas closed to new infrastructure include areas around Teshepuk Lake and all lands within the Utukok River Uplands Special Area (Figure 2.1). This would afford additional protection to wildlife, wildlife habitat, wilderness characteristics, and other surface values. The Proposed Action would also:

• Allow sand and gravel mining (mineral materials disposal) through the normal review process throughout the entire planning area.

• Allow the use of temporary hunting, fishing, and trapping structures (e.g., tents, blinds) throughout the NPR-A. The proposed action would also allow travel within the NPR-A by motorized vehicles, including motorboat, snowmobile, off-highway vehicle (OHV), and aircraft (including use of unimproved landing areas), provided that such use is consistent with the Off-Highway Vehicle use designation and would not detrimentally impact resources.

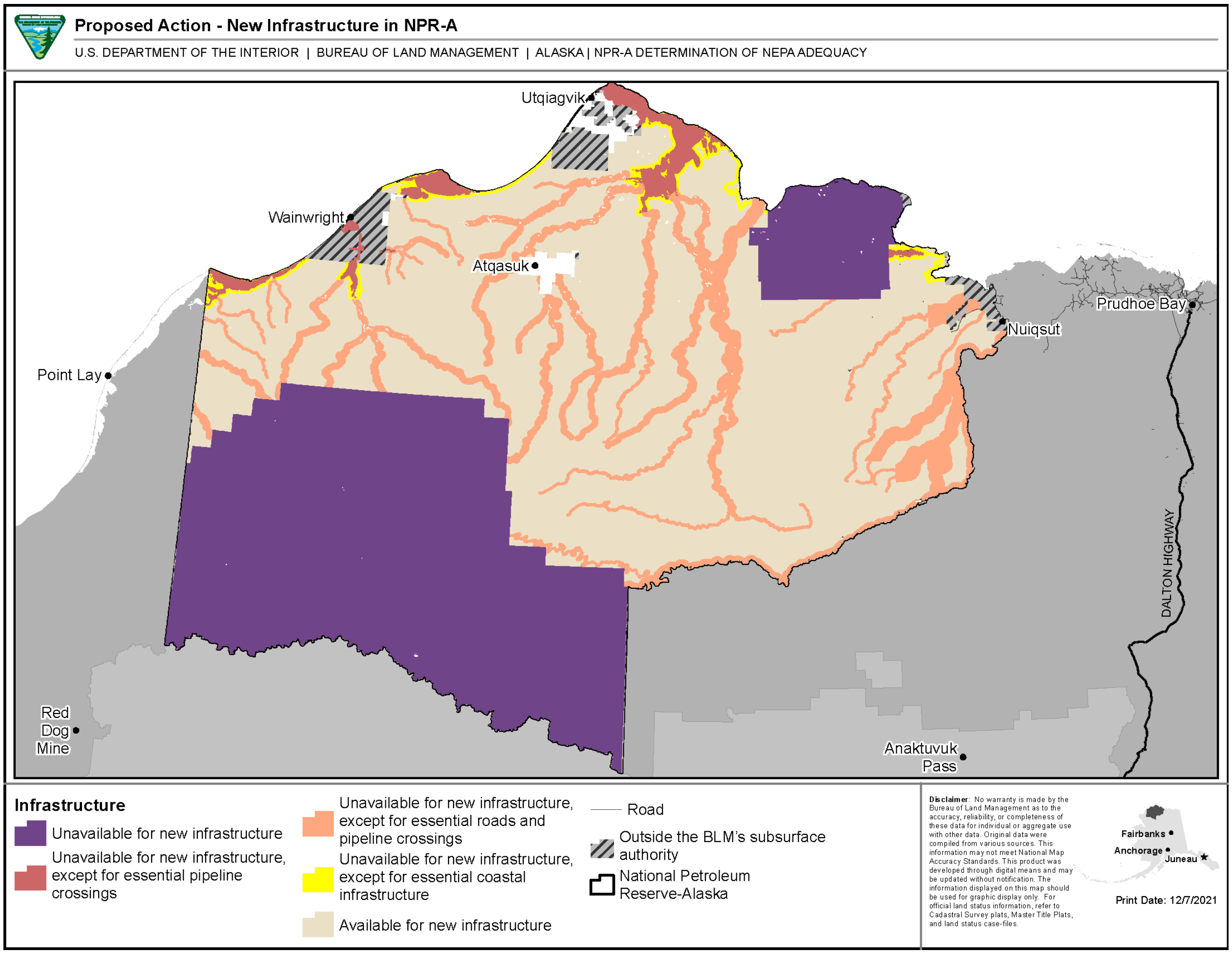

Figure 2.2 – Areas Available for Infrastructure Construction in NPR-A under the Proposed Action

2.2 Lease Stipulations, Best Management Practices, and Required Operating Procedures

While the proposed action may allow for oil and gas development and other activities in areas of NPR-A, activities are constrained by a number of Lease Stipulations, Best Management Practices, and Required Operation Procedures (ROPs) that apply to activities in NPR-A requiring authorization from BLM. These conditions are part of the proposed Action and some of them will serve to significantly reduce the potential effects of the action on listed species and critical habitat.

A complete list of ROPs and Lease Stipulations is provided as Appendix 1.

2.3 Reasonably Foreseeable Development Scenario

To assess the potential effects of activities that may be authorized pursuant to the proposed action, BLM developed a reasonably foreseeable development scenario (RFD). The RFD Scenario outlines a combination of the projected type and amount of development likely to occur within the NPR-A and provides a basis for estimating the potential effects on listed species and critical habitat. The RFD is described in full by BLM in Appendix B of the 2020 IAP/EIS (BLM 2020), and the key parts are summarized in BLM's Biological Evaluation for the proposed action

(BLM 2021). Both documents are incorporated by reference, and BLM's detailed summary is provided as Appendix 2 of this BO.

2.4 Project Design Criteria

During this framework programmatic consultation, the Service and the BLM developed and agreed upon four PDCs designed to minimize and monitor effects of the proposed action to spectacled and Steller's eiders and polar bears and to describe how compliance with section 7(a)(2) of the ESA will be ensured. These measures are considered part of the proposed action and figure prominently in our evaluation of the *Effects of the Action*, below.

PDC 1. The lease areas may now or hereafter contain plants, animals, or their habitats determined to be threatened or endangered or to have some other special status. The BLM may recommend modifications to exploration and development proposals to further its conservation and management objectives and to avoid approving activities that would contribute to the need to list such a species or its habitat. The BLM may require modifications to or may disapprove a proposed activity that is likely to adversely affect a proposed or listed endangered species, threatened species, or critical habitat. The BLM would not approve any activity that may affect any such species or critical habitat until it completes its obligations under applicable requirements of the ESA, 16 United States Code 1531 et seq., including completing any required procedure for conference or consultation.

PDC 2. The Service and the BLM will conduct programmatic reviews by meeting annually, to begin one year after a Decision for the NPR-A/ IAP has been issued unless the BLM and FWS both agree to a different interval, or such meetings are no longer needed. These reviews will evaluate, among other things, 1) whether activities proposed are consistent with the IAP, as described, 2) whether the nature and scale of predicted effects remain valid, and 3) whether the programmatic consultation, including the PDCs and determinations reached, remain adequate and appropriate. In addition, these meetings will provide a venue where any new information on the status of species or designated critical habitat, or new methods to avoid or minimize impacts can be shared.

PDC 3. Biological Assessments prepared to initiate formal consultation on actions to be authorized under this program will include: a) an updated, current review of the status of listed species and designated critical habitat that are likely to be adversely affected by the action under consideration; b) a summary of effects, including incidental take authorized under and resulting from the program to date; and c) a review of the need for, and efficacy of, reasonable and prudent measures to minimize the amount or extent of incidental take.

PDC 4. To address uncertainties surrounding the potential impacts of helicopter-supported activities on undeveloped tundra during the nesting and brood-rearing periods of spectacled and Steller's eiders, a collaborative program between the Service and BLM will be developed and implemented. The program will be designed to collect information on the spatial location and extent, temporal duration, dates, number of persons, activities being conducted, and other relevant factors, as appropriate. Depending on results of monitoring and reporting efforts, targeted research may be required to evaluate impacts to nest success and/or duckling/brood survival. Reasonable and prudent measures and terms and conditions to limit or reduce impacts may be required for actions authorized under this program.

3.0 ACTION AREA

Under regulations implementing Section 7 of the ESA, the Action Area includes all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. In determining the effects of the action, and hence the Action Area, we consider the consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that result from the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action.

In this BO, we define the Action Area based on information provided in the BLM's BE (2021). It includes all federal and non-federal lands and waters within the NPR-A boundaries, including 22.8 million surface and subsurface acres under federal jurisdiction[1] (Figure 2.1), as well as adjacent lands, and marine habitat outside the immediate area where consequences of the action could occur. Although most of the NPR-A is terrestrial, approximately 429,000 acres are in marine bays, inlets, and lagoons of the Chukchi and Beaufort seas. The Action Area also includes the marine transit route (MTR) between the NPR-A and Dutch Harbor (Figure 3.1).

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1 The boundaries of the NPR-A also encompass nearly 500,000 acres which are under non-federal jurisdiction.

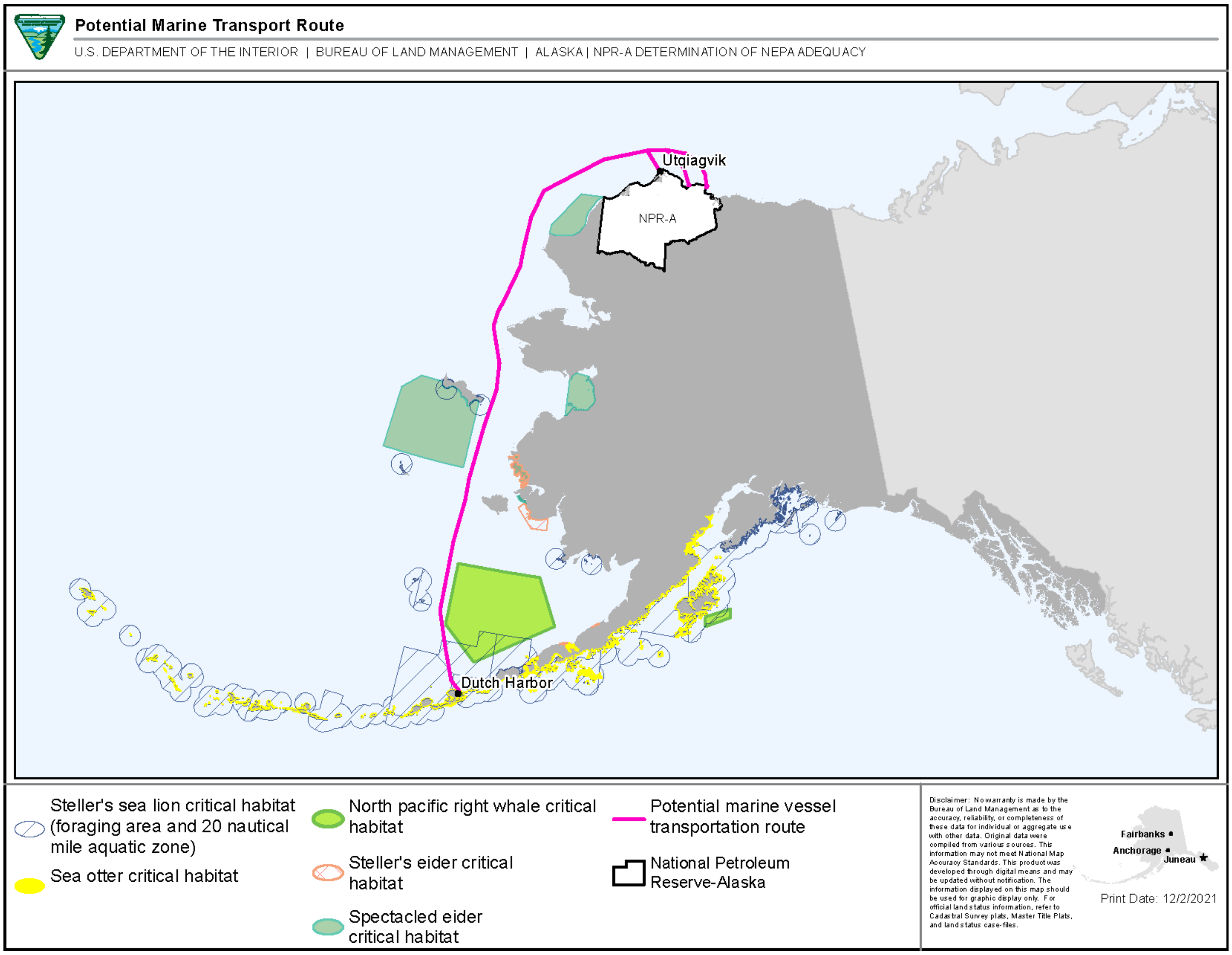

Figure 3.1 – Marine Transportation

4. EFFECT DETERMINATIONS FOR SHORT-TAILED ALBATROSS, NORTHERN SEA OTTERS, NORTHERN SEA OTTER CRITICAL HABITAT, SPECTACLED EIDER CRITICAL HABITAT, AND STELLER'S EIDER CRITICAL HABITAT

4.1 Effect Determinations for Short-tailed Albatross

The short-tailed albatross was listed as endangered throughout its range under the ESA in 2000 (65 FR 46643). In Alaska, short-tailed albatross are most often found in association with the Bering Sea and Gulf of Alaska continental shelf edge (Piatt et al. 2006). Within the Action Area, short-tailed albatrosses may be observed in low numbers year-around along the southern portion of the MTR, where they fly relatively low over the ocean surface and dive for squid, fish, shrimp, other crustaceans, and the eggs of flying fish (65 FR 46643).

Marine vessels associated with the proposed activities could disturb short-tailed albatross as they fly and forage within the Action Area. Short-tailed albatross could conceivably collide with vessels supporting projects authorized by the proposed action. However, due to the very low density of short-tailed albatross in the Action Area, and the low number of vessels predicted to be operating at any given time within the portion of the Action Area overlapping the range of short-tailed albatross; we expect the risk of collision would be discountable. Furthermore, should short-tailed albatross be encountered in the action area, we expect disturbance to flying or foraging short-tailed albatross would be minor because these individuals can respond to vessel presence or disturbance by moving away to a safe distance, and take is not likely, and impacts would be insignificant.

Short-tailed albatross in and around Unalaska Island could conceivably be impacted by unintentional spills during vessel re-fueling. However, the BLM has indicated that spills to the marine environment would be expected to be small, localized, and be contained or remediated quickly (BLM 2020a). Furthermore, protective measures included in the IAP through ROPs A-3, A-4 and A-5 would prevent and minimize potential impacts in the event of a spill. Therefore, given the low density of short-tailed albatross and spill prevention and response measures included in the IAP, we anticipate impacts to short-tailed albatross from small spills in the MTR would be insignificant.

In summary, because 1) effects of disturbance would be minor and temporary and are insignificant 2) the potential for other forms of adverse effects (i.e., collisions and small refueling spills and large spills) is discountable. Even given the collective effects of the proposed action on short-tailed albatross we concur with the BLM's determination that the proposed action is *not likely to adversely affect* the short-tailed albatross.

4.2 Effect Determinations for Northern Sea Otters

The Service listed the southwest Alaska distinct population segment (DPS) of the northern sea otter as threatened on August 9, 2005 (70 FR 46366). The Southwest DPS is distributed along the western shore of lower Cook Inlet; throughout the Alaska Peninsula and Bristol Bay coasts; and along the Aleutian, Barren, Kodiak, and Pribilof islands (USFWS 2014). Northern sea otters are non-migratory and occur year-round in nearshore coastal waters, typically within 131.2 ft (40 m) of depth to maintain consistent access to benthic foraging habitat (Riedman and Estes 1990).

Within the Action Area, vessels associated with sealift operations that result from the proposed action may encounter and disturb listed sea otters when transiting in and out of Dutch Harbor in the vicinity of Unalaska Island. However, sea otter density is relatively low in the vicinity of Dutch Harbor, and we expect sea lift barges and tugs would encounter very few individuals. We would also expect disturbance from barge traffic to be minor and temporary because 1) barges would move slowly (< 14 knots; BLM 2020a) through the vicinity of Dutch Harbor as they arrive and depart from the port, and 2) sea otters can respond to vessel presence or disturbance by moving away to a safe distance. Because disturbance to listed sea otters would be so minor, we expect the effects of disturbance would be insignificant.

Listed sea otters could also be impacted by unintentional spills during vessel transit through the MTR. However, geographic overlap between the range of listed sea otters and the MTR is small and limited to the vicinity of Dutch Harbor. Furthermore, the BLM has indicated that spills to the marine environment would likely be small spills of refined products (e.g., diesel, lubricating oil) resulting from barge transfer operations, and localized to the immediate area of the barge transfer. While a medium to large spill could occur along existing marine waterways leading to a barge transfer site if a tug or barge transporting modules runs aground, sinks, or its containment compartment(s) were breached and the contents released (BLM 2020a), medium or large spills of refined oil products (such as those carried by a vessel) are very unlikely and hence discountable. The risk of a sea otter encountering such a spill is further reduced given the limited geographic overlap between the species and the shipping route.

In summary, because effects of disturbance would be minor and temporary, and impacts from spills would be discountable we expect collective effects of the proposed action on listed sea otters would be insignificant. Therefore, the Service concurs with the BLM's determination that the proposed action is *not likely to adversely affect* the southwest Alaska DPS of the northern sea otter.

4.3 Effect Determinations for Northern sea otter critical habitat

The Service designated critical habitat for the southwest Alaska DPS of the northern sea otter on October 8, 2009 (74 FR 51988). The Eastern Aleutian Critical Habitat (Unit 2) occurs in nearshore marine waters around Unalaska Island ranging from the mean high tide line seaward for a distance of 100 meters, or to a water depth of 20 meters. Barge and tug traffic resulting from the proposed action may enter designated critical habitat near Dutch Harbor and Unalaska Island.

Designated critical habitat for sea otters could be impacted by unintentional spills during vessel re-fueling in Dutch Harbor. However, BLM has indicated the likelihood of spills in the marine environment would be low, and any spills would be limited to small volumes, and be localized and of short duration. Therefore, we anticipate impacts to the physical and biological features (PBF's) of critical habitat from very small or small refueling spills would be insignificant.

Because 1) overlap between barge traffic and designated sea otter critical habitat would be limited to the vicinity of Dutch Harbor and Unalaska Island, which represents a very small proportion of designated sea otter critical habitat, 2) vessel presence in critical habitat would be temporary as barges and tugs pass through the area, and 3) spills from re-fueling would be expected to be small, localized, and remediated quickly; action-specific impacts from proposed vessel traffic in the MTR are expected to be insignificant. Therefore, the Service concurs with the BLM's determination that the proposed action is *not likely to adversely affect* designated sea otter critical habitat.

4.4 Effect Determinations for Spectacled Eider Critical Habitat

On February 6, 2001, the Service designated critical habitat for the spectacled eider. Areas designated include portions of the Yukon-Kuskokwim Delta, Norton Sound, Ledyard Bay, and the Bering Sea between St. Lawrence and St. Mathew Islands. Only the Ledyard Bay Critical Habitat Unit (LBCHU) is adjacent to the Action Area as the MTR would transit nearby.

The LBCHU was designated to protect molting spectacled eiders. It is used by large numbers of eiders with 33,192 counted by aerial survey in September 1995 (Larned et al. 1995). In particular satellite telemetry data indicates that females who breed on the North Slope primarily use this area for molting (Peterson et al. 1995). We identified marine waters >5 m and ≤ 25 m at mean low water, along with associated marine aquatic flora and fauna in the water column, and the underlying marine benthic community as the physical or biological features essential to the conservation of spectacled eiders which are provided by the LBCHU.

Although barges and tugs associated with the Proposed Action would follow established MTRs that ordinarily avoid critical habitat (BLM 2021), because the MTR passes adjacent to the Ledyard Bay Critical Habitat Unit (LBCHU), barges or tugs could conceivably enter this unit during inclement weather or other emergencies. However, we expect these instances would be rare. The physical and biological features (PBF's) LBCHU include marine waters greater than 5 m (16.4 ft) and less than or equal to 25 m (82.0 ft) in depth at mean lower low water (MLLW), along with associated marine aquatic flora and fauna in the water column, and the underlying marine benthic community (66 FR 9146).

We do not anticipate that a few vessels rarely entering the LBCHU would affect the PBF's for which critical habitat was designated. Additionally, given the size of LBCHU and the expected rarity of vessels entering it, we do not anticipate vessel traffic associated with the proposed action would appreciably affect spectacled eider access to, or use of, LBCHU such that the function and conservation value of the LBCHU for spectacled eiders would be reduced.

Accidental spills during sealift operations would likely be limited to small spills originating from fuel transfers in the vicinities of Dutch Harbor and proposed potential barge landings sites in NRP-A at Oliktok Point, Atigaru Point, Smith Bay, and Utqiaġvik (BLM 2021). Wintering habitat south of St. Lawrence Island, the nearest critical habitat unit to Dutch Harbor, is 800 km away. Additionally, sealift operations would not take place from October through April when the wintering area is used by spectacled eiders. Therefore, it is extremely unlikely that any oil from small re-fueling spills would be carried into designated critical habitat, and we do not anticipate adverse impacts to spectacled eider critical habitat from small spills given sealift operations will not occur when spectacled eiders would be present in the area. Although conceivable, larger spills from vessels operating in the MTR extremely unlikely.

Because 1) impacts to terrestrial critical habitat from the Proposed Action are not expected, 2) impacts to the physical and biological features of the LBCHU are not expected from rare incursions by vessels traveling the MTR, and 3) due to geographic and temporal separation, impacts from small spills during refueling of vessels are very unlikely; collective impacts to spectacled eider critical habitat from the Proposed Action are expected to be discountable. Therefore, we conclude the Proposed Action is *not likely to adversely affect* designated spectacled eider critical habitat.

4.5 Effect Determinations for Steller's Eider Critical Habitat

Terrestrial critical habitat was designated for Steller's eiders on the Yukon-Kuskokwim Delta and in four marine areas, including three along the Alaska Peninsula and one just south of the Yukon-Kuskokwim Delta at the Kuskokwim Shoals (66 FR 8850). The Action Area does not include, nor is it proximal to terrestrial critical habitat and the MTR from Dutch Harbor through the Bering, Chukchi, and Beaufort seas, is well outside of all designated units.

As described above for Spectacled Eider Critical Habitat, it is possible that accidental spills of fuel and hydrocarbons could occur during sealift operations. However, these would likely be limited to small spills originating from fuel transfers in the vicinity of Dutch Harbor and proposed potential barge landings sights in NRP-A (Oliktok Point, Atigaru Point, Smith Bay, and Utqiaġvik). Wintering habitat in Izembek Lagoon, the nearest critical habitat unit to Dutch Harbor, is 270 km away. Therefore, it is extremely unlikely that any oil from small re-fueling spills would be carried into designated critical habitat, and we do not anticipate adverse impacts to Steller's eider critical habitat from small spills. Although conceivable, larger spills from vessels operating in the MTR are extremely unlikely.

Because impacts to terrestrial critical habitat from the Proposed Action would not occur, and due to geographic and temporal separation, impacts from small spills during refueling of vessels are extremely unlikely collective impacts to Steller's eider critical habitat from the Proposed Action are expected to be discountable. Therefore, we conclude the Proposed Action is *not likely to adversely affect* designated Steller's eider critical habitat.

5.0 STATUS OF THE SPECIES

5.1 Spectacled Eider

Spectacled eiders (quageq in Central Yup'ik, qavaasuk in Inupiaq, iyegaatelek in St. Lawrence Island Yupik, Latin *Somateria fischeri*; Figure 5.1A) were listed as threatened throughout their range on May 10, 1993 (USFWS 1993), based on indications of steep declines in the two Alaska-breeding populations. There are three primary spectacled eider populations, corresponding to breeding grounds; these are 1) the Yukon-Kuskokwim Delta (Y-K Delta) breeding population, the Alaska Coastal Plain (ACP) breeding population, and the Arctic Russia breeding population. The Y-K Delta population of spectacled eiders declined 96 percent between the early 1970s and 1992 (Stehn et al. 1993). Data from the Prudhoe Bay oil fields (Warnock and Troy 1992) and information from Native elders at Wainwright, Alaska (R. Suydam, pers. comm. in USFWS 1996) suggested concurrent localized declines on the ACP, although data for the entire breeding population were not available. An estimate of the Arctic Russia breeding population was also unavailable at the time of listing. Spectacled eiders molt in several discrete areas (Figure 5.1B) during late summer and fall, with birds from different populations and sexes apparently favoring different molting areas (Petersen et al. 1999). All three spectacled eider populations overwinter together in openings in pack ice of the central Bering Sea, with the historical core wintering area located south of St. Lawrence Island (Petersen et al. 1999; Figure 5.1B). They remain in the wintering area until March–April (Lovvorn et al. 2003). Critical habitat was designated for molting spectacled eiders in Norton Sound and Ledyard Bay, nesting areas on the Y-K Delta, and wintering areas southwest of St. Lawrence Island (Figure 5.1B).

(A)

(B)

Figure 5.1 - (A) Male and female spectacled eiders in breeding plumage. (B) Distribution of spectacled eiders. Molting areas (green) are used July to October. Wintering areas (yellow) are used October to April. The full extent of molting and wintering areas is not yet known and may extend beyond the boundaries shown.

Breeding – In Alaska, spectacled eiders breed primarily on the Y-K Delta and the ACP. The coastal fringe of the Y-K Delta is the only subarctic habitat where spectacled eiders occur at high densities. Although spectacled eiders historically occurred throughout the coastal zone of the Y-K Delta, they currently breed primarily in the central coast zone within about nine miles of the coast from Kigigak Island (Kigigak) north to Kokechik Bay (USFWS 1996). However, sightings on the Y-K Delta have also occurred both north and south of this area during the breeding season (R. Platte, USFWS, pers. comm. 1997). On the ACP, spectacled eiders breed north of a line connecting the mouth of the Utukok River to a point on the Shaviovik River about 15 miles inland from its mouth, with breeding density varying across the ACP (Figure 5.2) but generally lower than on the Y-K Delta. Lake (2007) documented some female spectacled eiders begin to breed in their third year, although most wait until their fourth year. Age at first breeding has not been determined for males, but probably occurs the third or fourth year, coinciding with the acquisition of adult plumage (Petersen et al. 2000).

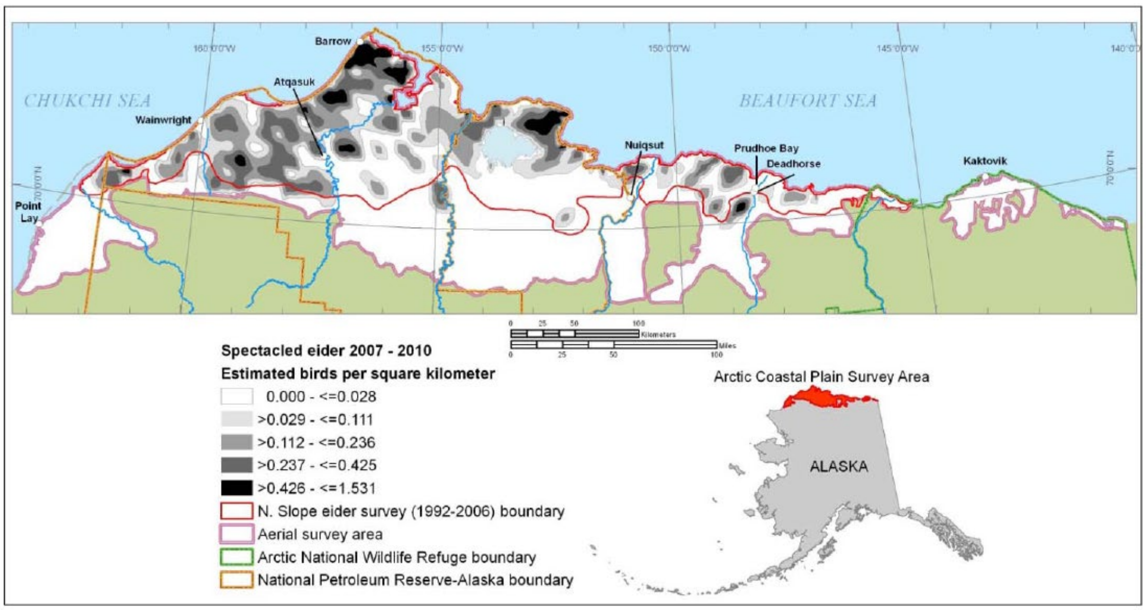

Figure 5.2. Density distribution of spectacled eiders observed on aerial transects sampling 35,627 square miles of wetland tundra on the North Slope of Alaska during early to mid-June, 2007 to 2010 (Larned et al. 2011).

Spring migration and breeding, including arrival, nest initiation, hatch, and fledging, is generally 3 to 4 weeks earlier on the Y-K Delta than on the ACP. Spectacled eiders breeding on the Y-K Delta typically arrive to the breeding grounds by the second week of May. During 1985 to 2014, mean nest initiation date on the Y-K Delta was May 28 (range May 18 to June 7; Fischer et al. 2018). Spectacled eiders typically arrive on the ACP breeding grounds in late May to early June, and numbers of breeding pairs peak in mid-June and decline 4 to 5 days later when males begin to depart from the breeding grounds (Smith et al. 1994, Anderson and Cooper 1994, Anderson et al. 1995, Bart and Earnst 2005). During 2010 to 2019, mean nest initiation date on the ACP ranged from June 6 to June 29 (Safine 2011, 2012, 2013, 2015; Graff 2016, 2018, 2020). Average clutch size reported from studies at Kigigak was 4.0 to 5.5 (Gabrielson and Spragens

2013, Moore and Sowl 2017); clutch size near Utqiaġvik averaged 3.2 to 4.1, with clutches of up to 8 eggs reported (Quakenbush et al. 1995, Safine 2011); and mean clutch size on the Colville River Delta (CRD) of the ACP has been reported as 4.3 (Bart and Earnst 2005). Incubation lasts 20 to 25 days (Kondratev and Zadorina 1992, Harwood and Moran 1993, Moran and Harwood 1994, Moran 1995), and hatching occurs from mid- to late July (Warnock and Troy 1992).

Following hatch, broods move from nests to freshwater ponds, brackish ponds, or flooded tundra usually traveling < 3 km, but occasionally up to 13 km (Petersen et al. 2000). On these breeding grounds, spectacled eiders dabble in ponds and wetlands feeding on mollusks, insect larvae (craneflies, caddisflies, and midges), small freshwater crustaceans, and plants and seeds (Kondratev and Zadorina 1992). Ducklings fledge approximately 50 days after hatch, when females with broods move from freshwater to marine habitat prior to fall migration (USFWS 2010b).

Nest survival – Nest success, the probability that a nest survives with at least one duckling hatching, is highly variable across both years and sites (Table 5.1) and is thought to be greatly influenced by predators (Petersen 1998, Lake 2007), including gulls (*Larus* spp.), jaegers (*Stercorarius* spp.), red foxes (*Vulpes vulpes*), and arctic foxes (*Alopex lagopus*). Studies on Kigigak found nest survival probability tended to be higher in years with low fox numbers or activity (i.e., no denning) or when foxes were eliminated from the island prior to the nesting season (study period 1992 to 2007; Lake 2007). On the Y-K Delta, nest success at Kigigak and the Kashunuk study site showed similar variation during 1992 to 2002 but did not appear to be correlated in most years (Flint et al. 2016). Nest success estimates from Kigigak in more recent years, 2003 to 2015, have shown similar annual variation and range. The available data suggest that nest success is lower on the ACP than on the Y-K Delta.

Table 5.1. Spectacled eider nest success estimates at study sites across Alaska.

	Years	Estimate of Apparent Nest Success
Y-K Delta		
Kashunuk[1]	1992-2002	0.04-0.92; average = 0.53, SE = 0.07
Kigagak[1]	1992-2002	0.04-0.92; average = 0.73, SE = 0.06
Kigigak[2]	2003-2015	0.05-0.91
ACP		
Utqiaġvik[3]	2009-2019	0.19-0.72
Kuparuk[4]	1993-2007	0.125-0.923; mean = 0.417
Colville Delta[5]	1994-1999	0.11-1.00; mean = 0.31

[1] Data from Flint et al. 2016
[2] Data from Gabrielson and Spragens 2013, Moore and Sowl 2017, Rizzolo et al. 2019
[3] Data from Safine 2011, 2012, 2013, 2015; Graff 2016, 2018, 2020
[4] Data from Anderson et al. 2007 in USFWS 2021.
[5] Data from Bart and Earnst 2005

Egg viability – Spectacled eider egg viability varies over time and among nesting areas. Available data indicate egg hatchability is high for spectacled eiders nesting on the ACP but considerably lower in the coastal region of the Y-K Delta. On the ACP, spectacled eider eggs that are addled or that do not hatch are very rare in the Prudhoe Bay area (Declan Troy, TERA, *pers. comm.* 1997); and at Utqiaġvik, no inviable eggs were found in half the years from 2010 to 2019, while 6 to 20 percent of spectacled eider nests had at least one inviable egg in other years (Safine 2012, 2013, 2015; Graff 2016, 2018, 2020). In contrast, on the Y-K Delta, 11 to 30 percent of spectacled eider nests at Kashunuk (1992 to 2004) and Kigigak (1992 to 2015) had at least one inviable egg, and 7.7 percent of eggs were inviable overall (Grand and Flint 1997, Moore and Sowl 2017).

Duckling and brood survival – Recruitment rate (the percentage of young eiders that hatch, fledge, and survive to sexual maturity) of spectacled eiders is poorly known (USFWS 1999) because there is limited data on juvenile survival. On the Y-K Delta, duckling survival to 30 days was found to vary annually, with an estimated rate of 0.39 at Kashunuk (1993 to 2002) and 0.67 at Kigigak (1999 to 2000; Flint et al. 2016). Mean brood survival (the percentage of females hatching a clutch that fledged at least one duckling) across years was estimated as 0.55 and 0.85 at Kashunuk and Kigigak, respectively (process variation2 [σ] = 0.001 and 0.009, respectively; Flint et al. 2016). Survival of juveniles from 30 days after hatch to departure from the breeding grounds was estimated at 0.71 at Kashunuk during 1997 to 1999 (Flint et al. 2000). At Utqiaġvik, spectacled eider brood survival from 2011 to 2012 was estimated as 0.76 (95% CRI = 0.626–0.815; Rizzolo 2020).

Adult survival – Survival of adult females is a major driver of spectacled eider population dynamics (USFWS 2021). Data from the Y-K Delta and from Arctic Russia show annual survival rate of adult females varies across years (Table 5.2) and may be primarily influenced by exposure to lead in some breeding areas, and by winter sea ice conditions (USFWS 2021). In spectacled eiders breeding on the Y-K Delta from 1993 to 1996, females exposed to lead survived at a lower rate than females not exposed to lead (estimated at 0.48, σ = 0.14 and 0.88, σ = 0.06, respectively; Flint et al. 2016). Overall, estimated annual female survival rates at Kashunuk and Kigigak showed the greatest variation during years with more severe sea ice conditions (Flint et al. 2016). Using a dataset from Kigigak spanning 1992 to 2015, Christie et al. (2018) found some support for higher annual survival under moderate sea ice conditions (compared to annual survival under severe or minimal ice cover). Information about survival rates from the ACP breeding population of spectacled eiders is lacking.

Non-breeding distribution – As with many other sea ducks, spectacled eiders spend the 8- to 10-month non-breeding season at sea. Spectacled eider migrating, molting, and wintering areas have been identified via satellite telemetry and aerial surveys. These studies are summarized in Petersen et al. (1999) and Larned et al. (1995). Results of more recent satellite telemetry research (2008 to 2011) are consistent with earlier studies (Matt Sexson, USGS, *pers. comm.*).

Post-breeding distribution and migration – Phenology of fall migration is similar between birds breeding on the Y-K Delta and on the ACP. Individuals depart breeding areas July to September, depending on breeding status and success, and molt in in the marine environment during September to October (Matt Sexson, USGS, *pers. comm.*).

2 Process variation [σ] is the component of total variation that explains environmental variation. The other component is sampling variation.

Table 5.2 - Annual survival rate estimates of adult female spectacled eiders in Alaska and Arctic Russia.

	Years	Estimated Annual Survival
Y-K Delta		
Kashunuk[1]	1993-1996	0.63-094; mean = 0.78, σ = 0.007
Kigagak[1]	1993-1996	0.55-0.95; mean = 0.81, σ = 0.009
Kigigak[2]	1992-2015	0.50 (SE = 0.05) -1.0
ACP		
Utqiaġvik		not available
Arctic Russia		
Chaun[3]	2003-2015	mean = 0.77 (SE = 0.04)

[1] Data from Flint et al. 2016
[2] Data from Christie et al. 2018
[3] Data from Solovyeva et al. 2017

Males generally depart breeding areas when females begin incubation, which is late June on the ACP (Anderson and Cooper 1994, Bart and Earnst 2005). Individuals sometimes spend several weeks staging in the Beaufort, Chukchi, and Bering Seas before moving to their molting areas (Petersen et al. 1999). Use of the Beaufort Sea by departing males is variable. Of 14 males implanted with satellite transmitters in one study, only 4 spent an extended period of time (11 to 30 days) in the Beaufort Sea (TERA 2002), appearing to prefer areas near large river deltas such as the CRD, where open water is more prevalent in early summer when much of the Beaufort Sea is still frozen. In a recent satellite telemetry study that marked spectacled eiders from both the Y-K Delta and ACP breeding populations, most adult males migrated to northern Russia to molt (USGS, unpublished data). These two studies suggest that male eiders typically follow coastlines (Matt Sexson, USGS, *pers. comm*.), and may move rapidly (e.g., average travel of 1.75 days; TERA 2002) over nearshore waters from breeding grounds to the Chukchi Sea. Alternatively, some males move to the Chukchi Sea over land after departing the breeding areas (TERA 2002), and some migrate straight across the northern Bering and Chukchi Seas *en route* to northern Russia (Matt Sexson, USGS, *pers. comm*.).

Females generally depart the breeding grounds later than males, with timing of female departure for the molting grounds depending on nesting success. Unsuccessful females move to molting areas in July, and successful females in August and September (Petersen et al. 1999). Females breeding on the ACP may make greater use of the Beaufort Sea compared to males. Females implanted with satellite transmitters spent an average of 2 weeks staging in the Beaufort Sea (range 6 to 30 days), with the western Beaufort Sea the most heavily used (TERA 2002). Females also appeared to migrate through the Beaufort Sea an average of 6.2 miles farther offshore than males (Petersen et al. 1999). Greater use of the Beaufort Sea and offshore areas by females was attributed to the greater availability of open water when females depart the ACP breeding area (Petersen et al. 1999, TERA 2002). Recent telemetry data indicate molt migration of failed/non-breeding females from the CRD through the Beaufort Sea is relatively rapid (2 weeks) compared to 2 to 3 months spent in the Chukchi Sea (Matt Sexson, USGS, *pers. comm*.).

Molting distribution – Beginning in late June, males arrive on molting areas, marine areas with relatively shallow coastal water usually less than 118 ft (36 m) deep (USFWS 2021), where they remain through mid-October. Non-breeding females, and those that nested but failed, arrive at molting areas in late July, while successfully breeding females and young of the year reach molting areas in late August through late September and remain through October.

Larned et al. (1995) and Petersen et al. (1999) found spectacled eiders show strong preference for specific molting locations, and concluded that spectacled eiders molt in four discrete areas during late summer and early fall: (1) eastern Norton Sound in the northern Bering Sea; (2) Ledyard Bay in the eastern Chukchi Sea; (3) Mechigmenskiy Bay off the coast of Russia in the western Bering Strait; and (4) the Indigirka-Kolyma River Deltas in the East Siberian Sea (Table 5.3; Petersen et al. 1999). Available data suggest male spectacled eiders do not necessarily favor molting areas near their breeding areas, and the majority molt in northern Russia (Petersen et al. 1999, USGS unpublished data), while females generally use molting areas nearest their breeding grounds (Petersen et al. 1999; Sexson et al. 2014, 2016). Satellite transmitter data collected from the 1990s and 2008 to 2011 show that marked spectacled eiders used the same general molting areas identified in Petersen et al. (1999), but the core distribution within each area has shifted (Sexson et al. 2016).

Table 5.3 - Important molting areas for male (M) and female (F) spectacled eiders from each breeding population. Locations identified in Petersen et al. 1999; Sexson et al. 2014, 2016; USGS, unpublished data.

Major Molting Areas	**Breeding Population and Sex**					
	ACP		**Y-K Delta**		**Russia**	
	M	F	M	F	M	F
Ledyard Bay, eastern Chukchi Sea	X	X			X	
Eastern Norton Sound, NE Bering Sea		X	X	X		
Mechigmenskiy Bay, western Bering Strait	X	X	X		X	
Indigarka-Kolyma River Deltas, East Siberian Sea	X		X		X	
Unknown						X

Wintering – Spectacled eiders from all three breeding populations generally depart molting areas in late October/early November (Petersen and Douglas 2004, Sexson et al. 2014, Sexson 2015), migrating offshore in the Chukchi and Bering Seas to their wintering areas in the Bering, Beaufort, and Chukchi Seas. Spectacled eiders use marine habitats in the open ocean or in polynyas (open water at predictable, recurrent locations in sea ice covered regions), or open leads (more ephemeral breaks in the sea ice, often along coastlines) at water depths of less than 263 ft

(Petersen et al. 2000; Rizzolo et al. 2021).

The majority of spectacled eiders from all three breeding populations intermix and mingle in a single wintering area in the central Bering Sea, the "core wintering area" south-southwest of St. Lawrence Island, through March or April (Figure 5.1B). In this relatively shallow area, spectacled eiders (Petersen et al. 1999) rest and feed, diving up to 230 ft to eat bivalves, other mollusks, and crustaceans (Cottam 1939, Petersen et al. 1998, Lovvorn et al. 2003, Petersen and Douglas 2004). Recent data suggest the winter distribution of spectacled eiders and timing of northward pre-breeding movement is changing, likely as a result of decreased extent of sea ice in the Bering Sea in later winter. Y-K Delta-breeding spectacled eiders instrumented with satellite transmitters provided location data during winters 2018–2019 and 2019–2020. The data suggest some portion of the spectacled eider population moves north of the core wintering area as early as February, and the northward movements coincide with the northward movement of sea ice (Rizzolo et al. 2021).

Spring migration – Observations of spectacled eiders arriving from the north or northwest to the Y-K Delta breeding area resulted in the hypothesis that spectacled eiders used pre-breeding staging areas north of the core wintering area (Dau and Kistchinski 1977, McCaffery et al. 1999). Data collected through satellite telemetry supports this hypothesis. Spectacled eiders instrumented with satellite transmitters from 2008 to 2011 dispersed from the northern Bering Sea wintering area as sea ice retreated northward, in March or April (Figure 5.3; Sexson et al. 2014). Most eiders used nearshore areas of the western Bering Strait, near Mechigmenskiy Bay, prior to moving to staging areas. Birds moved to staging areas in ice leads immediately offshore of breeding areas in April (Y-K Delta) or May (eastern Chukchi Sea or East Siberian Sea). Some marked spectacled eiders also staged in southern Norton Sound prior to moving to the Y-K Delta breeding area (Sexson et al. 2014). Timing of arrival to pre-breeding and breeding areas is dictated by availability of open water in marine areas *en route* and adjacent to terrestrial breeding habitat (Petersen et al. 2000), and spectacled eiders likely make extensive use of the eastern Chukchi Sea spring lead system.

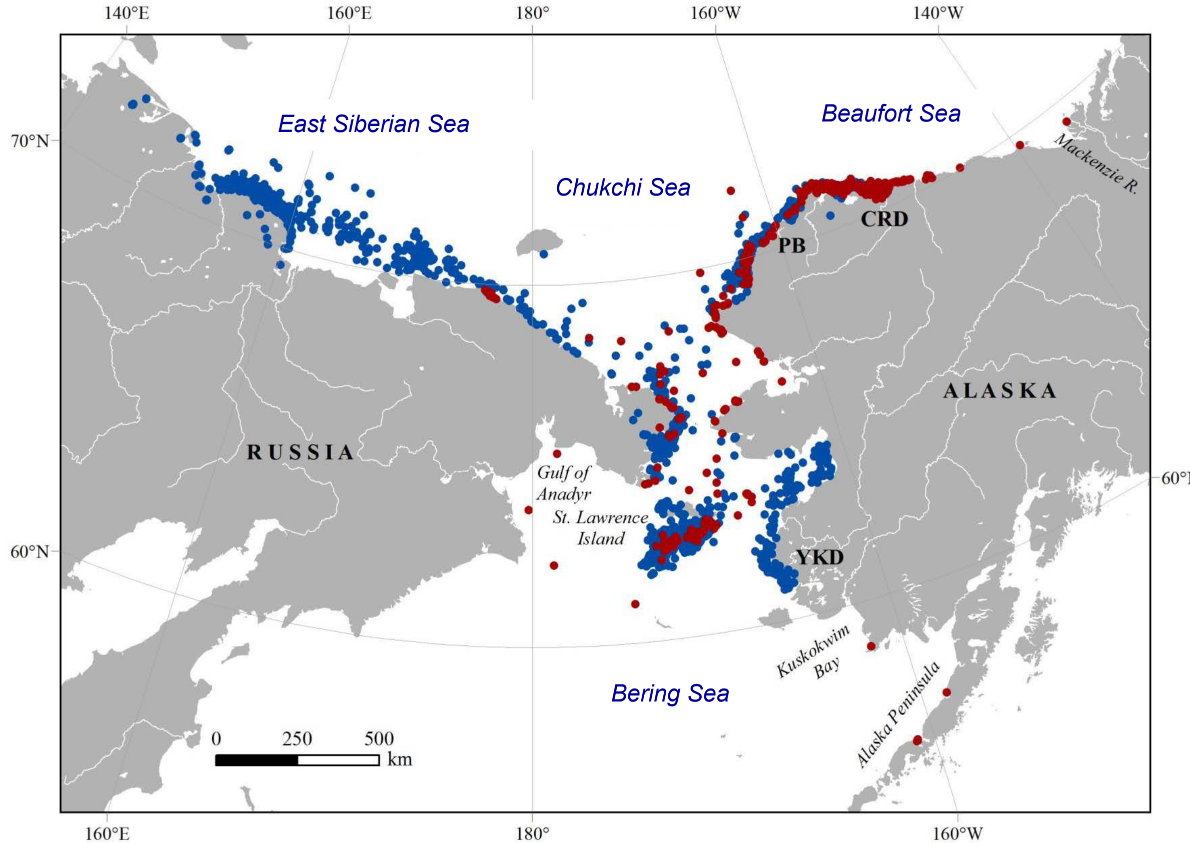

Figure 5.3 - Satellite telemetry locations received from 89 adult (blue points, n = 6,813) and 27 juvenile (red points, n = 371) spectacled eiders between 30 May 2008 and 9 August 2012. We implanted satellite transmitters in spectacled eiders in the Y-K Delta in 2008, at Peard Bay (PB) in 2009, and in the CRD in 2009–2011 (Sexson et al. 2014).

Abundance and trends

All three breeding populations winter together in one area of the Bering Sea, and surveys of spectacled eiders in the wintering area therefore present an opportunity to estimate the size of the global population. Aerial surveys of the wintering area in the Bering Sea were conducted 1995 to 1998, 2009 to 2010, and 2020 (Rizzolo et al. 2021, Larned et al. 2012). The best estimate of the wintering population during 1995 to 1998 is from 1997, which resulted in an estimate of 363,030 spectacled eiders (95% CI = 333,526–392,532; Larned and Tiplady 1997; Larned et al. 2012). The best survey from 2009 to 2010 was conducted in 2010 and resulted in an estimate of 369,122 spectacled eiders (90% CI = 364,190–374,054; Larned et al. 2012). These surveys were designed as near censuses, were conducted under optimal conditions, and we consider them to be accurate characterizations of the minimum size of the global population (USFWS 2021).

The most recent aerial survey was conducted in 2020, using methods similar to previous surveys. The 2020 survey resulted in a count of 76,592 spectacled eiders (USFWS 2021). Spectacled eider flock behavior, size, and location were notably different in 2020 than in the two prior survey periods, as were sea ice conditions. Additionally, detection within the survey area was likely less than 100 percent due to smaller flock size and increased open water conditions. Thus, the 2020 count should be considered as a crude minimum count, which is not comparable to previous counts (USFWS 2021).

Y-K Delta breeding population – The Y-K Delta spectacled eider population is thought to have declined by about 96 percent from the 1970s to 1992 (Stehn et al. 1993). Evidence of the dramatic decline in spectacled eider nesting on the Y-K Delta was corroborated by Ely et al. (1994), who found a 79 percent decline in eider nesting near the Kashunuk River between 1969 and 1992. Aerial and ground survey data indicated that spectacled eiders declined 9 to 14 percent per year from 1985 to 1992 (Stehn et al. 1993). Furthermore, from the early 1970s to the early 1990s, the number of breeding pairs on the Y-K Delta declined from 48,000 to 2,000, apparently stabilizing at that low level (Stehn et al. 1993). Since listing, the Service has relied on two coordinated surveys to provide indices of spectacled eider abundance on the Y-K Delta. A standardized aerial survey was conducted in the coastal zone of the Y-K Delta from 1985 to 2019 (breeding pair survey; Fischer et al. 2018, Lewis et al. 2019). This survey provides indices of population abundance, uncorrected for detection. In addition, a ground-based nest survey was conducted in a smaller subset of the Y-K Delta breeding area from 1985 to 2019 (nest plot survey; Fischer et al. 2018, Lewis et al. 2019). This survey reported the number of nests found, corrected for imperfect detection.

Fischer and Stehn (2013) used combined annual ground-based and aerial survey data to estimate the number of spectacled eider nests on the coastal area of the Y-K Delta in 2012 and evaluated long-term trends in the breeding population from 1985 to 2012. In a given year, the estimated number of nests reflects the minimum number of breeding pairs in the population and does not include non-nesting individuals or nests that were destroyed or abandoned (Fischer and Stehn 2013). The total number of spectacled eider nests on the Y-K Delta in 2012 was estimated at 8,062 (SE = 1,110, or 90% CI = 6,236–9,888). The average population growth rate based on these surveys was 0.999 (90% CI = 0.986–1.012) in 1985–2012, and 1.058 (90% CI = 1.005–1.113) over the most recent 10 years of data (2003 to 2012; Fischer and Stehn 2013). Log-linear regressions based solely on the long-term Y-K Delta aerial survey data indicate positive population growth rates of 1.070 (90% CI = 1.058–1.081) in 1988 to 2010 and 1.073 (90% CI = 1.046–1.100) in 2001 to 2010 (Platte and Stehn 2011).

To estimate the abundance and growth of the Y-K Delta breeding population over the most recent time period, Dunham et al. (2021) used a Bayesian state-space model and annual estimates of breeding birds (2007 to 2019), corrected for detection. The posterior mean abundance of the Y-K Delta breeding population in 2019, was 16,113 eiders (95% CRI = 12,313–21,352; Dunham et al. 2021). This estimate represents breeding birds in the Y-K Delta population and does not include non-nesting individuals and juveniles that may have remained in marine areas. The posterior mean population growth rate of the Y-K Delta breeding population was 0.016 (95 percent CRI: -0.065–0.091) from 2007 to 2019 (Dunham et. al. 2021).

In addition, the Service conducted a Bayesian population viability analysis to estimate population abundance and growth rate of spectacled eiders using the available demographic data and population abundance data. The Integrated Population Model-Population Viability Analysis (IPM-PVA) model is detailed in USFWS (2021). The IPM-PVA estimated mean abundance of the Y-K Delta breeding population in 2019 as 14,027 spectacled eiders (95% CI = 9,781–18,257), and the mean annual population growth rate from 1988 to 2019 as 1.053 (95% CI =

1.035–1.069; USFWS 2021).

ACP breeding population – Population indices for spectacled eiders breeding on the ACP prior to 1992 are unavailable. However, Warnock and Troy (1992) documented an 80 percent decline in spectacled eider abundance from 1981 to 1991 in the Prudhoe Bay area. Since 1992, the Service has conducted annual aerial surveys for breeding spectacled eiders on the ACP. The survey underwent some changes to methodology in 2007, and that methodology has been used consistently since (Wilson et al. 2018).

The 2010 population index based on these aerial surveys was 6,286 birds (95% CI = 4,877–7,695; unadjusted for detection probability), which is 4 percent lower than the 18-year mean (Larned et al 2011). In 2010, the index growth rate was significantly negative for both the long-term (0.987; 95% CI = 0.974–0.999) and most recent 10 years (0.974; 95% CI = 0.950–0.999; Larned et al. 2011). Stehn et al. (2006) developed a North Slope-breeding population estimate of 12,916 (95% CI = 10,942–14,890) based on the 2002 to 2006 ACP aerial index for spectacled eiders and relationships between ground and aerial surveys on the Y-K Delta. If the same methods are applied to the 2003 to 2012 ACP aerial index, the resulting adjusted population estimate for North Slope-breeding spectacled eiders is 14,814 (90% CI = 13,501–16,128; Stehn et al. 2013).

To estimate the abundance and growth of the ACP breeding population over the most recent time period, Dunham et al. (2021) used a Bayesian state-space model and annual estimates of breeding birds (2007 to 2019), corrected for detection. The posterior mean abundance of the ACP breeding population in 2019, which is the best available estimate for the number of spectacled eiders breeding in this region, is 6,401 eiders (95% CRI = 3,766–9,750; Dunham et. al. 2021). The posterior mean population growth rate of the ACP breeding population is -0.005 (95% CRI: -0.092–0.082) from 2007 to 2019 (Dunham et. al. 2021).

The IPM-PVA model estimated mean abundance of the ACP breeding population in 2019 as 5,408 spectacled eiders (95% CI = 3,696–7,364), and the mean annual population growth rate from 1988 to 2019 as 0.996 (95% CI = 0.982–1.008). Restricted to 2007 – 2019, the mean annual growth rate is estimated as -0.025 (95 percent CRI: -0.055 – 0.004; USFWS 2021).

Arctic Russia breeding population – Information on abundance, distribution, and trend of the Arctic Russia breeding population is extremely limited. Aerial surveys conducted in Arctic Russia from 1993 to 1995 produced an index of 146,425 spectacled eiders (coefficient of variation = 0.08, unadjusted for detection rate; Hodges and Eldridge 2001). These surveys were conducted within 124 miles of the coast, between the Kolyuchin and Lena Rivers, where most of the population is thought to nest. Current Arctic Russia breeding population trend and abundance are unknown, except what can be inferred from estimates of the global wintering population. Using the most recent estimate of global population size, less the combined Alaska breeding population estimates, the minimum Arctic Russia breeding population of spectacled eiders in March 2020 was 46,995 spectacled eiders (USFWS 2021).

The 2020 survey represents a low count for the global wintering population of spectacled eiders. A decline in the Arctic Russia breeding population cannot be ruled out as a possible contributor to the low count, but data is not available with which to estimate a trend (USFWS 2021). The low count in the 2020 survey of the global population could also reflect incomplete detection within the survey area, and/or the presence of spectacled eiders outside the survey area (USFWS 2021).

Spectacled eider recovery criteria
The Spectacled Eider Recovery Plan (USFWS 1996) presents research and management priorities with the objective of recovery and delisting so that protection under the ESA is no longer required. Although the cause or causes of the spectacled eider population decline is/are not known, factors that affect adult survival are likely to have the most influence on population growth rate. These include lead poisoning from ingested spent shotgun pellets, which may have contributed to the rapid decline observed in the YK-Delta (Franson et al. 1995, Grand et al. 1998), and other factors such as habitat loss, increased nest predation, overharvest, and disturbance and collisions caused by human infrastructure. Under the Recovery Plan, the species will be considered recovered when each of the three recognized populations (Y-K Delta, North Slope of Alaska, and Arctic Russia): (1) is stable or increasing over 10 or more years and the minimum estimated population size is at least 6,000 breeding pairs, or (2) numbers at least 10,000 breeding pairs over 3 or more years, or (3) numbers at least 25,000 breeding pairs in one year. Spectacled eiders do not currently meet these recovery criteria.

Threats

Factors which may have contributed to the current status of spectacled eiders include but are not limited to long-term habitat loss through development and disturbance, environmental contaminants, increased predator populations, harvest, collisions with structures, research, and climate change. These threats are summarized below; a more comprehensive analysis of these threats to spectacled eiders can be found in the Species Status Assessment (USFWS 2021).

Terrestrial habitat loss and disturbance through development
Destruction or modification of spectacled eider nesting habitat and development-related disturbance have been limited and are not believed to have contributed substantially to population declines of spectacled eiders. However, development has likely impacted individual spectacled eiders by reducing available nesting and brood-rearing habitat. Human activity has likely impacted individual spectacled eiders through disturbance to nesting females and young, and disturbance to juveniles and adults during molt, fall and spring migration, and the wintering period.

On the Y-K Delta, long-term habitat loss from human development has been minimal (USFWS 2021). No oil and gas or mining activities have occurred within the primary breeding area of spectacled eiders or within designed critical habitat. While there has been some population increase in the handful of communities within the Y-K Delta, village footprints have seen little expansion; and overcrowding of housing is an ongoing, significant issue (AHFC 2017). On the ACP, extensive oil and gas development has occurred around Prudhoe Bay, extending from the western border of the Arctic National Wildlife Refuge to the eastern border of the National Petroleum Reserve in Alaska. This has resulted in long-term loss of spectacled eider breeding habitat, directly (e.g., through gravel extraction and the building of roads and other infrastructure) and indirectly (e.g., through disturbance from oilfield activities). The actual footprint of oil and gas infrastructure is small relative to the overall geographic distribution of spectacled eiders on the ACP. However, oil and gas developments have gradually progressed westward across the ACP. Given ongoing industry interest in the region (expressed in lease sales, seismic surveys, and exploratory wells), industrial development farther into spectacled eider breeding habitat on the ACP is likely to continue.

Additionally, community populations on the ACP, including that of Utqiaġvik, have been increasing. With the development of community infrastructure, spectacled eiders likely have experienced some loss of reproductive potential from direct and indirect habitat loss. Overall, direct, long-term habitat loss on the ACP due to both community and oil and gas development has not had a major impact on the core area of spectacled eider terrestrial habitat in this region to-date but may be a concern in the future with continued expansion. Similar data due to community infrastructure and industrial development is unavailable for Arctic Russia. However, this region of Russia is generally characterized as remote and sparsely populated.

Disturbance from human activities may affect individual spectacled eiders in a variety of ways, including by forcing birds to move away from preferred foraging, nesting, and brood-rearing habitats; by flushing incubating birds off nests or hens away from broods, increasing vulnerability of eggs and young to exposure and predation; and finally, by reducing adult survival if disturbance is frequent and/or in combination with other stressors. It is unknown to what degree spectacled eiders can reproduce successfully in disturbed areas or move to less-disturbed areas to successfully reproduce. The likelihood that disturbance from activities associated with human development is currently affecting spectacled and eiders at the population-level is low, given their wide breeding distribution versus the relatively limited human footprint within the Action Area and Arctic Russia. However, as infrastructure expands, the overall effect of disturbance and habitat loss may increase.

Environmental contaminants

Deposition of lead shot in tundra wetlands and shallow marine habitat where eiders forage is considered a threat to spectacled eiders, and also affects the suitability of designated critical habitat. Lead poisoning has been documented in spectacled eiders on the Y-K Delta (Franson et al. 1995; Grand et al. 1998; Flint et al. 2016) and in Steller's eiders on the ACP (Trust et al. 1997; Service unpublished data). The use of lead shot in waterfowl hunting has been prohibited in the United States since 1991. On the ACP and Y-K Delta, lead shot is prohibited in the hunting of all bird species (banned by the State of Alaska at the request of regional advisory boards in 2006 and 2007, respectively), and on the Y-K Delta (where critical habitat is designated for spectacled eiders) it is also prohibited. It is hypothesized that lead poisoning has contributed to population declines of spectacled eiders, but to what extent, on its own or in combination with other stressors, is unknown. While the use of lead shot appears to be declining in the Action Area, there is evidence lead shot is still available for purchase in some communities adjacent to habitats used by spectacled eiders (including designated critical habitat; USFWS, unpublished observations). Waterfowl will presumably continue to be exposed to residual lead shot in the environment annually and for some time into the future, and lead exposure will continue to be a factor affecting spectacled eiders and the suitability of designated critical habitat on the Y-K Delta.

Other contaminants, including petroleum hydrocarbons from local sources or globally distributed heavy metals, may also affect spectacled eiders. For example, spectacled eiders wintering near St. Lawrence Island exhibited high concentrations of metals as well as subtle biochemical changes (Trust et al. 2000). Additionally, spectacled eiders breeding and staging in areas of industrial development, including the CRD, may be exposed to petroleum hydrocarbons, heavy metals, and other contaminants. Vessel traffic and industrial development also pose a risk of hydrocarbon exposure as a result of oil spills to the marine environment, including to critical habitat designated for spectacled eiders. Overall, risk of contaminant exposure and potential affects to spectacled eiders and critical habitat are unmeasured. With vessel traffic and industrial development increase within the marine habitats used by spectacled eiders, risk of hydrocarbon and other contaminant exposure will also increase.

Collisions with structures

Migratory birds suffer considerable risk from collisions with human-made structures (Manville 2005), including light poles, buildings, drill rigs, towers, wind turbines, and overhead powerlines. Collisions can cause immediate mortality, injury leading to death, or temporary injury. A study in the Prudhoe Bay oil fields found that collision rate along a 7.8-mile power line during 1986 and 1987 was related to flight height (Anderson and Murphy 1988). Johnson and Richardson (1982) reported that 88 percent of eiders observed in a study along the Beaufort Sea coast flew below an estimated altitude of 32 feet, and well over half flew below 16 feet. Day et al. (2003) estimated a mean flight altitude of 6 feet for eider species flying past St. Lawrence Island, Alaska in the fall. This tendency to fly low puts eiders at risk of striking even relatively low objects in their path.

Spectacled eiders are most at risk of collision with structures on the breeding grounds and during migration. Human structures, including buildings and powerlines, are sparse and limited on the Y-K Delta, and collision risk to spectacled eiders is not significant in this region, including within designated critical habitat. Relative to the Y-K Delta and Arctic Russia spectacled eider breeding populations, ACP-breeding spectacled eiders likely have a higher collision risk due to more extensive human development in the Prudhoe Bay oil fields, near Utqiaġvik, and along the Beaufort Sea coast, where several offshore oil facilities are operating or in construction. While systematic surveys have not been conducted, low numbers of spectacled eider collisions with powerlines or structures were documented from 1991 to 2019 near Utqiaġvik and in Prudhoe Bay (USFWS, unpublished data).

It is difficult to measure the population-level effect of collisions on spectacled eiders. Several factors confound accurate collision estimates, including (1) annual variation in eider density and distribution; (2) how feature configurations (e.g., presence or absence of guy wires) contribute to avian attraction, disorientation, and collision; and (3) how variations in weather and lighting conditions affect probability of collisions. The Service consults with Federal agencies on most industrial and community development on the ACP and seeks to minimize collision risk through various measures (including design considerations, such as avoiding the use of guyed towers, keeping lighting to a minimum). Nevertheless, some unknown level of collision risk remains over the life of human-made infrastructure, and evidence suggests some number of individual spectacled eiders are killed annually by collisions. Development is projected to increase on the

ACP and along the coast of Arctic Russia in the future (BOEM 2018, Rosneft 2020a, Roseneft 2020b), which will likely increase the risk of collisions for spectacled eiders.

Vessel disturbance and collisions
Vessels used for shipping, fishing, research, and tourism transit through spectacled eider marine habitats, including migration corridors, molting areas, and wintering areas. The majority of spectacled eider marine habitat, including designated critical habitat in molting areas in Norton Sound and Ledyard Bay and the wintering area southwest of St. Lawrence Island, has historically had low levels of vessel traffic (USFWS 2021).

In the marine environment, spectacled eiders may be most at risk of vessel disturbance and collision during molt, when they have limited ability to move away and are under higher energetic demand, and during winter, when light and weather conditions might contribute to risk (USFWS 2021). Some vessel traffic is subject to consultation with the Service; and for those that consult, the Service recommends measures to mitigate disturbance and risk of collision. Recommended measures include reduced vessel speed or avoiding major molting areas during the molting period. As vessel traffic increases, disturbance and collisions may become more of a concern for spectacled eiders, including in designated critical habitat.

Increased Predator Populations
Human development within the range of spectacled eiders may artificially increase the availability of food and nest/denning sites for avian and mammalian predators, thereby driving predator population increases and indirectly increasing predation on spectacled eiders and their eggs. Human-made structures provide denning sites for foxes and nest sites for ravens, which have allowed them to expand their range to parts of the ACP and Y-K Delta where they were not found prior to human development (Eberhardt et al. 1983; Day 1998; Powell and Backensto 2009; USFWS, unpublished observations). Reduced fox trapping on the ACP and increased anthropogenic food sources in developed areas of both regions (e.g., from landfills and marine mammal carcasses) may support higher gull, raven, and fox populations than were historically present (Day 1998, Powell and Backensto 2009). On the Y-K Delta, where critical habitat has been designated in spectacled eider nesting areas, predator populations may be increasing but at lower rates than on the ACP (USFWS 2021). No systematic surveys of nest predators are conducted in Arctic Russia, but observations at Chaun suggest the population of large gulls may have increased over the past three decades (Solovyeva and Zelenskaya 2016) and may have resulted in higher spectacled eider nest predation rates (Solovyeva et al. 2018).

Individual spectacled eiders in the vicinity of communities and industrial areas have likely been impacted by increased predator populations. Ravens are highly efficient egg predators (Day 1998), and have been observed depredating Steller's eider nests near Utqiaġvik (Quakenbush et al. 2004). It is possible increased predator populations have had consequences at the population-level, but the overall severity of impacts has been difficult to quantify. While some localized efforts have been made to reduce predator populations that have increased due to human subsidies, there is no information regarding the effectiveness of these measures (USFWS 2021). As the number of anthropogenic attractants increases near breeding populations of spectacled eiders, reproductive success of spectacled eiders may decrease, and population-level effects may become more apparent.

Harvest, including egging and shooting
An unknown level of incidental and intentional harvest of spectacled eiders and their eggs occurs in both Alaska and Russia. Regulatory mechanisms and outreach/education efforts may lower harvest of spectacled eiders and their eggs in the future, but to our knowledge such efforts are confined to Alaska and have not occurred in Russia. Spectacled eiders may be harvested during migration, during the breeding period on the tundra, or in the marine staging and molting areas.

All harvest of spectacled eiders was closed in 1991 by Alaska State regulations and Service policy, and outreach efforts have been conducted on the ACP by the Service, North Slope Borough (NSB), and BLM to encourage compliance. However, annual harvest surveys indicate that some spectacled eiders continue to be incidentally taken during subsistence activities in the NSB. Although local knowledge suggests spectacled eiders have not been specifically targeted for subsistence, spectacled eiders may be subject to misidentification and inadvertent harvest. They could also be taken if hunters are unaware of species-specific closures, or they could be taken deliberately (USFWS 2020a). Ongoing efforts to help subsistence users avoid incidental harvest are being implemented in NSB villages, particularly in Utqiaġvik where the perceived risk for spectacled eiders is greatest due to their relatively high rates of occurrence and occupancy in areas commonly used for hunting. Similar outreach is not conducted on the Y-K Delta at this time.

The harvest of spectacled eiders is legally prohibited in Russia, as is any activity that may result in habitat degradation or a reduction in numbers (USFWS 2021). Exceptions include subsistence purposes for indigenous people. We do not have reliable information on the enforcement of harvest regulations and harvest levels in Russia (USFWS 2021).

Research
Field-based scientific research has also intensified in response to interest in climate change and its effects on arctic ecosystems. While some activities have no impact on spectacled eiders (e.g., a project that occurs when eiders are absent or employs remote sensing tools), other activities could have negative direct (e.g., through nest trampling or collection of eiders or their eggs) and indirect (e.g., through disturbance) effects. Activities that could affect spectacled eiders through disturbance include aerial surveys, on-tundra activities, or remote aircraft landings. Many of these activities are considered in intra-Service consultations, or under a programmatic consultation with the BLM for summer activities in the NPR-A.

The Service has also issued permits under section 10 of the ESA to authorize take of endangered or threatened species for the purpose of propagation, enhancement, or survival. Since 1993, annual reporting requirements associated with section 10 permits for spectacled eiders indicate that approximately 11 spectacled eider adults and 5 eggs have been taken as an indirect result of research activities.

Disease, parasites, bacteria, and biotoxins
Spectacled eiders may be affected by naturally occurring diseases, parasites, and biotoxins (e.g., from harmful algal blooms) through a direct effect on individuals or through impacts to food quality (USFWS 2021). Exposure may result in a one-time, temporary effect to individuals, or exposure may be chronic and affect future reproductive potential and survival (USFWS

2021). The effects of disease, parasites, toxins, and bacteria to individual eiders have not been evaluated, and studies on population-level effects of these stressors on sea ducks are lacking (Hollmen and Franson 2015; USFWS 2021).

Climate Change

The environmental baseline includes consideration of ongoing and projected changes in climate, using terms as defined by the Intergovernmental Panel on Climate Change (IPCC). Various types of changes in climate can have direct or indirect effects on 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).

Globally, climate change is characterized by warming atmospheric and ocean temperatures, diminishing snow and ice cover, and rising sea levels (IPCC 2014). High latitude regions such as the ACP, Arctic Russia, and even the subarctic Y-K Delta are thought to be especially sensitive to effects of climate change (Quinlan et al. 2005; Smol et al. 2005; Schindler and Smol 2006). Climate change will likely have impacts at multiple scales (e.g., at the level of individual organisms and the community level), but it is difficult to predict with certainty how effects will manifest. Biological, climatological, and hydrologic components of the ecosystem are interlinked and operate on varied spatial, temporal, and organizational scales with feedback between components (Hinzman et al. 2005).

Marine environment – The North Pacific Ocean, including the Bering Sea, is subject to longer-term cycles in oceanic conditions, such as the Pacific Decadal Oscillation, and regime shifts that are defined by rapid changes in ecosystem structure. We do not have adequate information to characterize the effects of marine regime shifts on spectacled eiders (USFWS 2021), but signals of regime shifts include alterations to primary productivity, invertebrate populations, and fisheries that then persist at a decadal time scale (Overland et al. 2008).

Despite regime shifts over decadal scales, data suggests the North Pacific Ocean and Arctic Ocean, which includes the Beaufort, Chukchi, and East Siberian Seas, may be warming overall. Over large areas of the seasonally ice-free Arctic, summer sea surface temperatures have increased around 0.5° per decade from 1982 to 2017 (IPCC 2019). Trend analyses of the Chukchi Sea have shown warming over the past 96 years, and the rate of warming has increased in recent decades (Danielson et al. 2020). Historically, the climate of the Bering Sea has shifted from alternating warm and cold years, but more recently has been dominated by multi-year warm periods (Stabeno et al. 2007). Climate-induced changes in sea surface temperature may have cascading effects to the marine ecosystem, including negative effects on bivalves that result from a corresponding increase in ocean acidification. An indirect effect of climate change to spectacled eiders may therefore be a decrease in the abundance of benthic bivalve prey in marine habitats.

Arctic sea ice, including that in the Chukchi, Beaufort, and Bering seas, has been declining in extent and concentration in recent decades (IPCC 2019). Changes in sea ice are particularly apparent in the Bering Sea, and it is very likely that projected Arctic warming will result in a continued loss of sea ice in the future (USFWS 2021). A reduction or disappearance of sea ice during portions of the winter could affect spectacled eiders by requiring them to remain in open water rather than use sea ice as a resting platform. Spectacled eiders may also have to contend with more extreme wave conditions in the absence of sea ice and its dampening effect. Both factors may directly affect spectacled eiders by increasing energetic requirements during winter, with possible negative effects to body condition, reproduction, and even survival (Lovvorn et al. 2009). In addition, with extended open water season and increased extent of open water in the Bering and southern Chukchi seas, vessel traffic is expected to increase, which increases the risk to spectacled eiders of collisions, disturbance, and oil spills.

Climate-related changes in the marine environment could reduce the suitability of designated critical habitat for spectacled eiders. We do not know whether spectacled eiders might behaviorally adapt to such ecosystem changes by moving to new habitat. Data show at least some portion of the spectacled eider wintering population may move north in response to sea ice retreat (USFWS 2021), but we do not know how northward migration affects subsequent survival or reproductive capacity.

Terrestrial and freshwater environment – A wide variety of climate-related changes are also occurring in terrestrial habitat across the circumpolar Arctic, including tundra areas where spectacled eiders nest and raise broods. Some impacts from increasing air temperatures in the sub-Arctic and Arctic include: erratic weather patterns, changing snow conditions, increased pond temperatures that could influence primary productivity and invertebrate communities, permafrost degradation and erosion contributing to declines in pond area and abundance, and storm surge flooding that increases salinity in freshwater ponds.

Spectacled eiders depend on landscapes dominated by freshwater wetlands for foraging and brood rearing (Quinlan et al. 2005). Water bodies in subarctic and arctic tundra are draining in response to thawing permafrost (Oechel et al. 1995; Smith et al. 2005), or due to increased evaporation and evapotranspiration during prolonged ice-free periods (Schindler and Smol 2006; Smol and Douglas 2007). Such climate-related changes could have cascading effects to the reproductive success of spectacled eiders. Changes in water chemistry or temperature are altering nutrient loads, primary productivity, and invertebrate communities that form the basis of the arctic food web (Chapin et al. 1995; Hinzman et al. 2005; Quinlan et al. 2005; Smol et al. 2005; Lougheed et al. 2011). We do not know how these changes act singularly or in combination to affect the quality of nesting or brood-rearing habitat, the aquatic invertebrate community spectacled eiders depend on for food, or whether they contribute to phenological mismatches between spectacled eiders and their tundra wetland invertebrate prey stock (USFWS 2021).

In the Utqiaġvik Triangle, there has been a 30.3 percent net decrease in pond area and a 17.1 percent decrease in pond abundance from 1948 to 2010 (Andersen and Lougheed 2015), and there is strong evidence that permafrost loss caused by climate change is decreasing large lake area and abundance in areas with discontinuous permafrost, including parts of subarctic Alaska (Riordan et al. 2006). Permafrost degradation could also contribute to a decrease in tundra pond habitat for nesting and brood-rearing eiders in areas with continuous permafrost, such as the ACP and Arctic Russia. The low-relief Y-K Delta could also be susceptible to impacts from an increase in the magnitude and frequency of coastal storm surges and storm-driven flood ties

(Jorgenson and Ely 2001, IPCC 2014); and increased storminess may be exacerbated by a reduction in sea ice coverage, which has a dampening effect on wave action (IPCC 2014). During flood-tide events in this region, coastal lakes and low-lying wetlands are often breached, altering soil/water chemistry as well as floral and faunal communities (USGS 2006; Terenzi et al. 2014). The frequency and magnitude of coastal storm surges is expected to continue increasing (IPCC 2014). When coupled with softer, semi-thawed permafrost, reductions in sea ice have also significantly increased coastal erosion rates (USGS 2006). The overall effect may be a reduction in available coastal tundra habitat over time, especially on the Y-K Delta. Critical habitat has been designated on the Y-K Delta for spectacled eiders, and impacts in this region could be detrimental, especially to the nesting success of spectacled eiders (USFWS 2021).

Changes in precipitation patterns and air and soil temperatures are also affecting terrestrial ecosystems in the subarctic and Arctic (Chapin et al. 1995; Hinzman et al. 2005; Prowse et al. 2006). Snow cover duration in the Arctic is projected to decrease 5 to 25 percent by the end of the century (IPCC 2019), while total precipitation and rain-on-snow events are expected to increase (IPCC 2014, ACIA 2005). These conditions may affect microtine populations (Aars and Ims 2002, Kausrud et al. 2008, Gilg et al. 2009), with possible cascading effects to predator-prey dynamics and other changes throughout the tundra ecosystem (USFWS 2021). Additionally, changing weather patterns could expose spectacled eiders to harsher weather during the breeding season, which could increase energy requirements and/or impact reproductive effort and success (USFWS 2021).

While the impacts of climate change are ongoing, and the ultimate effects on spectacled eiders and critical habitat are unclear, climate-related changes in habitats used by each species throughout the annual cycle are predicted to continue. Some species may adapt and thrive under changing environmental conditions, while others decline or suffer reduced biological fitness. Species with small populations are more vulnerable to the impacts of environmental change (Crick 2004), but the net effect of climate-related changes to spectacled eiders remains to be measured.

5.2 Alaska-Breeding Steller's Eiders

The Steller's eider (anarnissakuq, caqiar(aq)/ in Central Yup'ik, Igniquaqtuq in Inupiaq, Aglekesegak in St Lawrence Island Yupik, Latin *Polysticta stelleri*) is a small sea duck with circumpolar distribution and is the sole member of the genus *Polysticta*. Males are in breeding plumage (Figure 5.4) from early winter through mid-summer. Females are dark, mottled brown with a white-bordered, blue wing speculum (Figure 5.4). Juveniles are dark, mottled brown until fall of their second year when they acquire breeding plumage.

Figure 5.4 - Male and female Steller's eiders in breeding plumage.

Steller's eiders are divided into Atlantic and Pacific populations; the Pacific population is further subdivided into the Russia-breeding and Alaska-breeding populations. Alaska-breeding birds mix together with Russia-breeding birds in molting and wintering areas, and are collectively known as the "Pacific-wintering population." Alaska-breeding Steller's eiders represent approximately one percent of the Pacific-wintering population (Stehn and Platte 2009, Larned 2012). The Alaska-breeding population of Steller's eiders was listed as threatened on July 11, 1997, based on:

- Substantial contraction of the species' breeding range on the ACP and Y-K Delta
    - Steller's eiders on the North Slope historically occurred east to the Canada border (Brooks 1915), but have not been observed on the eastern North Slope in recent decades (USFWS 2002)
    - Steller's eiders historically occurred on the coastal fringe of the Y-K Delta. They were a common breeding bird at Kokechik Bay in 1924 (62 FR 31748), and low numbers of nests were reported in southwestern Alaska, the Seward Peninsula, and St. Lawrence Island prior to 1960 (62 FR 31748);
- Reduced numbers breeding in Alaska; and
- Resulting vulnerability of the remaining Alaska-breeding population to extirpation (USFWS 1997).

In Alaska, Steller's eiders now breed almost exclusively on the ACP, and winter in southwest Alaska, along with the majority of the Russia-breeding population (Figure 5.5). In 2001, the Service designated 2,830 mi^2 of critical habitat for the Alaska-breeding population of Steller's eiders that includes: historical breeding areas on the Y-K Delta; molting and staging areas in the

Kuskokwim Shoals and Seal Islands; molting, wintering, and staging areas at Nelson Lagoon; and Izembek Lagoon (USFWS 2001). No critical habitat has been designated for Steller's eiders on the ACP.

Life History

Breeding – Steller's eiders arrive in small flocks of breeding pairs on the ACP in early June. Nesting on the ACP is concentrated in tundra wetlands near Utqiaġvik (Figure 6.5), and occurs at lower densities elsewhere on the ACP from Wainwright east to the Sagavanirktok River (Quakenbush et al. 2002; Obritschkewitsch and Ritchie 2017). Annual nesting effort near Utqiaġvik varies considerably (Graff 2018). This could be in part due to variation in detection rate (USFWS 2019). However, long-term studies of Steller's eider breeding ecology near Utqiaġvik were thought to indicate periodic non-breeding by the entire local population. From 1991 to 2010, Steller's eider nests were detected in 12 of 20 years (Safine 2011). It is now thought, especially given observations since 2005, annual nesting effort of Steller's eiders near Utqiaġvik might be better characterized as falling on a continuum of low to high effort, rather than the binomial breeding or non-breeding (USFWS 2011a).

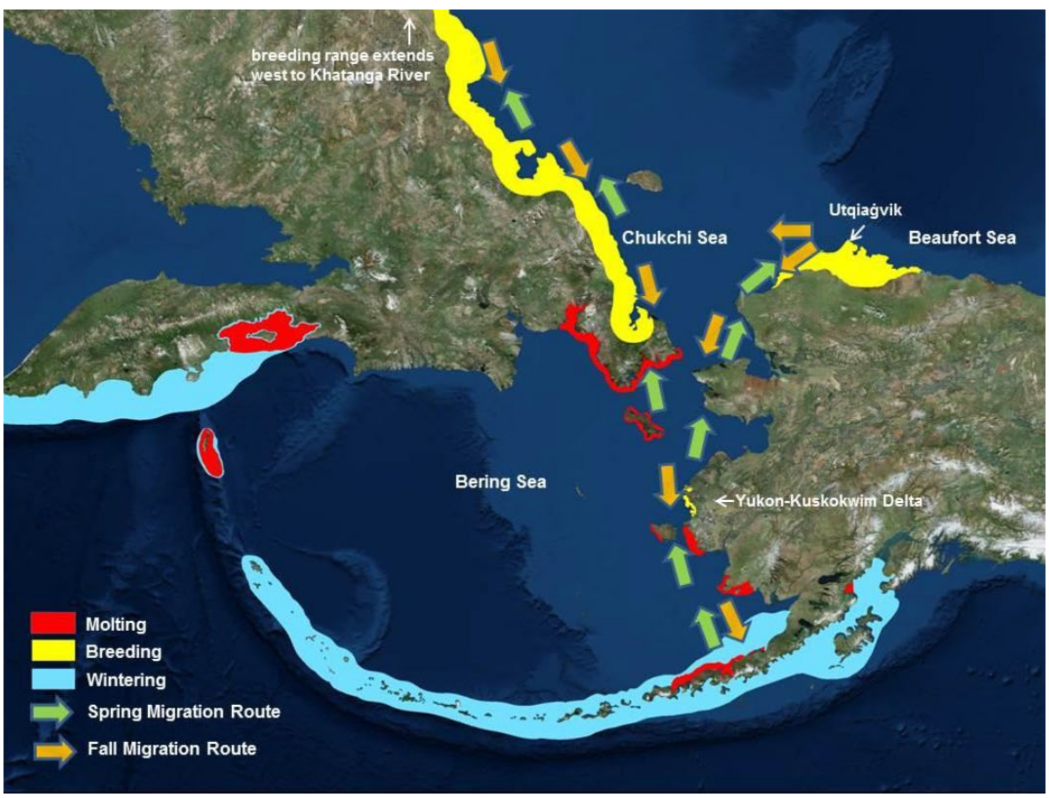

Figure 5.5 - Steller's eider distribution in the Bering, Chukchi, and Beaufort Seas. The area around Utqiaġvik has the highest density of breeding Steller's eiders in Alaska. Figure from USFWS 2019.

Steller's eider breeding effort near Utqiaġvik seems to be higher in years of high lemming and predator abundance (Quakenbush et al. 2004, USFWS 2019). During years of peak abundance, brown lemmings (*Lemmus trimucronatus*) are a primary food source for predators including jaegers, owls, and foxes (Pitelka et al. 1955a, b; MacLean Jr. et al. 1974; Larter 1998; Quakenbush et al. 2004). It is hypothesized that Steller's eiders and other ground-nesting birds increase reproductive effort during lemming peaks because predators preferentially select (prey-switch) for hyper-abundant lemmings, reducing the likelihood of bird nests being depredated (Roselaar 1979; Summers 1986; Dhondt 1987; Quakenbush et al. 2004). Furthermore, nesting effort is also higher for pomarine jaegers (*Stercorarius pomarinus*) and snowy owls (*Bubo scandiacus*) during high lemming abundance, and Steller's eider nest survival (the probability of at least one duckling hatching) has been reported as a function of distance from nests of these species (Quakenbush et al. 2004). These avian predators aggressively defend their nests against other predators, and this defense likely indirectly imparts protection to Steller's eiders nesting nearby.

Steller's eiders typically initiate nesting in mid- June, but timing of nest initiation is affected by timing of snowmelt, which varies annually (Graff 2018). Nests are commonly located on the rims of polygon-shaped tundra, near permanent water bodies dominated by *Carex aquatilis* and *Arctophila fulva* (Quakenbush et al. 2004, USFWS 2011a). Mean clutch size at Utqiaġvik was 5.4 ± 1.6 SD (range = 1–8) over 5 nesting years between 1992 and 1999 (Quakenbush et al. 2004). Breeding males depart the area following onset of incubation by females. Steller's eider nest failure has been attributed to depredation by jaegers, common ravens (*Corvus corax*), arctic fox, glaucous gulls (*Larus hyperboreus*), and in at least one instance, polar bears (Quakenbush et al. 1995; Rojek 2008; Safine 2011, 2012).

Hatching typically occurs from mid-July through early August, after which hens move their broods to adjacent ponds with emergent vegetation (Quakenbush et al. 2004; USFWS 2011a). In these brood-rearing ponds, hens with ducklings feed on aquatic insect larvae and freshwater crustaceans. In general, broods remain within 0.5 miles of their nests (Quakenbush et al. 2004), although movements of up to 2.2 miles from nests have been documented (Rojek 2006, 2007). Large distance movements from hatch sites may be a response to the drying of wetlands, which would normally be used for brood rearing (Rojek 2006). Fledging occurs 32 to 36 days post hatch (Quakenbush et al. 2004; USFWS 2011a).

Information on breeding site fidelity of Steller's eiders is limited. However, ongoing research at Utqiaġvik has documented some cases of site fidelity in nesting Steller's eiders. Since the mid-1990s, eight banded birds that nested near Utqiaġvik were recaptured in subsequent years near Utqiaġvik where they nested again. Time between capture events ranged from 1 to 12 years and distance between nests ranged from 0.06 to 3.9 miles (USFWS, unpublished data).

Nest survival – Mean nest survival rate for Steller's eiders (1991 to 2018) was 0.3 (95% CI = 0.09–0.65). Low nest survival occurred in 1997, 2013, and 2017 when very few nests were found and no known nests hatched (nest survival = 0). In contrast, nest survival was highest in 2006 when an average number of nests were found (n = 16) and most nests hatched (nest survival = 0.88; 95% CI = 0.40–0.98; Graff 2018).

Late summer localized movements – Timing of departure from the breeding grounds near Utqiaġvik, and presumably the rest of the ACP, differs between sexes, and also varies depending on reproductive success. In breeding years, male Steller's eiders typically leave the breeding grounds in late June to early July after females begin incubating (USFWS 2001b, USFWS 2006a, USFWS 2007a). From mid-July to early August, flocks with a higher proportion of females (presumably failed breeders) are observed on the tundra and along the Chukchi and Beaufort Sea coasts near Utqiaġvik (USFWS 2001, USFWS 2006a). Females with fledged broods depart the breeding grounds in late August and mid-September to rest and forage in freshwater and marine habitat near the Utqiaġvik spit prior to fall migration along the Chukchi coast. Females with broods are often observed near the channel that connects North Salt Lagoon and Elson Lagoon (J. Bacon, North Slope Borough Department of Wildlife Management [NSBDWM], *pers. comm.*). In 2008, 10 to 30 adult female and juvenile Steller's eiders were observed staging daily in Elson Lagoon, North Salt Lagoon, Imikpuk Lake, and the Chukchi Sea from late August to mid-September (USFWS, unpublished data).

Before fall migration in both breeding and non-breeding years, some Steller's eiders rest and forage in coastal waters near Utqiaġvik, including Elson Lagoon, North Salt Lagoon, Imikpuk Lake, and the vicinity of Pigniq (or "Duck Camp"; Figure 5.6). In breeding years, these flocks are primarily comprised of males that remain in the area until the second week of July, while in non-breeding years flocks are composed of both sexes and depart earlier than in nesting years (J. Bacon, NSBDWM, *pers. comm.*).

Safine (2012) investigated post-hatch movements of 10 Steller's eider hens with VHF transmitters in 2011. Most (8 of 10) females successfully reared broods to fledging. From late August through early September, females and fledged juveniles were observed in nearshore waters of the Chukchi and Beaufort seas from Point Barrow south along the coast approximately 11 miles. During this period, marked Steller's eiders and broods frequented areas traditionally used for subsistence waterfowl hunting (e.g., Duck Camp; Figure 5.6).

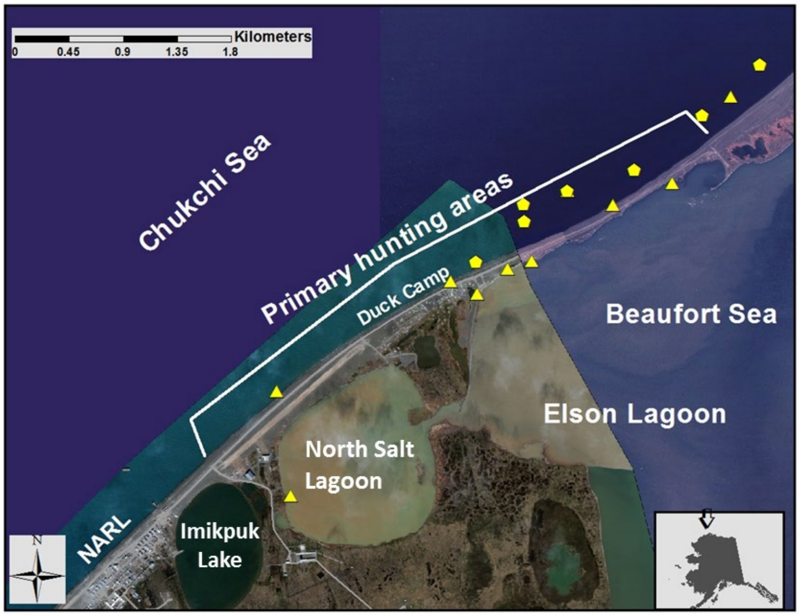

Figure 5.6 - Some post-breeding and pre-migration staging areas for Steller's eiders near Utqiaġvik, Alaska. Locations of Steller's eider hens with successfully fledged (triangles) and failed (pentagons) broods from mid-August to early September, 2011.

Fall migration and molting distribution – Following departure from the breeding grounds, Steller's eiders migrate to southwest Alaska where they undergo complete, flightless molt for 3 weeks to greater than 1 month (Peterson 1980, T Hollmén, Alaska SeaLife Center, *pers. comm* 2018). Timing of molt for adults coincides with their arrival at molting areas: males arrive first in late August (Petersen 1980), followed by unsuccessful breeding and non-breeding females, and finally successful females and broods (Rosenburg et al. 2014, Martin et al. 2015). Pacific-wintering Steller's eiders prefer molting areas that include shallow waters with extensive eelgrass (*Zostera marina*) beds, and intertidal mud and sand flats, where Steller's eiders forage on bivalve mollusks and amphipods (Petersen 1980; Metzner 1993).

The Russia- and Alaska-breeding populations both molt in southwest Alaska, and banding studies found at least some individuals had a high degree of molting site fidelity in subsequent years (Flint et al. 2000; Rosenberg et al. 2014). Primary molting areas include the north side of the Alaska Peninsula (Izembek Lagoon, Nelson Lagoon, Port Heiden, and Seal Islands and other smaller lagoons; Gill et al. 1981; Petersen 1981; USFWS 1986; Rosenberg et al. 2014) as well as the Kuskokwim Shoals in northern Kuskokwim Bay (Martin et al. 2015). Larned (2005) also reported greater than 2,000 eiders molting in lower Cook Inlet near the Douglas River Delta, and smaller numbers have been reported around islands in the Bering Sea, along the coast of Bristol Bay, and in smaller lagoons along the Alaska Peninsula (e.g., Dick and Dick 1971; Petersen and Sigman 1977; Wilk et al. 1986; Dau 1987; Petersen et al. 1991). Some Steller's eiders marked with satellite transmitters were located near Nunivak and St. Lawrence Islands during molt (Rosenberg et al. 2014, Martin et al. 2015), and hundreds of molting and post-molting Steller's eiders were observed during USFWS surveys of Nunivak Island in 1991 to 1992 and 1996

(USFWS 2001).

Wintering – After molt, Pacific-wintering Steller's eiders disperse throughout the Aleutian Islands, Alaska Peninsula, and western Gulf of Alaska, including Kodiak Island and lower Cook Inlet (Figure 5.7; Larned 2000; Rosenberg et al. 2014; Martin et al. 2015), although thousands may remain in molting lagoons unless freezing conditions force their departure (USFWS 2002).

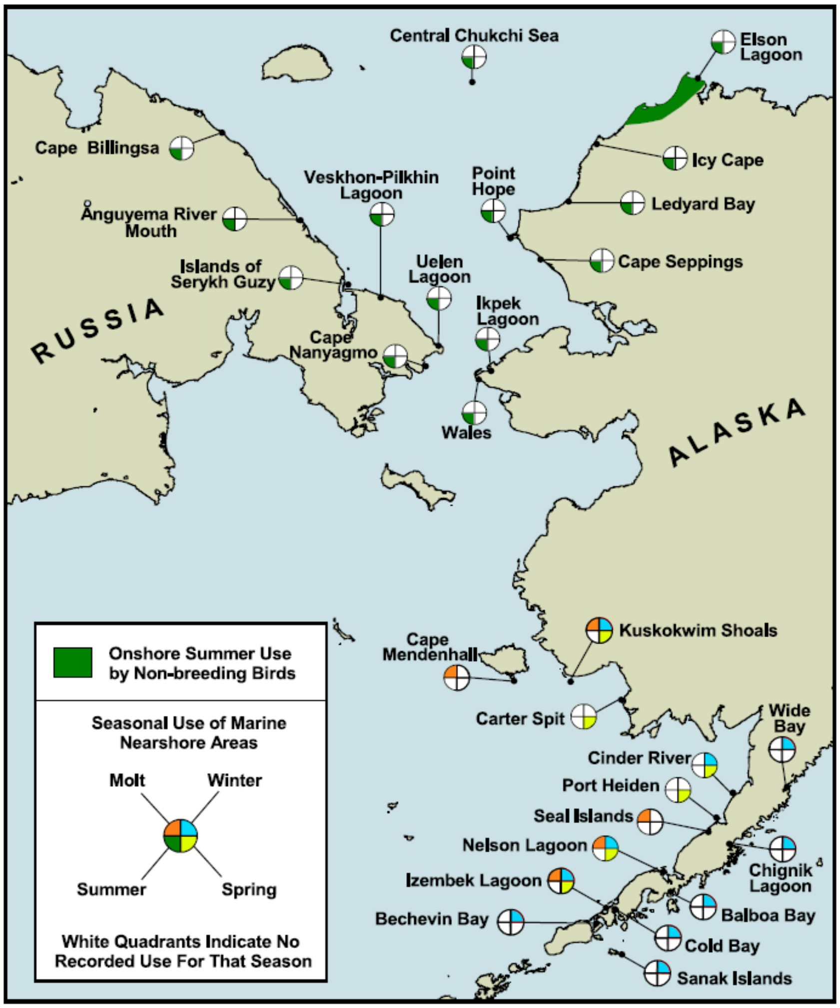

Figure 5.7 - Distribution of Alaska-breeding Steller's eiders during the non-breeding season, based on locations of 13 birds implanted with satellite transmitters in Utqiaġvik, Alaska, during June 2000 and June 2001. Marked locations include those at which a bird remained for at least 3 days. Onshore summer use areas comprise locations of birds that departed Utqiaġvik, apparently without attempting to breed in 2001 (USFWS 2002).

The Service estimates the Alaska-breeding population comprises only approximately 1 percent of the Pacific-wintering population of Steller's eiders. Wintering Steller's eiders usually occur in shallow waters (less than 33 feet deep) within 1,312 feet of shore, or in shallow waters farther offshore (USFWS 2002). Substantial use of habitats greater than 33 feet deep has been reported during mid-winter, although this use may reflect nocturnal rest periods or shifts in availability of food resources (Martin et al. 2015).

Spring migration – The majority of the world's population of Steller's eiders migrates along the Bristol Bay coast of the Alaska Peninsula in the spring (April and May), where they linger *en route* to feed at the mouths of lagoons and other productive habitats (USFWS 2019). Thousands of Steller's eiders stage in estuaries along the north coast of the Alaska Peninsula or lower Cook Inlet (Rosenberg et al. 2014) and in particular at Kuskokwim Shoals, sometimes for extended periods of time (Figure 5.8; Larned 2000; Martin et al. 2015). Marked birds staged at Kuskokwim Shoals for 21 to 38 days (Martin et al. 2015). Larned (1998) concluded that Steller's eiders show strong site fidelity to specific areas[3] during migration, where they congregate in large numbers to feed before continuing northward.

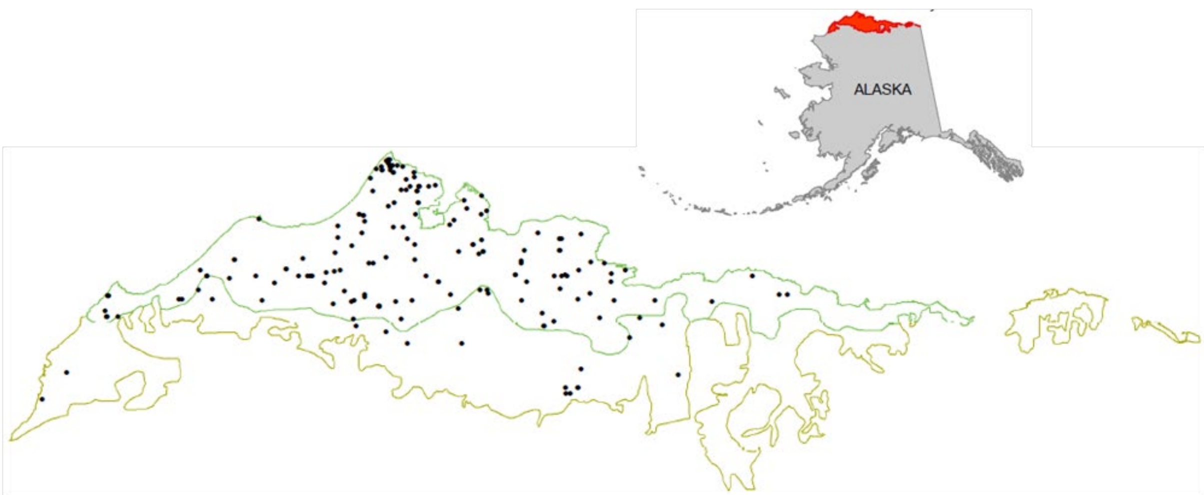

Figure 5.8 - All Steller's eider sightings from the Arctic Coastal Plain (ACP) Survey (1989 to 2008) and the North Slope Eider (NSE) Survey (1992–2006). The ACP Survey encompasses the entire area shown; the NSE, which was combined with the ACP survey in 2007, included only the northern portion outlined in green (modified from Stehn and Platte [2009]). Most observations from both surveys occurred within the area of the NSE survey.

Spring migration usually includes movements along the coast, although some Steller's eiders may make straight line crossings of water bodies such as Bristol Bay (W. Larned, USFWS, *pers. comm.* 2000). Despite numerous aerial surveys, Steller's eiders have not been observed during migratory flights (W. Larned, USFWS, *pers. comm.* 2000). Steller's eiders likely use spring

3 Several areas receive consistent use by Steller's eiders during spring migration, including Bechevin Bay, Morzhovoi Bay, Izembek Lagoon, Nelson Lagoon/Port Moller Complex, Cape Seniavin, Seal Islands, Port Heiden, Cinder River State Critical Habitat Area, Ugashik Bay, Egegik Bay, Kulukak Bay, Togiak Bay, Nanwak Bay, Kuskokwim Bay, Goodnews Bay, and the south side of Nunivak Island (Larned et al. 1993; Larned 1998, 2000a,b).

leads for feeding and resting as they move northward, although there is little information on distribution or habitat use after departure from spring staging areas.

Migration patterns relative to breeding origin – There is limited information on migratory movements of Steller's eiders in relation to breeding, and it remains unclear where the Russia- and Alaska-breeding populations converge and diverge during their molt and spring migrations. Martin et al. (2015) attached satellite transmitters to 14 Steller's eiders near Utqiaġvik in 2000 and 2001. Despite the limited sample, there was disproportionately high use of Kuskokwim Shoals by Alaska-breeding Steller's eiders during wing molt compared to the greater Pacific wintering population. However, Martin et al. (2015) did not find Alaska-breeding Steller's eiders to preferentially use specific wintering areas. A later study marked Steller's eiders wintering near Kodiak Island, Alaska, and followed birds through the subsequent spring (n = 24) and fall (n = 16) molt migrations from 2004 to 2006 (Rosenberg et al. 2011). Most birds marked near Kodiak Island migrated to eastern Arctic Russia prior to the nesting period and none were relocated on land or in nearshore waters north of the Yukon River Delta in Alaska (Rosenberg et al. 2011).

Alaska-breeding population abundance and trends – Available data suggest that very few Steller's eiders, perhaps tens of individuals, breed in western Alaska (USFWS 2019), and the Alaska-breeding population primarily consists of individuals breeding in northern Alaska. Three surveys provide some information on the number of Steller's eiders present on the ACP annually. These are the ACP Waterfowl Breeding Population Survey (ACP Survey; Figure 6.8), the Utqiaġvik Triangle Survey (Figure 6.9), and the Utqiaġvik ground-based breeding pair survey (Figure 6.10). Design and caveats of each survey are described in detail in the Steller's Eider Species Status Assessment (USFWS 2019).

The ACP Survey covers the largest portion of the range of Steller's eiders in northern Alaska (35,627 square miles), but its low coverage and the small number of Steller's eiders present in the study area contributes to unknown direction and amount of bias in the resulting estimates. However, estimation methods and inclusion of a detection rate, albeit from a surrogate species (long-tailed duck, *Clangula hyemalis*), has improved our ability to estimate the number of Steller's eiders in the survey area in recent years. After removing data from transects that overlap with the other two surveys described below, the mean number of Steller's eiders present annually from 2007 to 2019 in the ACP survey area is 83 (95% CI = 0 -332, range 29-205; E. Osnas and C. Frost, USFWS, *pers. comm.* In USFWS 2019).

Two surveys provide more intensive coverage of that area of the ACP with the highest densities of breeding Steller's eiders: the aerial Utqiaġvik Triangle Survey and complementary ground-based surveys closer to Utqiaġvik. The Utqiaġvik Triangle Survey (or "Barrow Study Area", Figure 6.9), conducted annually since 19994, provides coverage of 25 to 50 percent of a 1,713 square mile area, from just south of the community of Utqiaġvik to the Mead River (Obritschkewitsch and Gall 2019 in USFWS 2019). Using estimation methods similar to that used for ACP survey results, the mean number of Steller's eiders present annually from 1999 to 2019 in the Utqiaġvik Triangle Survey area is 198 (95% CI = 177-221, range = 177-221; C. Bradley, USFWS, *pers. comm.* in USFWS 2019).

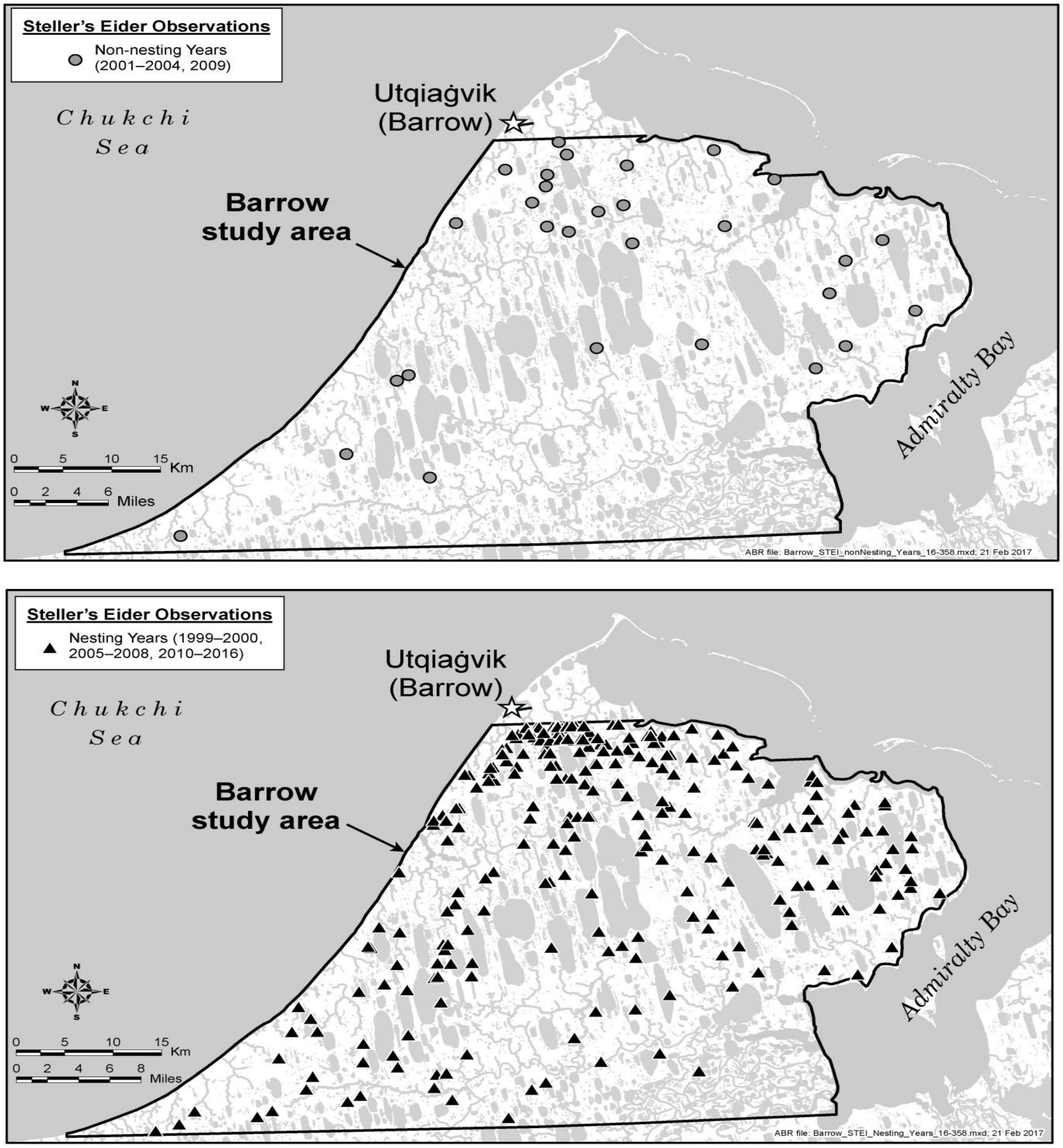

Figure 5.9 - Locations of Steller's Eiders observed during the aerial Utqiaġvik Triangle Survey (in the figure, "Barrow study area") in years with low breeding effort (top) and high-effort years (bottom) near Utqiaġvik, Alaska, June 1999 to 2016 (Obritschkewitsch and Ritchie 2017). Although observations from 2017 to 2019 are not included, 2017 to 2019 were also nesting years (Obritschkewitsch and Gall 2019 in USFWS 2020a).

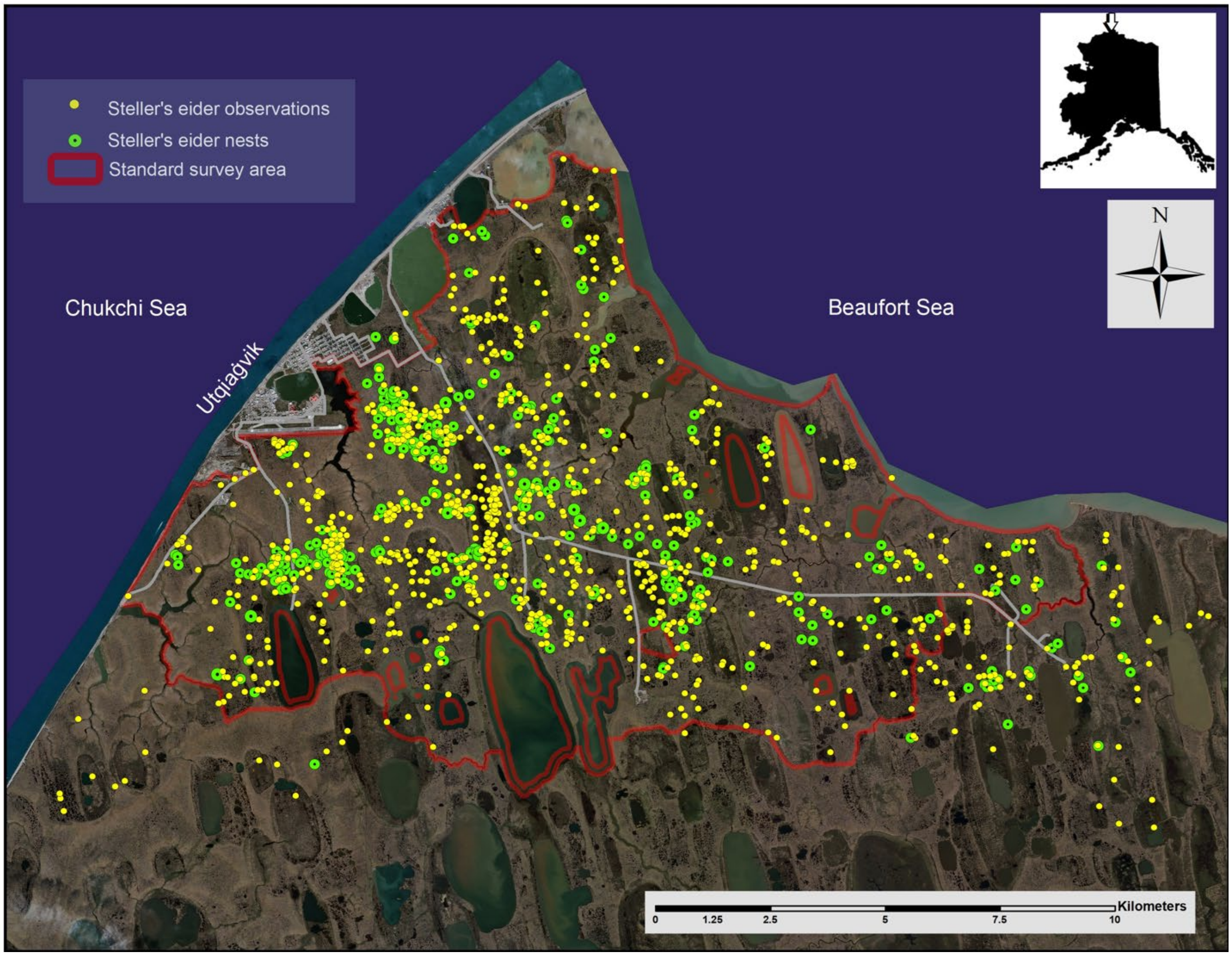

Figure 5.10 - Steller's eider nest locations (1991 to 2017; green) and breeding pair observations (1999 to 2017; yellow) from ground surveys surrounding the Utqiaġvik road system (Graff 2018). The red border represents the standard annual survey area. This survey is expanded beyond the standard area in some years.

Standardized ground surveys for eiders have also been conducted near Utqiaġvik since 1995 (Figure 5.10; Graff 2018), with nearly 100 percent spatial coverage of the study area surrounding the Utqiaġvik road system. After removing the portion of the study area that overlaps with the Utqiaġvik Triangle Survey, the mean number of Steller's eiders observed during the most recent half of the survey, 2007 to 2019, is 45 (SD = 29, range = 6–94; N. Graff, USFWS, unpublished data).

By combining the mean estimates from each survey, the number of Steller's eiders present annually in northern Alaska is approximately 326 (USFWS 2019). However, this estimate should be interpreted with caution when characterizing the size of the Alaska-breeding population. Several caveats are outlined in the Steller's eider Species Status Assessment, including low confidence given the number of actual observations, and the high annual variation

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5 Neither the Steller's eider Utqiaġvik Triangle Survey, nor the complementary ground-based survey, took place in 2020 due to public health concerns related to the SARS-CoV-2 pandemic.

in estimates resulting in low precision (USFWS 2019). Most importantly, however, the estimate is likely an underestimate of the abundance of the entire Alaska-breeding population. These surveys enumerate the birds present on the breeding area, but the proportion of the overall Alaska-breeding population that breeds likely varies annually. Non-breeding birds may remain in marine areas, stage in other terrestrial areas prior to molt, or visit northern Alaska briefly before moving back to marine habitat. It is also possible some birds nest in Russia in years when they are not present in Alaska. Thus, some unknown portion of the population is not available to be detected in the breeding surveys. Because we do not have an estimate of annual breeding propensity, we cannot directly translate these estimates to population abundance (USFWS 2019).

Y-K Delta sub-population – The Service has conducted three breeding waterfowl surveys annually on the Y-K Delta. These include two aerial surveys, the North American Breeding Waterfowl Survey (1957 to 2017; USFWS 2017a) and the Yukon-Kuskokwim Delta Breeding Pair Survey (1986 to 2017, USFWS 2017b), and one ground survey aimed at estimating the number of waterfowl nests on the central coast of the Y-K Delta (1985 to 2017, USFWS 2017c). In addition to the three annual surveys focused on breeding pairs of waterfowl, field research is conducted throughout the central coastal zone by the U.S. Geological Survey, the Service, universities, and other government agencies. Observations of Steller's eiders would likely be recorded during these activities and reported, given the species' rarity and interest in the species (USFWS 2019).

Contemporary (1960s to present) observations of Steller's eiders are limited to the central coastal zone of the Y-K Delta. Observations of 44 adult Steller's eiders, plus 8 nests and 1 brood, were reported during nest plot surveys and other avian research from 1997 to 2017 (Flint and Herzog 1999; USFWS, unpubl. data). Nests were found at Kigigak Island and near the Tutakoke and Kashunuk Rivers (USFWS 2019). No Steller's eiders were recorded during aerial surveys from 1997 to 2017 (J. Fischer, USFWS Biologist, *pers. comm.*). When the species was listed in 1997, no Steller's eider nests had been found in this region for approximately 20 years (since 1975, Kertell 1991). The small number of Steller's eider observations in nesting habitat, despite substantial research and activity, suggests that Steller's eiders breeding in western Alaska remain rare.

Alaska-breeding Steller's Eider Recovery Criteria

The Steller's Eider Revised Recovery Plan (USFWS 2021b) presents research, monitoring, and management actions that are re-evaluated and adjusted periodically, with the objective of recovery so that protection under the ESA is no longer required. When the Alaska-breeding population was listed as threatened, factors causing the decline were unknown, although possible causes identified were increased predation, overhunting, ingestion of spent lead shot in wetlands, and habitat loss from development. Since listing, other potential threats have been identified, including exposure to other contaminants, disturbance caused during scientific research, and climate change, but causes of decline and obstacles to recovery remain poorly understood.

Criteria used to determine when species are recovered are often based on historical abundance and distribution, or on the population size required to ensure that extinction risk, based on population modeling, is tolerably low. For Steller's eiders, information on historical abundance is lacking, and demographic parameters needed for accurate population modeling are poorly understood. Thus, the Service recommended that demographic recovery criteria be refined, or additional criteria be added, to improve our ability to measure progress towards recovery, which was addressed in the revised Recovery Plan. Our vision of a recovered Alaska-breeding population of Steller's eiders is a stable breeding population in Alaska that persists for the foreseeable future. Enough individuals will breed in Alaska to ensure the population is resilient; that is, it can withstand demographic stochasticity (the random temporal fluctuations in individual mortality and reproduction in a population). The population will persist over a long enough time frame to demonstrate that it can withstand multiple bouts of demographic stochasticity at that level of abundance. The Alaska-breeding population will be distributed widely across suitable breeding and non-breeding habitat, ensuring it can adapt to changing environmental conditions (representation) and withstand catastrophic events (redundancy). Our vision for adequate redundancy does not include the existence of multiple subpopulations in Alaska, but instead relies on wide distribution in northern Alaska (or, alternatively, other areas in the state if colonized naturally). Additionally, we envision a stable or increasing Pacific Wintering Population (PWP) of Steller's eiders, consisting of both the Alaska-breeding and Russia-Pacific breeding populations. A healthy PWP ensures the possibility of recruitment of Russia-origin birds into the Alaska-population exists, and demonstrates that habitat in the shared molting, wintering and staging areas in Alaska is in good condition (USFWS 2021; see Recovery Plan for detailed criteria).

5.3 Polar bear

Status and distribution

Due to threats to sea ice habitat, on May 15, 2008, the Service listed the polar bear as threatened under the ESA (73 FR 28212) throughout its range. 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. Polar bears are widely distributed throughout the Arctic where the sea is ice-covered for large portions of the year. Polar bears are subdivided into 19 recognized subpopulations or stocks (Figure 5.11). The U.S. contains portions of two subpopulations: the Chukchi Sea (CS) (also called the Alaska-Chukotka subpopulation in the U.S.–Russia Bilateral Agreement) and the Southern Beaufort Sea (SBS) subpopulation.

Population size estimates and trends

The most current global population estimate for polar bears is approximately 26,000 individuals (95 % CI = 22,000-31,000; Wiig et al. (2015). The International Union for Conservation of Nature and Natural Resources, Species Survival Commission (IUCN/SSC) Polar Bear Specialist Group (PBSG) ranked three of the 19 subpopulations as "declining," including the SBS subpopulation, and nine, including the CS subpopulation, as "data deficient." They ranked five as "stable" and just two as "increasing" (PBSG 2016; USFWS 2017).

Species biology and life history

Polar bears are the largest living bear species (DeMaster and Stirling 1981) with a longer neck and proportionally smaller head than other ursids. They are sexually dimorphic; females weigh 400 to 700 pounds (lbs) and males up to 1,440 lbs (USFWS 2017).

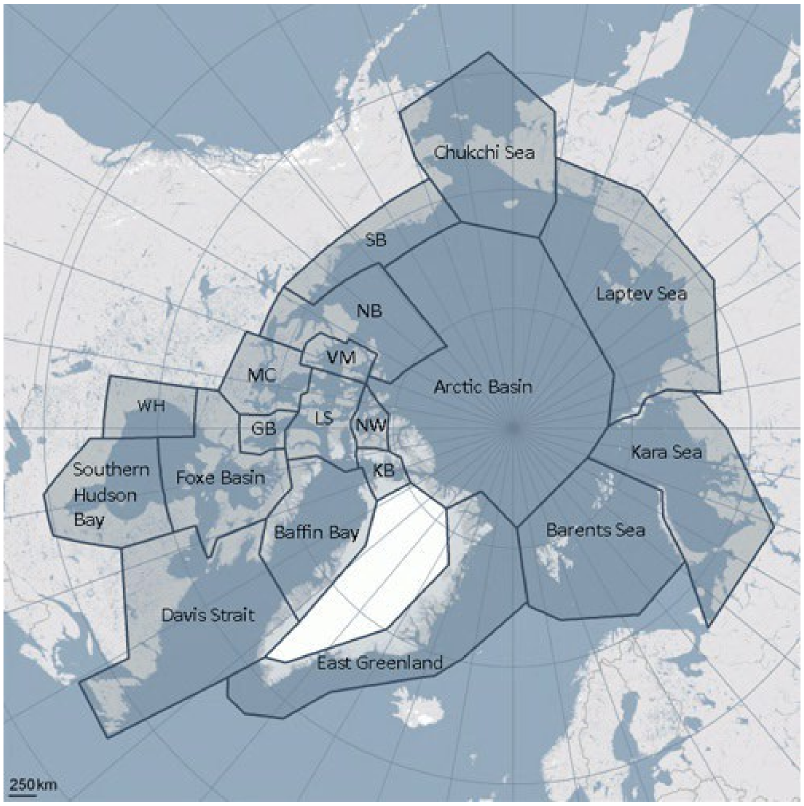

Figure 5.11 - Global distribution of polar bear subpopulations as defined by the Polar Bear Specialist Group (Obbard et al. 2010; http://pbsg.npolar.no/en/status/population-map.html). Subpopulations include the Southern Beaufort Sea (SBS), Chukchi Sea, Laptev Sea, Kara Sea, Barents Sea, East Greenland, Northern Beaufort (NB), Kane Basin (KB), Norwegian Bay (NW), Lancaster Sound (LS), Gulf of Boothia (GB), McClintock Channel (MC), Viscount Melville (VM), Baffin Bay, Davis Strait, Foxe Basin, Western Hudson Bay (WH), and Southern Hudson Bay.

Breeding and reproduction – Polar bears are a K-selected species, characterized by late sexual maturity, small litter sizes, and extended maternal investment in raising young. All of these factors contribute to the species' low reproductive rate (Amstrup 2003). Females generally mature and breed for the first time at 4 or 5 years and give birth at 5 or 6 years of age. Litters of two cubs are most common, but 3-cub litters are seen on occasion across the Arctic (Amstrup 2003). The minimum reproductive interval for adult females is three years. Cubs stay with their mothers until weaning, which occurs most commonly in early spring when cubs are 2 1/2 years old. Female bears are available to breed again after their cubs are weaned (USFWS 2017).

Survival – Polar bears are long-lived and are not generally susceptible to disease or parasites. Due to extended maternal care of young and low reproductive rates, polar bears require high adult survival rates, particularly of females, to maintain population levels (Eberhardt 1985; Amstrup and Durner 1995). Survival rates are generally age dependent, with cubs-of-the-year having the lowest rates and prime-age adults (prime reproductive years are between approximately 5 and 20 years of age) having survival rates that can exceed 90 percent (Regehr et al. 2007a). Survival rates exceeding 90 percent for adult females are essential to sustain polar bear populations (Amstrup and Durner 1995).

Changes in body condition have been shown to affect bear survival and reproduction, which could, in turn, have population-level effects (Regehr et al. 2010; Rode et al. 2010). Survival of polar bear cubs-of-the-year has been directly linked to their weight and the weight of their mothers, with lower weights resulting in reduced survival (Derocher and Stirling 1996; Stirling et al. 1999). Changes in body condition indices were documented in the Western Hudson Bay subpopulation before a statistically significant decline in that subpopulation was documented (Regehr et al. 2007b). Thus, changes in these indices may signal reductions in survival and abundance are imminent (USFWS 2017).

Feeding – Polar bears are top predators in the Arctic marine ecosystem. They prey heavily on ice-seals, principally ringed seals (*Phoca hispida*), and to a lesser extent, bearded seals (*Erignathus barbatus*). Areas near ice edges, leads, or polynyas where ocean depth is minimal are the most productive hunting grounds (Durner et al. 2004). Bears occasionally take larger animals, such as walruses (*Odobenus rosmarus*) and belugas (*Delphinapterus leucas*) (Kiliaan and Stirling 1978).

Bowhead whale carcasses, leftover after subsistence harvest, have been available to polar bears as a food source on the North Slope since the early 1970s (Koski et al. 2005). 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).

Threats to the polar bear

Because the polar bear depends on sea ice for its survival, loss of sea ice due to climate change is its largest threat worldwide, although polar bear subpopulations face different combinations of human-induced threats (73 FR 28212; Obbard et al. 2010). The largest direct human-caused loss of polar bears is from subsistence hunting, but for most subpopulations where subsistence hunting of polar bears occurs, it is a regulated and/or monitored activity (Obbard et al. 2010). A thorough account of subsistence hunting, sport harvest, poaching, defense-of-life removals, and the management systems controlling these direct removal activities can be found in USFWS (2017). 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).

Climate change – As described in the Polar Bear Conservation Management Plan (PBCMP) (USFWS 2016), polar bears evolved over thousands of years to life in a sea ice-dominated ecosystem and depend on sea ice for essential life functions. Climate-induced habitat degradation and loss are negatively affecting some polar bear subpopulations, and unabated global warming is expected to reduce the worldwide polar bear population (Obbard et al. 2010). Patterns of increased temperatures, earlier spring thaw, later fall freeze-up, increased rain-on-snow events (which may cause dens to collapse), and potential reductions in snowfall are also occurring. Loss of sea ice habitat due to climate change is identified as the primary threat to polar bears (73 FR 28212; Schliebe et al. 2006; Obbard et al. 2010).

The sea ice ecosystem supports ringed seals and other marine mammals that comprise the polar bear's prey base (Stirling and Archibald 1977; Smith 1980, 1985; Iverson et al. 2006). Sea ice cover is shown to be strongly, negatively correlated with surface temperature, which is increasing at about 3 times the global average in the Arctic (Comiso 2012). Declines in sea ice area more pronounced in summer than winter (NSIDC 2011a; b). The mean linear rate of decline for August sea ice extent is 29,000 square miles per year, or 10.4 percent per decade since 1979 relative to the 1981 to 2010 average (NSIDC 2018). Thus, average Arctic sea ice extent in August is approximately 40% less now than 40 years ago. 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, 2006; Fowler et al. 2004; Lindsay and Zhang 2005; Holland et al. 2006; Serreze et al. 2007; Stroeve et al. 2014).

Loss of access to prey – The decline of sea ice habitat due to changing climate is affecting the ability of polar bears to forage in several ways. Sea ice provides a platform for hunting and feeding, seeking mates and breeding, denning, resting, and for long-distance movement. Polar bears depend on sea ice to hunt seals, and temporal and spatial availability of sea ice is predicted to decline. Once sea ice concentration drops below 50 percent, polar bears have been documented to abandon sea ice for land, where access to their primary prey is almost entirely absent, or they may retreat northward with more consolidated pack ice over the polar basin, which is likely less productive foraging habitat (Whiteman et al. 2015). In either case, polar bears are likely to have reduced access to prey resources (Whiteman et al. 2015). Ware et al. (2017) found that polar bears are increasingly occurring on ice over less-productive waters in summer. Although polar bears occasionally capture ringed seals in open water (Furnell and Oolooyuk 1980), typically ice seals in open water are inaccessible to polar bears (Harwood and Stirling 1992). Thus, species experts do not believe that polar bears will readily adapt to the loss of sea ice by adopting other hunting methods, such as hunting seals in ice-free water (Stirling and Derocher 1993; Derocher et al. 2004).

Effects of climate change on polar bear prey species – Ice seals, principally ringed seals, and to a lesser extent bearded seals, are the primary prey of polar bears, although other food sources are occasionally exploited (USFWS 2017a). Climate change and the loss of Arctic sea ice are expected to affect ice seal populations significantly, and in response in 2012 the NMFS listed the Arctic subspecies of ringed seal (*Phoca hispida hispida*) and the Beringia DPS of the bearded seal (*Erignathus barbatus nauticus*) as threatened species under the Act (77 FR 76706; 77 FR 76740).

Ice seal population dynamics reflect a complex mix of biotic and abiotic factors (Pilfold et al. 2015), making it difficult to accurately assess the effects of changes in sea ice. However, several mechanisms by which a warming environment have affected ice seals, or plausibly should be expected to, have been identified. An adequate snow layer providing insulation around birth lairs is crucial for thermoregulation and survival of young pups (Stirling and Smith 2004). Pups in lairs with thin snow roofs are also more vulnerable to predation than pups in lairs with thick roofs (Hammill and Smith 1991; Ferguson et al. 2005), and when lack of snow cover has forced birthing to occur in the open, nearly 100% of pups died (Smith and Lydersen 1991; Smith et al. 1991). Rain-on-snow events during the late winter are increasing in frequency and can damage or eliminate snow-covered pupping lairs. Exposed pups are then vulnerable to hypothermia and predation by polar bears and arctic foxes (*Alopex lagopus*) (Stirling and Smith 2004). Pupping habitat on landfast ice (McLaren 1958; Burns 1970) and drifting pack ice (Wiig et al. 1999; Lydersen et al. 2004) can also be affected by earlier warming and break-up in the spring, which shortens the length of time pups have to grow and mature (Kelly 2001).

Although the rate and extent of population-level response of ice seals to changes in sea ice conditions remain unclear, effects to ice seal populations will certainly affect polar bear populations. Polar bear populations fluctuate with prey abundance (Stirling and Lunn 1997), and regional declines in ringed and bearded seal numbers and productivity have been linked to marked declines in the associated polar bear subpopulations (Stirling and Øritsland 1995; Stirling 2002).

Redistribution of polar bears in response to changes in sea ice – Several studies have shown that changes in sea ice, including the timing of melt in spring and freeze-up in fall, correlate with changes in the distribution of polar bears and their body condition or other indices of fitness. In Western Hudson Bay, sea ice break-up now occurs approximately 2.5 weeks earlier than it did 30 years ago because of increasing spring temperatures (Stirling et al. 1999; Stirling and Parkinson 2006), which is also correlated with when female bears come ashore and when they are able to return to the ice (Cherry et al. 2009). Similarly, changes in summer sea ice conditions have resulted in an increase in the time spent on shore during summer and the proportion of the population on shore in the Southern Beaufort Sea and Chukchi Sea subpopulations (Rode et al. 2015; Atwood et al. 2016). Rode et al. (2015) also found that changes in sea ice likely explain shifts in summer distribution of the Chukchi Sea subpopulation, from use of both Alaskan and Russian coastal areas before reductions in sea ice, to almost exclusive use of coastal areas in Russia after reductions in sea ice.

Changes in the distribution of polar bears in response to changes in sea ice may increase exposure to some threats. If bears spend more time on land during the open water period, there is potential for increased disease transmission (Kirk et al. 2010; Prop et al. 2015; Wiig et al. 2015), particularly where bears concentrate at dwindling food resources (e.g., remains of subsistence-harvested whales at Barter Island, Cross Island, and Point Barrow). Aggregations could also increase the number of individuals exposed in the event of oil spills (BOEM 2014). Increased use of onshore habitat by polar bears has also led to an increase in human-polar bear conflicts (Dyck 2006; Towns et al. 2009). In two studies from northern Canada, researchers found that the majority of polar bears killed in defense of human life occurred during the open water season (Stenhouse et al. 1988; Dyck 2006). Thus, as more bears come on shore during summer, remain on shore longer, and become increasingly food-stressed, the risk of human conflict increases along with a probable increase in defense-of-life kills.

Demographic response – Reduced access to preferred prey (i.e., ice seals; Thiemann et al. 2008) is likely to have demographic effects on polar bears. For example, in the Southern Beaufort Sea subpopulation, the period when sea ice is over the continental shelf has decreased significantly over the past decade, resulting in reduced body mass and productivity (Rode et al. 2010, 2014) and likely reduced population size (Bromaghin et al. 2015).

Changes in movements and seasonal distributions caused by climate change have been shown to affect polar bear nutrition and body condition (Stirling and Derocher 2012). Declining reproductive rates, subadult survival, and body mass have occurred because of longer fasting periods on land resulting from progressively earlier ice break-ups (Stirling et al. 1999; Derocher et al. 2004). Rode et al. (2010) suggested that declining sea ice has resulted in reduced body size and reproductive rates in the Southern Beaufort Sea subpopulation, and Regehr et al. (2007a) found that reduced sea ice habitat correlated with a reduction in the number of yearlings produced per female. In the Western Hudson Bay subpopulation, sea ice related declines in vital rates led to reduced abundance and declining population trends (Regehr et al. 2007b).

To date, however, researchers have documented demographic effects of sea ice loss in only a few of the 19 polar bear subpopulations (Regehr et al. 2007a; Rode et al. 2012). Rode et al. (2014) found that even though sea ice loss during summer had been substantial in the Chukchi Sea, polar bears in that subpopulation had not yet exhibited concomitant declines in body mass or productivity.

Reduced denning success – Climate change could negatively influence polar bear denning (Derocher et al. 2004). Insufficient snow would prevent den construction or result in use of poor sites where the roof could collapse (Derocher et al. 2004). Changes in the amount and timing of snowfall could also impact the thermal properties of dens, and because cubs are born helpless and remain in the den for three months before emergence, major changes in the thermal properties of dens could negatively impact cub survival (Derocher et al. 2004). Unusual rain events are projected to increase throughout the Arctic in winter (Liston and Hiemstra 2011), and increased rain in late winter and early spring could cause den collapse (Stirling and Smith 2004). The proportion of bears denning on ice has decreased for some subpopulations (Atwood et al. 2016) and not others, but the consequences of these shifts to cub survival are unknown.

While polar bears can successfully den on sea ice (Amstrup and Gardner 1994; Fischbach et al. 2007), for most subpopulations, maternity dens are located on land (Derocher et al. 2004). Female polar bears can repeatedly return to specific denning areas on land (Harington 1968; Ramsay and Stirling 1990; Amstrup and Gardner 1994). For bears to access preferred denning areas on land, pack ice must drift close enough or freeze sufficiently early to allow pregnant females to walk or swim to the area by late October or early November (Derocher et al. 2004). As distance increases between the pack ice edge and coastal denning areas, it will become increasingly difficult for females to access terrestrial denning locations unless they are already on or near land. Distance between the ice edge and shore is one factor thought to limit denning in western Alaska in the CS subpopulation (Rode et al. 2015). Increased travel distances could negatively affect denning success and ultimately population size of polar bears (Aars et al. 2006).

For example, over the last two decades, the Southern Beaufort Sea subpopulation has experienced a marked decline in summer sea-ice extent, along with pronounced lengthening of the open-water season (Stroeve et al. 2014; Stern and Laidre 2016). The dramatic changes in extent and phenology of sea-ice habitat have coincided with evidence suggesting use of terrestrial habitat has increased during open-water periods and prior to denning.

In addition to increased use of land during the open-water season, Southern Beaufort Sea polar bears have also increasingly used land for maternal denning. Olson et al. (2017) examined the choice of denning substrate (land compared to sea ice) by adult females between 1985 and 2013 and determined that the frequency of land-based denning increased over time, constituting 34.4 percent of all dens from 1985 to 1995, 54.6 percent from 1996 to 2006, and 55.2 percent from 2007 to 2013. Additionally, the frequency of land denning was directly related to the distance that sea ice retreated from the coast. From 1985 to 1995 and 2007 to 2013, the average distance from the coast to 50 percent sea ice concentration in September (when sea ice extent reaches its annual minimum) increased 351 ± 55 km (218.10 ± 34.17 mi), while the distance to 15 percent sea ice concentration increased by 275 ± 54 km (170.88 ± 33.55 mi). Rode et al. (2018) determined that reproductive success was greater for females occupying land-based dens compared to ice- based dens, which may be an additional factor contributing to an individual's increase of land- based den sites.

Under most climate-change scenarios, the distance between the edge of the pack ice and land will increase during summer. Bergen et al. (2007) found that between 1979 and 2006, the minimum distance polar bears traveled to denning habitats in northeast Alaska increased by an average rate of 3.7-5.0 miles per year, have nearly doubled since 1992, and would likely increase threefold by 2060. Comiso (2002) predicted that under future climate change scenarios (i.e., by the 2050s), pregnant female polar bears will be unable to access many of the most important denning areas in the north coast of the central Beaufort Sea (Derocher et al. 2004).

Shipping and transportation – A decline in Arctic sea ice has increased the navigability of Arctic waters, with previously ice-covered sea routes now opening in summer, allowing access for commercial shipping, natural resource development, and tourism. Potential effects include fracturing of sea ice, disturbance of polar bears and their prey, increased human-polar bear encounters, introduction of waste/ litter and toxic pollutants into the environment, and increased risk of oil spills (USFWS 2017). Although shipping is expected to increase in Arctic waters in response to declining sea ice, the PBCMP concluded that trans-Arctic shipping poses minimal risk to polar bears in the long-term (USFWS 2016). Arctic nations are increasingly working cooperatively to track changes in shipping and manage possible increases in environmental impacts (USFWS 2017).

Oil and gas development – Polar bears overlap with both active and planned oil and gas operations throughout their range. Impacts on polar bears from industrial activities, such as oil and gas development, may include: disturbance from increasing human-bear interactions, resulting in direct displacement of polar bears, preclusion of polar bear use of preferred habitat (most notably, denning habitat); and/or displacement of primary prey.

Although oil and gas exploration, development, and production throughout the Arctic has declined since the time of the listing, offshore oil and gas activities may increase due to a decline in summer sea ice (USFWS 2016, 2017). Plans are also underway for new oil and gas development and infrastructure in polar bear habitat (e.g., natural gas pipeline from Mackenzie Delta to southern Canada, exploration offshore from Greenland, Russia, and Alaska [Beaufort

Sea]), and proposed offshore and onshore lease sales. In the United States, potential effects on polar bears are in part mitigated through: 1) development of activity-specific human-bear interaction plans (to avoid disturbance), 2) safety and deterrence training for industry staff, 3) bear monitoring and reporting requirements, and 4) implementation of project-specific protection measures (e.g., 1 mile buffers around den sites).

Contaminants – In the final rule listing the polar bear as a threatened species, the Service identified three categories of contaminants in the Arctic that present the greatest potential threats to polar bears and other marine mammals, these are persistent organic pollutants, heavy metals, and petroleum hydrocarbons (PCBs) (73 FR 28288-28291). In the PBCMP (USFWS 2016), the Service concluded that contaminant concentrations were not thought to have population level effects on most polar bear populations but noted that contaminants may become a threat in the future, especially in subpopulations experiencing declines related to nutritional stress brought on by sea ice loss and environmental changes.

Petroleum hydrocarbons/oil spills – Oil spills could potentially affect polar bears through: 1) affecting their ability to thermoregulate if their fur is oiled, 2) lethal or sublethal effects of ingestion of oil from grooming or eating contaminated prey, 3) habitat loss or decreased availability of preferred habitat; and 4) impacts to the abundance or health of prey. At the time of listing, no major oil spills had occurred in the marine environment within the range of polar bears and the Service had determined that the probability of a large oil spill occurring in polar bear habitat was low. We also noted that, in Alaska: 1) previous operations in the Beaufort and Chukchi seas have been conducted safely, and effects on wildlife and the environment have been minimized; 2) regulations exist to require pollution prevention and control; and 3) plans are reviewed by both leasing and wildlife agencies to ensure appropriate species-specific protective measures for polar bears are included. However, we also noted that increased oil and gas development coupled with increased shipping elevated the potential for spills, and if a large spill were to occur, it could have significant impacts to polar bears and their prey, depending on the size, location, and timing of the spill.

Persistent Organic Pollutants (POPs) – Persistent organic pollutants are organic chemicals resistant to biodegradation and can affect apex predators such as polar bears that have low reproductive rates and high lipid levels because POPs tend to bioaccumulate and biomagnify in fatty tissues. While the levels of some contaminants, such as PCBs, generally seem to be decreasing in polar bears, others, such as hexachlorocyclohexanes, were relatively high, and newer compounds, such as polybrominated diphenyl ethers and perflouro-octane sulfonates, posed a potential future risk to polar bears. The effects of these contaminants at the population level are relatively unknown (USFWS 2017).

Metals – The most toxic or abundant elements in marine mammals are mercury, cadmium, selenium, and lead. Of these, mercury is of greatest concern because of its potential toxicity at relatively low concentrations and its tendency to bioaccumulate and biomagnify in the food web (73 FR 28291). In the final rule to list the polar bear (73 RF 28212) the Service noted that although mercury found in marine mammals often exceed levels that have caused effects in terrestrial mammals, most marine mammals appear to have evolved mechanisms that allow tolerance of higher concentrations of mercury (AMAP 2005). Although population-level effects are still widely undocumented for most polar bear subpopulations, increasing exposure to contaminants may become a more significant threat in the future, especially for declining polar bear subpopulations and/or bears experiencing nutritional stress (USFWS 2017).

Ecotourism – Polar bear viewing and photography are popular forms of tourism that occur primarily in Churchill, Canada; Svalbard, Norway; and the north coast of Alaska (near the communities of Kaktovik and Utqiaġvik). In the final listing rule for the polar bear, the Service noted that, while it is unlikely that properly regulated tourism will have a negative effect on polar bear subpopulations, increasing levels of public viewing and photography in polar bear habitat might lead to increased human-polar bear interactions. Tourism can also result in inadvertent displacement of polar bears from preferred habitats or alter natural behaviors (Dyck and Baydack 2004; Eckhardt 2005). Conversely, tourism can have the positive effect of increasing the worldwide constituency of people with an interest in polar bears and their conservation (USFWS 2017).

5.4 Polar Bear Critical Habitat

The polar bear was listed as a threatened species throughout its range, but the regulatory authority to designate critical habitat (50 CFR 424.12(h)) is limited to areas of U.S. jurisdiction, which in the case of the polar bear includes Alaska and adjacent territorial and U.S. waters. The Service designated 484,734 square kilometers of critical habitat for the polar bear in 2010 (75 FR 76086).

Description of Polar Bear Critical Habitat

Designation of critical habitat requires, within the geographical area occupied by the polar bear, identification of the physical or biological features (PBFs) essential to the conservation of the species that may require special management or protection. We identified the following three PBFs essential to the conservation of the polar bear:

1) Sea-ice habitat used for feeding, breeding, denning, and movement, which is further defined as sea-ice over waters 300 m or less in depth that occurs over the continental shelf with adequate prey resources (primarily ringed and bearded seals) to support polar bears.
2) Terrestrial denning habitat, which includes topographic features, such as coastal bluffs and riverbanks, with suitable macrohabitat characteristics. Suitable macrohabitat characteristics are:
    a) Steep, stable slopes (range 15.5–50.0 degrees), with heights ranging from 1.3 to 34 m, and with water or relatively level ground below the slope and relatively flat terrain above the slope;
    b) Unobstructed, undisturbed access between den sites and the coast;
    c) Sea-ice in proximity to terrestrial denning habitat prior to the onset of denning during the fall to provide access to terrestrial den sites; and
    d) The absence of disturbance from humans and human activities that might attract other polar bears.
3) Barrier island habitat used for denning, refuge from human disturbance, and movements along the coast to access maternal den and optimal feeding habitat, including all barrier islands along the Alaska coast and their associated spits, within the range of the polar bear in the United States, and the water, ice, and terrestrial

habitat within 1.6 km of these islands.

Considering the three PBFs, and the quantity and spatial arrangement of them necessary to support conservation of the polar bear, we designated the following three critical habitat units, each of which contains at least one of the PBFs:

Unit 1, Sea Ice Habitat – Sea ice habitat covers approximately 464,924 km^2 of primarily marine habitat extending from the mean high tide line of the Alaska coast seaward to the 300 m depth contour, and spans west to the international date line, north to the Exclusive Economic Zone, east to the US–Canada border, and south to the southern limit of the known distribution of the Chukchi Sea polar bear subpopulation. Sea ice is used by polar bears for the majority of their life cycle for activities such as hunting seals, breeding, denning, and traveling.

Unit 2, Terrestrial Denning Habitat – Terrestrial denning habitat occurs within approximately 14,652 km^2 of land along the northern coast of Alaska from the Canadian border west to near Point Barrow. It encompasses approximately 95% of the known historical terrestrial den sites from the Southern Beaufort Sea subpopulation (Durner et al. 2009a). The inland extent of denning distinctly varies between two longitudinal zones, with 95 percent of known dens between the Alaska/Canada border and Kavik River occurring within 32 km of the mainland coast, and 95 percent of dens between the Kavik River and Utqiaġvik occurring within 8 km of the mainland coast. The inland boundary of the Terrestrial Denning Unit reflects this difference in the distribution of known den sites, with the boundary drawn at 32 km inland between the Alaska/Canada border and the Kavik River and 8 km inland between the Kavik River and Utqiaġvik.

Unit 3, Barrier Island Habitat – Barrier island habitat covers approximately 10,575 km^2 of barrier islands and the associated complex of spits, water, ice, and terrestrial habitats within 1.6 km of barrier islands. There is significant overlap between this unit and the Terrestrial Denning and Sea Ice units. Like the Sea Ice Unit, the Barrier Island Unit extends from near the Alaska/Canada Border to near Hooper Bay in southwestern Alaska but only occurs where barrier islands exist.

Exclusions within Designated Polar Bear Critical Habitat – Within the Terrestrial Denning and Barrier Island units, critical habitat does not include manmade structures (e.g., houses, gravel roads, airport runways and facilities, pipelines, well heads, generator plants, construction camps, sewage treatment plants, hotels, docks, seawalls, and the land on which they were constructed) that existed on the effective date of the rule. The communities of Utqiaġvik and Kaktovik were also excluded.

6.0 ENVIRONMENTAL BASELINE

The environmental baseline refers to the condition of the listed species or designated critical habitat in the Action Area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the Action Area, the anticipated impacts of all proposed Federal projects in the Action Area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline

6.1 Baseline of listed eiders in the terrestrial portion of the Action Area

Spectacled and Alaska-breeding Steller's eiders nest and raise broods in the Action Area at low density from late May through late October, and Steller's eiders are particularly rare. In summer, listed eiders are widely distributed near lakes or coastal margins throughout the North Slope with a trend toward higher abundance near the coast, north of Teshekpuk Lake, and within the Utqiaġvik Triangle. Within the Action Area, listed eiders nest primarily in non-patterned wet meadows, and in wetland complexes containing emergent grasses and sedges (Anderson and Cooper 1994; Anderson et al. 2009). After hatching, listed eider hens with broods occupy deep *Arctophila* and shallow *Carex* habitat (Safine 2011).

Factors which may have contributed to the current status of listed eiders in the Action Area include but are not limited to, long-term habitat loss through development and disturbance, environmental contaminants, increased predator populations, subsistence harvest, collisions with structures, research, and climate change. These impacts are occurring throughout much of the species' range, including within the Action Area.

Habitat loss through development and disturbance

Because the majority of the Action Area, with the exception of northeast NPR-A, is remote and unconnected to road systems, industrial development, human habitation, and disturbance have been limited to date. The communities of Atqasuk, Nuiqsut, Wainwright, and Utqiaġvik, and the CD-5, GMT-1 and GMT-2 developments are the only year-round human habitation within the Action Area. However, given industry interest in the Action Area, expressed in lease sales, seismic surveys, and exploratory wells; expansion of industrial development is likely to continue. Despite the limited extent of development, it is likely that listed eiders in the area have experienced some loss of reproductive potential resulting from direct and indirect habitat loss. However, the degree to which spectacled eiders and Steller's eiders can reproduce in disturbed areas or move to other less disturbed areas to reproduce, is unknown.

Environmental contaminants

Deposition of lead shot in tundra wetlands and shallow marine habitat where eiders forage is considered a threat to listed eiders. Lead poisoning of spectacled eiders has been documented on the YK-Delta (Franson et al. 1995; Grand et al. 1998) and in Steller's eiders on the ACP (Trust et al. 1997; Service unpublished data). Waterfowl hunting with lead shot is prohibited in Alaska, and for hunting all birds on the North Slope. However, it may persist in the environment and may still be used by hunters in some areas (Service, unpublished data). Lead deposition in tundra wetlands would likely be limited to areas adjacent to the communities of Atqasuk, Nuiqsut, Wainwright, and Utqiaġvik and frequently used travel corridors, and the concentration of lead presumably would decline with increasing distance from these areas. Although the use of lead shot appears to be declining, residual lead shot may be present in the environment and be available to waterfowl for an unknown period into the future.

Other contaminants such as globally distributed heavy metals, may also affect listed eiders. For example, spectacled eiders sampled in winter near St. Lawrence Island exhibited high concentrations of metals, as well as subtle biochemical changes (Trust et al. 2000). However, risk of contaminant exposure and potential effects to listed eiders in the Action Area are unknown.

Increased predator populations
Predator and scavenger populations have likely increased near rural communities and industrial infrastructure on the ACP in recent decades (Eberhardt et al. 1983; Day 1998; Powell and Backensto 2009). Reduced fox trapping, anthropogenic food sources in rural communities, and an increase in availability of nesting/denning sites at human-built structures may have resulted in increased numbers of arctic foxes (*Alopex lagopus*), common ravens (*Corvus corax*), and glaucous gulls (*Larus hyperboreus*) in developed areas of the ACP (Day 1998). For example, ravens are highly efficient egg predators (Day 1998) and have been observed depredating Steller's eider nests near Utqiaġvik (Quakenbush et al. 2004). Ravens also appear to have expanded their breeding range on the ACP by using manmade structures for nest sites (Day 1998). Therefore, as the number of structures and anthropogenic attractants associated with human habitation increase, reproductive success of listed eiders may decrease, although to date, anthropogenically influenced increases in predator abundance in the Action Area have likely been limited to the vicinities Atqasuk, Nuiqsut, Wainwright, and Utqiaġvik and Industry developments in northeastern NPR-A (CD-5, GMT-1, and GMT-2). Due to, 1) the overall low density of listed eiders in the Action Area, 2) predator populations likely diminishing with increasing distance from human habitation, and 3) areas with increased predator populations overlapping a very small subset of the Action Area; increased predator populations have likely had a minimal impact on listed eiders in the Action Area.

Subsistence harvest
Although local knowledge suggests listed eiders were not specifically targeted for subsistence, an unknown level of harvest occurred across the North Slope prior to listing spectacled and Steller's eiders under the ESA (Braund 1993). Harvest of spectacled and Alaska-breeding Steller's eiders was closed in 1991 by Alaska State regulations, and outreach efforts have been conducted by the Service, the BLM, and the North Slope Borough to encourage compliance. However, annual harvest data indicate that at least some listed eiders continue to be inadvertently or deliberately taken during subsistence activities on the North Slope. Annual intra-Service consultations are conducted for the Migratory Bird Subsistence Hunting Regulations, and although estimates are imprecise, harvest of all migratory bird species, including listed eiders, is reported annually.

Instances of inadvertent harvest would likely be concentrated near Atqasuk, Nuiqsut, Wainwright, and Utqiaġvik, and we expect the frequency of inadvertent harvest would decline with increasing distance from communities as access becomes more difficult. Furthermore, due to overall low density of spectacled and Steller's eiders in the Action Area, except near Utqiaġvik where density of both species is comparatively higher; harvest of listed eiders is likely rare.

Collisions with structures

Migratory birds suffer considerable mortality from collisions with man-made structures (Manville 2005) including light poles, buildings, drill rigs, guyed towers or poles, and overhead powerlines. Birds are particularly at risk of collision when visibility is impaired by darkness or inclement weather (Weir 1976). There is also evidence that lights on structures increase collision risk (Reed et al. 1985, Russell 2005, numerous authors cited by Manville 2000). Anderson and Murphy (1988) monitored bird behavior and strikes to a 12.5 km power line in the Lisburn area (the southern portion of the Prudhoe Bay oil fields) during 1986 and 1987. They documented line strike mortality in 18 different species of birds, including at least one eider. Results indicated that strike rate was related to flight behavior, in particular the height of flight. Johnson and Richardson (1982) in their study of migratory bird behavior along the Beaufort Sea coast reported that 88% of eiders flew below an estimated altitude of 10 m (32 ft) and well over half flew below 5 m (16 ft). This tendency to fly low puts eiders at risk of striking even relatively low objects in their path.

Although several factors confound accurate collision estimates for listed eiders, including: 1) temporal changes in eider density and distribution, 2) lack of understanding how feature configurations contribute to avian collisions, and 3) how variations in weather and lighting conditions effect probability of collisions; an unknown level of collision risk remains over the life of man-made structures. However, some design considerations, such as those implemented at CD-5, GMT-1, and GMT-2 (USFWS 2011b; 2014b; 2018) may reduce or eliminate collision risk for listed eiders, including shielded lighting to limit outward-radiating light and minimize potential attraction and/or disorienting effects to eiders, and avoiding use of guyed towers or overhead lines).

Research

Field-based scientific research has increased in the Arctic in response to interest in climate change and its effects on Arctic ecosystems. While some activities have no impact on listed eiders (e.g., project timing occurs when eiders are absent or employs remote sensing tools), aerial surveys, on-tundra activities, or remote aircraft landings may disturb listed eiders. Many of these activities are considered in intra-Service, or project-specific, consultations with BLM, the National Science Foundation, or other Action Agencies.

Climate change

The environmental baseline includes consideration of ongoing and projected changes in climate which have consequences for listed species in the Action Area. The terms “climate” and “climate change” 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). 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). Various types of changes in climate can have direct or indirect effects on 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).

In our analyses, we use our best professional judgment to weigh relevant information, including uncertainty, in our consideration of various aspects of climate change.

High latitude regions, such as Alaska's North Slope, are thought to be especially sensitive to 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 certainty how these effects will manifest. Biological, climatological, and hydrologic components of the ecosystem are interlinked and operate on varied spatial, temporal, and organizational scales with feedback between components (Hinzman et al. 2005).

There are a wide variety of changes occurring across the circumpolar Arctic. Arctic landscapes are dominated by freshwater wetlands (Quinlan et al. 2005), which listed eiders depend on for forage and brood rearing. As permafrost thaws, some water bodies are draining (Smith et al. 2005; Oechel et al. 1995) or drying due to increased evaporation and evapotranspiration during prolonged ice-free periods (Schindler and Smol 2006; Smol and Douglas 2007). In addition, productivity of some lakes and ponds is increasing in correlation with elevated nutrient inputs from thawing soil (Quinlan et al. 2005; Smol et al. 2005; Hinzman et al. 2005; Chapin et al. 1995) and other changes in water chemistry or temperature are altering algal and invertebrate communities, which form the basis of the Arctic food web (Smol et al. 2005; Quinlan et al. 2005).

With reduced summer sea ice coverage, the frequency and magnitude of coastal storm surges has increased. During these events, coastal lakes and low-lying wetlands are often breached, altering soil/water chemistry as well as floral and faunal communities (USGS 2006). When coupled with softer, semi-thawed permafrost, reductions in sea ice have significantly increased coastal erosion rates (USGS 2006), which may reduce available coastal tundra habitat over time.

Changes in precipitation patterns, air and soil temperatures, and water chemistry are also affecting terrestrial communities (Hinzman et al. 2005; Prowse et al. 2006; Chapin et al. 1995), and the range of some boreal vegetation species is expanding northward (Callaghan et al. 2004). Climate-induced shifts in distributions of predators, parasites, and disease vectors may also have significant effects on listed species. Climate change may also cause mismatched phenology among listed eider migration, development of tundra wetland invertebrate stocks, fluctuation of small mammal populations, and corresponding abundance of predators (Callaghan et al. 2004). In summary, the impacts of climate change are on-going and the ultimate effects on spectacled eiders within the Action Area are unclear. Some species may adapt and thrive under changing environmental conditions, while others decline or suffer reduced biological fitness; it is unknown how spectacled eider populations may be affected.

6.2 Baseline of listed eiders in the MTR

Both Steller's and spectacled eiders occur along the MTR during their migrations. During molt, spectacled eiders are present in the MTR in Ledyard Bay.

While we have some information regarding migration routes of spectacled eiders (e.g., Sexson et al. 2014; Sexson 2015), specific information regarding these routes for Alaska-breeding Steller's eiders is lacking. In spring, spectacled eiders move through leads in the sea ice consistent with patterns exhibited by other sea duck species that migrate from wintering areas in the Bering Sea to breed in coastal Alaska (Sexson et al. 2014). Steller's eiders likely follow a similar migration pattern. In summer and autumn, Steller's eiders return to use open waters along the Chukchi Sea coast, with spectacled eiders remaining in these areas to molt. Large numbers of molting spectacled eiders are present in the Ledyard Bay Critical Habitat Unit (LBCHU) from late June through late October (Larned et al. 1995; Petersen et al. 1999).

A recent study in which spectacled eiders were marked with satellite telemetry devices at coastal areas adjacent to Peard Bay and in the Colville River delta has provided information regarding how the species uses the eastern Chukchi Sea (approximately within 70 km of the coast of northern Alaska) during migration (Sexson et al. 2014; Sexson 2015). Spectacled eiders used this area during pre-breeding migration, breeding, post-breeding migration, and/or post-fledging dispersal. Adult males that used the eastern Chukchi Sea during post-breeding migration arrived in early July and departed in early September, although departure dates varied substantially, ranging from 4 July to 5 October (Sexson et al. 2014). Consequently, sustained occupancy among adult males during post-breeding migration ranged from 30–97 days (Sexson et al. 2014). Adult females that used the eastern Chukchi Sea during post- breeding migration arrived in August and departed in October (Sexson et al. 2014), although the timing of arrival during post-breeding migration varied considerably; arrival occurred as early as 15 July and as late as 28 September. Consequently, the duration of sustained occupancy among adult females during post-breeding migration ranged from 16–84 days.

Juveniles that fledged in tundra wetlands near or adjacent to the Beaufort Sea arrived in the eastern Chukchi Sea in early October and stayed for 13–29 days before departing by late October. Thus, spectacled eiders use the eastern Chukchi Sea continuously from pre-breeding staging through post-fledgling dispersal.

Use of the Beaufort Sea by listed eiders varies over time and by breeding status and is in part controlled by ice cover on the sea surface (Schamel 1978, TERA 2002, Fischer and Larned 2004). Breeding male spectacled eiders generally depart the terrestrial environment in late June when females begin incubation (Anderson and Cooper 1994, Bart and Earnst 2005). Use of the Beaufort Sea by departing males is variable as indicated by satellite telemetry studies (TERA 2002). Of 14 males implanted with transmitters, only 4 spent an extended period of time (11–30 days), in the Beaufort Sea (TERA 2002). Preferred areas were near large river deltas such as the Colville River where open water is more prevalent. Some appeared to move directly to the Chukchi Sea over land, although the majority moved rapidly (average travel of 1.75 days) over nearshore waters from breeding grounds to the Chukchi Sea (TERA 2002).

Female spectacled eiders generally depart the breeding grounds later, when much more of the Beaufort Sea is ice-free, allowing for more extensive use of the area. Females spent an average of 2 weeks in the Beaufort Sea (range 6-30 days) with the western Beaufort Sea the most heavily used (TERA 2002). Females also appeared to migrate through the Beaufort Sea an average of 10 km further offshore than the males (Peterson et al. 1999). This offshore migration route and the greater use of the Beaufort Sea by females is attributed to decreased sea ice later in summer when females migrate through the region (Peterson et al. 1999; TERA 2002).

Factors which may have contributed to the current status of listed eiders in the MTR include but are not limited to, environmental contaminants, collisions with offshore or coastal structures and vessels, and climate change. These impacts are occurring throughout much of the species' range, including within the MTR.

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

While no large spills of crude oil have occurred in the Beaufort Sea, small spills of refined petroleum products do occur. These spills decrease habitat quality and pose a risk to migrating eiders. However, detailed oil spill contingency plans associated with each industry development, and rapid spill response measures limit the area impacted by spills. Furthermore, wildlife hazing during spill response reduces the probability that spectacled eiders encounter and contact spilled product. Similar to the Chukchi Sea, the area of the Beaufort Sea within the MTR is likely minimally impacted by spills or other contaminants.

Collisions with offshore or coastal structures
Onshore, coastal, and offshore structures pose potential collision risk for listed eiders moving through the MTR. Within the Action Area, coastal development has been limited and most existing infrastructure is limited to previously occupied sites (Cape Simpson, Peard Bay, Camp Lonely, and DEW-Line sites; BLM 2020a). With the exception of former DEW-Line sites, most of these locations lack permanent structures or facilities. There are also several oil facilities, currently operating or planned, along the Beaufort Sea coast east of the Action Area (e.g., Nanashuk, Ooguruk, and North Star). These facilities have likely resulted in small-scale, localized impacts on individual listed eiders as is described in the Biological Opinions issued for these projects (USFWS 2006, 2009, 2019b). As described above in *Collisions with Structures*, birds are particularly at risk of collision when visibility is impaired by darkness or inclement weather (Weir 1976). There is also evidence that lights on structures increase collision risk (Reed et al. 1985; Manville 2000; Russell 2005). Johnson and Richardson (1982), in their study of migratory bird behavior along the Beaufort Sea coast, reported that 88% of eiders flew below an estimated altitude of 10 m (32 ft) and well over half flew below 5 m (16 ft). Thus, structures of almost any height pose a collision risk to migrating eiders.

Collisions with vessels
As described above, migratory birds suffer considerable mortality from collisions with anthropogenic objects including vessels. For example, 22 spectacled eiders were killed in a collision event with a ground fishing vessel near Saint Lawrence Island in late fall 2019 (Anchorage Fish and Wildlife Conservation Office and Migratory Bird Management *pers. comm*.). However, impacts of vessel collisions on listed eiders are difficult to quantify because: 1) collisions are often episodic, and those resulting from light attraction in inclement weather may be particularly so, such that observations collected on a few vessels in a single year may not be representative of collisions in general, 2) monitoring for collisions is difficult and an unknown number of collisions may go undetected, even by trained bird observers, and 3) low visibility often coincides with increased collisions (Ronconi et al. 2015), which may increase the number of undetected collisions. Therefore, although listed eider collisions with vessels at sea are known to occur, the collective impacts of collisions on listed eiders in the MTR are difficult to quantify.

6.3 Baseline of Polar Bears in the Action Area
The Southern Beaufort Sea (SBS) polar bear subpopulation occurs in the Action Area. The highest number of polar bears in the Action Area occurs on land during the late summer / fall (July through November) and an average of 140 bears may occur on shore during any week during the period July through November between Utqiagvik and the Alaska-Canada border (Wilson et al. 2017b). At this time some polar bears move onto the coastline and Barrier Islands adjacent to the Beaufort Sea as they abandon melting sea ice. They use these terrestrial areas as travel corridors, resting areas and to some degree foraging areas (particularly subsistence harvested whale carcasses near Kaktovik, which is outside of the Action Area), or, for pregnant females, suitable den sites. Bears may also spend some time on land while transiting to other areas. If bears come ashore due to fall storms, melting sea ice, and/or ocean currents, they may remain along the coast or on barrier islands for several weeks until sea ice returns.

Polar bears in the SBS subpopulation historically spent the entire year on the sea ice hunting for seals, with the exception of a relatively small proportion of adult females that would come ashore during autumn and overwinter to den. However, over the last two decades, the SBS subpopulation has experienced a marked decline in summer sea-ice extent, along with a pronounced lengthening of the open-water season (period of time between sea ice break-up and freeze-up; Stroeve et al. 2014; Stern and Laidre 2016). The dramatic changes in the extent and phenology of sea-ice habitat have coincided with evidence suggesting that use of terrestrial habitat has increased during summer and prior to denning, including in the Action Area. Rode et al., (2015) and Atwood et al. (2016) linked the length of time polar bears spent in these coastal habitats to sea ice dynamics.

The SBS subpopulation had an estimated population size of approximately 900 bears in 2010 (Bromaghin et al. 2015). This represents a significant reduction from previous estimates of approximately 1,800 in in 1986 (Amstrup et al. 1986) and 1,526 in 2006 (Regehr et al. 2006). However, the population appears to have remained stable from 2010 to 2015 (Atwood et al. 2020).

Polar bears have no natural predators (though cannibalism is known to occur; Stirling et al. 1993); however, their life-history (e.g., late maturity, small litter size, prolonged breeding interval) is conducive to low intrinsic population growth. The lifespan of wild polar bears is approximately 25 years (Rode et al. 2020). Females reach sexual maturity at 3-6 years old giving birth one year later (Ramsay and Stirling 1988). In the SBS region, females typically give birth at five years old (Lentfer & Hensel 1980). On average, females produce litters of 1.3-2.3 cubs (Derocher 1999) at intervals that vary from one to three or more years depending on cub survival (Ramsay and Stirling 1988) and foraging conditions. For example, when foraging conditions are unfavorable, polar bears may delay reproduction in favor of survival (Derocher and Stirling 1996; Eberhardt 2002). The determining factor for growth of polar bear subpopulations is adult female survival (Eberhardt 1990). In general, rates above 90 percent are essential to sustain polar bear subpopulations (Amstrup and Durner 1995) given low cub litter survival, which was estimated at fifty percent (90 percent CI: 33-67 percent) for the SBS subpopulation from 2001-2006 (Regehr et al. 2010). In the SBS, the probability that adult females will survive and produce cubs-of-the-year is negatively correlated with ice-free periods over the continental shelf (Regehr et al. 2007a). In general, survival of cubs-of-the-year is positively related to the weight of the mother and their own weight (Derocher and Stirling 1996; Stirling et al. 1999).

Females without dependent cubs typically breed in the spring (Amstrup 2003, Stirling et al. 2016). Pregnant females enter maternity dens between October and December (Durner et al. 2001; Amstrup 2003), and young are usually born between early December and early January (Van de Velde et al. 2003). Only pregnant females den for an extended period during the winter (Rode et al. 2018). Other polar bears may excavate temporary dens to escape harsh winter conditions, however shelter denning is rare for Alaskan polar bear subpopulations (Olson et al. 2017).

Typically SBS females emerge from the den with their cubs around March (mean emergence: March 1 ± 2.1 days, Rode et al. 2018), and commonly begin weaning when cubs are approximately 2.3-2.5 years old (Ramsay and Stirling 1988, Arnould and Ramsay 1994, Amstrup 2003, Rode 2020). Cubs are born blind, with limited fat reserves and are only able to walk after 60-70 days (Blix and Lentfer 1979; Kenny and Bickel 2005), thus if the mother moves young cubs from the den before they can walk or withstand the cold, risk of cub mortality increases (Hansson and Thomassen 1983, Van de Velde 2003, Derocher and Wiig 1999, Amstrup et al. 2006, Lentfer 1975). Therefore, it is thought that successful denning, birthing, and rearing activities require a relatively undisturbed environment.

In the Action Area, the greatest impact to polar bears is loss of sea ice resulting from climate change. Other factors such as subsistence hunting, recreation and research, oil and gas development, and environmental contaminants are also discussed in this section.

Climate change
Global climate change and its effects in the Arctic are likely to have serious consequences for the worldwide population of polar bears and their prey (Amstrup et al. 2007; Amstrup et al. 2008; Hunter et al. 2010; Atwood et al. 2015). The associated reduction of summer Arctic sea ice is expected to be a primary threat to polar bear populations (Stirling and Derocher 2012), and projections indicate continued climate warming at least through the end of this century (IPCC 2013). The Service issued a final Polar Bear Conservation Management Plan (USFWS 2016).

In it, the Service reaffirms the 2008 ESA-listing decision, that the decline of sea ice habitat due to changing climate, driven primarily by increasing atmospheric concentrations of greenhouse gases, is the primary threat to polar bears.

Climate change is expected to impact polar bears in a variety of ways. The timing of ice formation and breakup will impact seal distributions and abundance, and, consequently, how efficiently polar bears can hunt seals. Reductions in sea ice are expected to increase the polar bears' energetic costs of traveling, as moving through fragmented sea ice and swimming in open water requires more energy than walking across consolidated sea ice (Cherry et al. 2009; Pagano et al. 2012; Rode et al. 2014). Research has linked declines in summer sea ice to reduced physical condition, growth, and survival of polar bears (Bromaghin et al. 2015).

Habitat loss due to declining Arctic sea ice throughout the polar bear's range has been identified as the primary cause of population decline and is expected to continue for the foreseeable future (73 FR 28212). Amstrup et al. (2007) projected a 42 percent loss of optimal summer polar bear habitat by 2050. They concluded that if current Arctic sea-ice declines continue, polar bears may eventually be excluded from onshore denning habitat in the Polar Basin Divergent Region. Amstrup et al. (2007) projected the SBS subpopulation may be extirpated within the next 45–75 years, if sea-ice declines continue at current rates.

The occurrence of polar bears along the Beaufort Sea coast has increased in recent years (Schliebe et al. 2008) in correlation with the distance of pack ice from the coast at that time of year (i.e., more bears are observed onshore when the leading edge of the ice is further offshore; Schliebe et al. 2006). We expect this trend to continue in the future, and surmise that an increasing number of bears onshore for longer periods of time during the open water season may increase the potential for human-bear conflicts. Additionally, in recent years when sea ice has retreated far from the Beaufort Sea coast, researchers have observed polar bears swimming in open water, far from the nearest sea ice or land, presumably placing them at risk of exhaustion (Durner et al. 2011; Pagano et al. 2012). In the fall of 2004, four drowned polar bears were observed in the Beaufort Sea during a BOEM coastal aerial survey program (Monnett and Gleason 2006).

Schliebe et al. (2008) determined that an average of 4.0 percent of the SBS subpopulation of polar bears was on land in autumn during 2000 to 2005, and that the percentage increased when sea ice was farther from the coast. More recently, Atwood et al. (2016) determined that the percentage of radio-collared adult females coming ashore in summer and fall increased from 5.8 to 20 percent between 2000 and 2014. Over the same period, the mean duration of the open-water season increased by 36 days and the mean length of stay on land by polar bears increased by 31 days (Atwood et al. 2016). While on shore, the distribution of polar bears is largely influenced by the opportunity to feed on the remains of subsistence-harvested bowhead whales. Most polar bears are aggregated at three sites along the coast, Utqiaġvik, Cross Island, and Kaktovik (Rogers et al. 2015; McKinney et al. 2017; Wilson et al. 2017b).

In addition to increased use of land during the open-water season, polar bears in the SBS subpopulation have also increasingly used land for maternal denning. Olson et al. (2017) examined the choice of denning substrate (land compared to sea ice) by adult females between

1985 and 2013 and determined that the frequency of land-based denning increased over time, constituting 34.4 percent of all dens from 1985 to 1995, 54.6 percent from 1996 to 2006, and 55.2 percent from 2007 to 2013. Additionally, the frequency of land denning was directly related to the distance that sea ice retreated from the coast. From 1985 to 1995 and 2007 to 2013, the average distance from the coast to 50 percent sea ice concentration in September (when sea ice extent reaches its annual minimum) increased 351±55 km (218.10±34.17 mi), while the distance to 15 percent sea ice concentration increased by 275±54 km (170.88±33.55 mi). Rode et al. (2018) determined that reproductive success was greater for females occupying land-based dens compared to ice-based dens, which may be an additional factor contributing to the increase in land-based denning. However, this increase in the proportion of dens occurring in the terrestrial environment may increase the potential for disturbance at dens from industrial development and other human activities.

Subsistence harvest

The Inuvialuit-Inupiat Polar Bear Management Agreement, a Native-to-Native agreement, between the Inupiat from Alaska and the Inuvialuit in Canada was created for the SBS stock of polar bears in 1988. The agreement establishes quotas and recommendations concerning protection of denning females, family groups, and methods of harvest.

In 1988, the Inuvialuit-Inupiat Council (Council) established a sustainable harvest quota of 76 bears for the SBS stock. In 2011, the Council reduced the quota to 70 polar bears. The Alaska Native subsistence harvest of polar bears from the SBS population has declined. From 1990 to 1999, an average of 42 bears were taken annually. The annual average decreased in the years 2000-2010 to 21 bears annually, and from 2015-2020, Alaska Natives harvested an average of 11 bears annually. The reason for the decline of harvested polar bears from the SBS population is unknown. Alaska Native subsistence hunters and harvest reports have not indicated a lack of opportunity to hunt polar bears or disruption by Industry activity.

Research

Polar bear research takes place within Action Area. The long-term goal of 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 disturbance and/or minor injuries (e.g., sedation, tissue sampling, marking, etc.) to individual polar bears targeted in survey and capture efforts, and may incidentally disturb other individuals. In rare cases, research efforts may lead to serious injury or death of polar bears. Polar bear research is authorized through Division of Management Authority (DMA) permits issued under the MMPA. These permits include estimates of the maximum number of bears likely to be impacted during the life (typically five years) of the permit.

Tourism

As more polar bears are spending time onshore, there has been an increase in “polar bear viewing” tourism. The influx of visitors may result in increased anthropogenic disturbance of polar bears (e.g., from humans on foot, ATVs, snow machines, or other vehicles). Although difficult to quantify, these disturbances are usually temporary, which may limit the severity of their impact, although the frequency could increase.

Oil and Gas Development
Oil and gas development and its associated activities such as seismic surveys, gravel mining and road and pad construction, and operation of facilities may impact polar bears within the action area through habitat loss, disturbance, an increase in human-polar bear encounters, and oil and hazardous materials spills (were they to occur). To date, the only facilities in NPR-A are GMT-1, GMT-2, and CD-5 which are located just west of the Colville River on the eastern edge of NPR-A. These facilities are located >2miles from the Beaufort Sea coast and hence their intersection with polar bears is low and their potential impacts have been further mitigated by the implementation of conditions of Letters of Authorization (LOAs) which have been issued to these projects pursuant to the MMPA. Reports from these facilities (required by the LOAs) suggest some minor disturbance of individual polar bears has occurred, but no injury or mortalities have been documented.

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. To date, no large oil spills from oil and gas activities have occurred in marine waters of arctic Alaska. However, 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 1) the slower rate of breakdown of POPs including organochlorine compounds (OCs), 2) relatively simple food chains, and 3) 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), and the highest concentrations of persistent organic pollutants in Arctic marine mammals have been found in seal-eating walruses and polar bears near Svalbard (Norstrom et al. 1988; Muir et al. 1999; Andersen et al. 2001).

However, contaminant concentrations are not presently thought to have population-level effects on most polar bear populations. However, increased exposure to contaminants has the potential to operate in concert with other factors, such as nutritional stress from loss or degradation of sea ice habitat, decreased prey availability and accessibility, or lower recruitment and survival rates. Extended fasting seasons, as a result of sea ice decline will cause polar bears to depend more heavily on their lipid reserves for energy, which can release lipid-soluble contaminants, such as persistent organic pollutants and mercury, into the bloodstream and organ tissues. The increased levels of contaminants in the blood and tissues can affect polar bear health and body condition which has implications for reproductive success and survival (Jenssen et al. 2015). These combined stressors could ultimately have negative population level effects on polar bears.

6.4 Baseline of Polar Bear Critical Habitat in the Action Area
The Action Area includes portions of each of the three polar bear critical habitat units. The proposed Action would primarily occur within terrestrial denning habitat, but, in the event of unexpected circumstances, spilled oil could also reach the sea ice and barrier island critical habitat units.

Habitat loss
Historically, habitat used for terrestrial denning by polar bears in the Action Area has been subject to industry development and/or support infrastructure including Oliktok Dock, and the Mustang, Alpine and Greater Moose's Tooth Developments. However, existing anthropogenic infrastructure was exempted from inclusion in critical habitat at the time of designation (75 FR 76086). Therefore, permanent alteration of the physical and biological features of terrestrial denning habitat in the Action Area, since designation in 2010, has been relatively limited, although some new development and expansion of existing industry infrastructure in or adjacent to the Action Area have occurred (e.g., the Mustang and Nanushuk Developments and Nuiqsut Spur Road). The Action Area has also been subject to localized short-term human disturbance from seasonal ice roads, and access by researchers, recreational and subsistence users. At a larger spatial scale, globally distributed pollutants and climate change have diminished the quality of polar bear critical habitat; however, estimating the magnitude of these effects within the Action Area is difficult.

Environmental contaminants
Exposure to environmental contaminants may affect polar bear survival or reproduction, as discussed above in the *Baseline of Polar Bears*. Thus, the presence of contaminants within polar bear critical habitat could affect the conservation value of the habitat.

Petroleum hydrocarbon contamination from oil and gas development has had a limited effect on the environmental baseline of polar bear critical habitat. A single large spill has been reported for the Chukchi and Beaufort seas: in August 1988, 68,000 gallons (1,619 barrels) of heating fuel were spilled by a tanker 3–6 miles north of the barrier islands off Brownlow Point approximately 150 km southeast of the Action Area. However, no large spills from oil and gas activities have occurred in Arctic Alaska. Some small terrestrial spills have occurred, although they have been infrequent, small in number, and thus far, have affected a limited area. Although polar bears in Arctic Alaska and designated polar bear critical habitat in Alaska have unquestionably been affected by exposure to environmental contaminants, at this time we have no reason to believe the critical habitat's ability to support polar bears has been affected.

Climate change
Climate change is contributing to the rapid decline of sea ice throughout the Arctic, and some of the largest declines are predicted to occur in the Chukchi and southern Beaufort seas (Durner et al. 2009b). This directly affects the PBFs of sea ice, which provide feeding, breeding, denning, and traveling habitat for polar bears. Decreased quality and quantity of sea ice may increase the importance of barrier islands and terrestrial habitat for foraging, denning, and resting. For example, Schliebe et al. (2006) demonstrated an increasing trend in the number of observed polar bears using terrestrial habitats in the fall. Additionally, Fischbach et al. (2007) hypothesized that reduced availability of older, more stable sea ice is contributing to the observed decrease in the proportion of female polar bears denning on sea ice in northern Alaska.

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

7. EFFECTS OF THE ACTION ON LISTED SPECIES

This section analyzes the potential effects of industry and non-industry activities that could result from the proposed action. Because industry activities are the focus of the IAP and RFD, and entail a relatively greater capacity to cause effects, our evaluation concentrates on industry activities projected by the RFD. Prior to permitting or otherwise authorizing any activities – whether industry or non-industry – BLM would evaluate the need for step-down consultation with the Service and engage in such consultation whenever warranted due to potential effects to listed species or designated critical habitat.

7.1 Effects to listed eiders

To evaluate effects of the action to spectacled and Alaska-breeding Steller's eiders (hereafter, listed eiders), we first present some relevant generalizations regarding the two species' distributions and status, and then review the factors that would serve to minimize potential effects to listed eiders, including areas closed to leasing and other protections built into the IAP. We then evaluate the potential effects to listed eiders, separately estimating impacts for spectacled and Steller's eiders as appropriate. We consider possible adverse effects in the onshore Action Area to include long-term habitat loss (including direct impacts from fill and indirect effects from disturbance associated with infrastructure), disturbance from aircraft landings in undeveloped areas, increased predators, spills, collisions with structures, and possible changes in subsistence practices prompted by increased access for hunters. Additionally, we consider how spectacled and Steller's eiders could be affected along the marine transport route (MTR) of the Action Area from disturbance, spills, and collisions with vessels.

Based on recent analyses of the distributions and densities of listed eiders by Amundson et al. (2019), about 88 percent of the ACP population of spectacled eiders and nearly all of the ACP population of Steller's eiders occur within the boundaries of the NPR-A, although substantial numbers of both species occur on lands outside of BLM's subsurface control south of Utqiaġvik and surrounding Wainwright (Figure 8.1). Approximately 50% of spectacled eiders and 38% of Steller's eiders within the NPR-A occur in areas open to fluid mineral leasing, while 76% of spectacled eiders and 66% of Steller's eiders within NPR-A occur in areas where permanent infrastructure would be permitted under the Proposed Action (BLM 2021). Under the proposed action lands closed to leasing include most of the Beaufort Sea coastline, several significant coastal water bodies, and lands around Teshekpuk Lake. These lands provide important nesting habitat for listed eiders and their status under the proposed action reduces the potential impacts of development to the species (Figure 7.1).

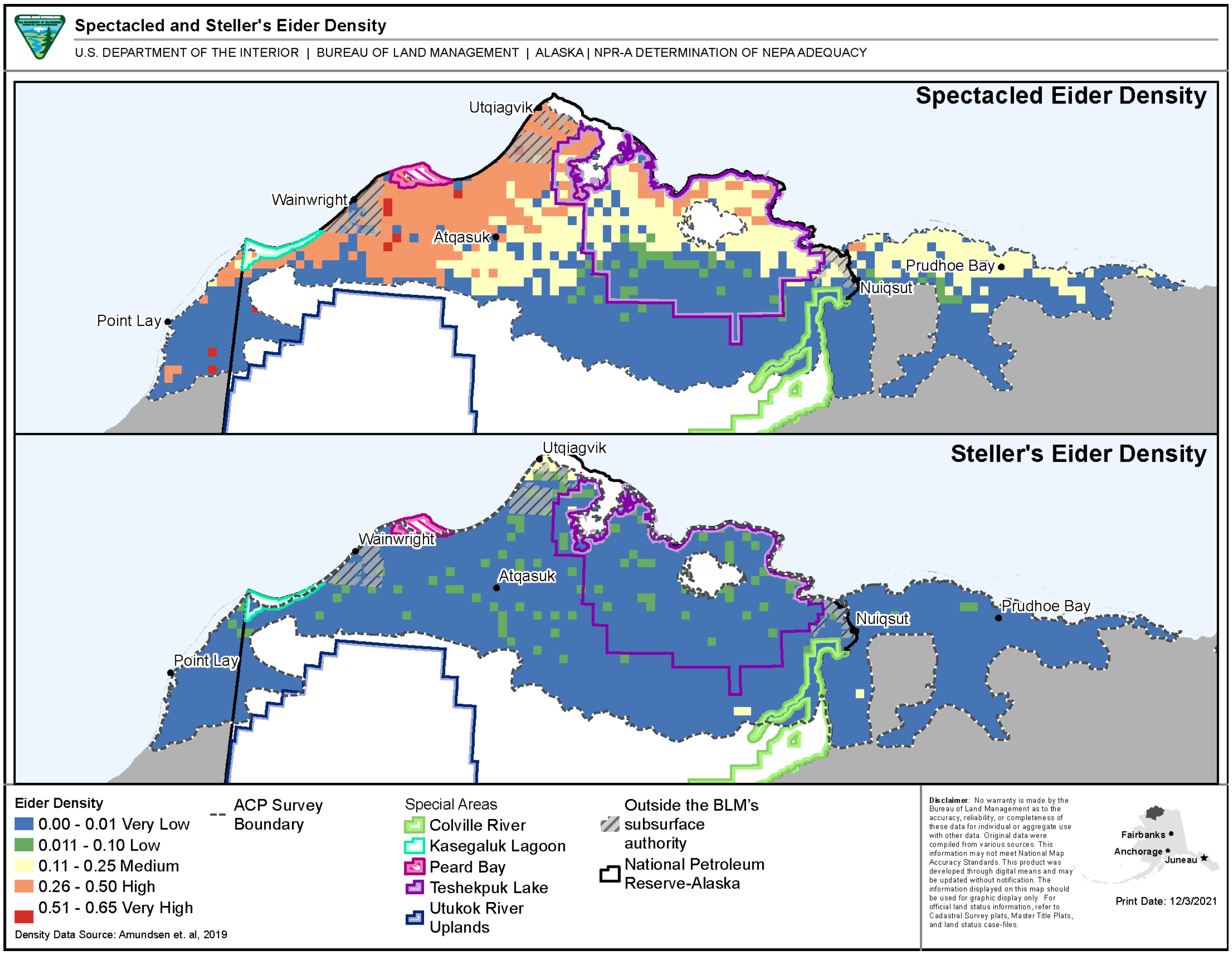

Figure 7.1 Density and Distribution of Spectacled and Steller's Eiders on the Arctic Coastal Plain of the NPR-A in relation to areas with specific designations.

It is helpful to highlight some similarities and differences of spectacled and Alaska-breeding Steller's eiders prior to evaluating potential impacts of the Proposed Action. First, spectacled eiders occur over a much broader geographic area and are much more numerous than Steller's eiders (as discussed in more detail in Status of the Species, above). This is depicted in Figure 7.1, which shows density estimates across the NPR-A, as calculated at the 6 × 6 km pixel scale (derived from Amundson et al. 2019, taken from BLM 2021). Second, the density of both species varies substantially across the landscape, and as a result the location of future actions to be proposed under the Proposed Action would have significant influence on the number of individuals potentially affected. Third, Figure 8.1 shows how density varies across the landscape between spectacled and Steller's eiders. For example, a distinct gradient in density is suggested for spectacled eiders, with none present in the southeastern most portion of the ACP in the NPR-A, and density steadily increasing to the north and west. The highest density of Steller's eiders is found in the northern most portion of the NPR-A, in and near the Barrow Triangle, south of Utqiaġvik and west of Dease Inlet and Admiralty Bay. Elsewhere on the ACP of the NPR-A, Steller's eiders are so scarce or occur so infrequently that density estimates for the vast majority of the region are zero (0 Steller's eiders/km2). However, throughout that vast region, and lacking obvious pattern or gradient, are individual or small clusters of pixels where Steller's eiders have been observed in sufficient number to result in density estimates above zero. In summary, Steller's eiders occur in greater numbers and at higher frequency in and near the Barrow Triangle, but have also been documented, albeit in very low numbers or very infrequently, across a broad expanse of the ACP of the NPR-A. Last, when evaluating whether the Proposed Action jeopardizes the continued existence of listed species, it is important to note that for spectacled eiders the question is addressed at the species scale, evaluating potential reductions in the likelihood of both the survival and recovery of spectacled eiders throughout the species' global range. In contrast, the Alaska-breeding population of Steller's eiders was listed as a distinct population segment, and therefore our evaluation of jeopardy is at the distinct population segment scale.

Factors Serving to Minimize Effects

Under a framework programmatic action such as the IAP evaluated in this BO, take of ESA-listed species is not anticipated to occur unless and until specific actions are proposed, analyzed in a step-down consultation, and authorized consistent with program requirements. This ensures that effects of all future actions to listed species and designated critical habitat are evaluated for compliance with section 7(a)(2) of the ESA, and that project-specific evaluations and determinations would be made in full consideration of the status of the species and critical habitat, environmental baseline, and cumulative effects at the time those step-down consultations are conducted. Although the Project Design Criteria (PDCs) are presented in the Project Description, above, we repeat them here due to their importance in our evaluation of potential impacts to spectacled and Steller's eiders.

PDC 1. The lease areas may now or hereafter contain plants, animals, or their habitats determined to be threatened or endangered or to have some other special status. The BLM may recommend modifications to exploration and development proposals to further its conservation and management objectives and to avoid approving activities that would contribute to the need to list such a species or its habitat. The BLM may require modifications to or may disapprove a proposed activity that is likely to adversely affect a proposed or listed endangered species, threatened species, or critical habitat. The BLM would not approve any activity that may affect any such species or critical habitat until it completes its obligations under applicable requirements of the ESA, 16 United States Code 1531 et seq., including completing any required procedure for conference or consultation.

PDC 2. The Service and the BLM will conduct programmatic reviews by meeting annually, to begin one year after a decision for the NPR-A/ IAP has been issued unless the BLM and FWS both agree to a different interval, or such meetings are no longer needed. These reviews will evaluate, among other things, 1) whether activities proposed are consistent with the IAP, as described, 2) whether the nature and scale of predicted effects remain valid, and 3) whether the programmatic consultation, including the PDCs and determinations reached, remain adequate and appropriate. In addition, these meetings will provide a venue where any new information on the status of species or designated critical habitat, or new methods to avoid or minimize impacts can be shared.

PDC 3. Biological Assessments prepared to initiate formal consultation on actions to be authorized under this program will include: a) an updated, current review of the status of listed species and designated critical habitat that are likely to be adversely affected by the action under consideration; b) a summary of effects, including incidental take authorized under and resulting from the program to date; and c) a review of the need for, and efficacy of, reasonable and prudent measures to minimize the amount or extent of incidental take.

PDC 4. To address uncertainties surrounding the potential impacts of helicopter-supported activities on undeveloped tundra during the nesting and brood-rearing periods of spectacled and Steller's eiders, a collaborative program between the Service and BLM will be developed and implemented. The program will be designed to collect information on the spatial location and extent, temporal duration, dates, number of persons, activities being conducted, and other relevant factors, as appropriate. Depending on results of monitoring and reporting efforts, targeted research may be required to evaluate impacts to nest success and/or duckling/brood survival. Reasonable and prudent measures and terms and conditions to limit or reduce impacts may be required for actions authorized under this program.

Protections Inherent in the Project Description

The BE (BLM 2021) provides information on the spatial relationships between the distribution of listed eiders and the relevant provisions of the proposed action as they relate to potential impacts to listed eiders. As described above, approximately 50% of spectacled eiders and 38% of Steller's eiders within the NPR-A occur in areas open to fluid mineral leasing, while 76% of spectacled eiders and 66% of Steller's eiders within NPR-A occur in areas where permanent infrastructure would be permitted under the Proposed Action. It is important to note the degree to which these provisions actually reduce impacts would be influenced by the location of future proposed actions. This in turn would determine the degree of spatial overlap between proposed actions, the distributions of listed eiders. Nonetheless, a significant portion of the breeding populations of both species would presumably not encounter infrastructure and human activities associated with it that may result from the proposed action BLM (2021).

In addition to areas closed for leasing, ROPs and Lease Stipulations further limit where development activities can occur and how activities will occur. Many of these will also reduce impacts to listed eiders. A complete description of the ROPs and Lease Stipulations is provided in BLM's BE (BLM 2021), however, the following provides a brief description of the principal ways key ROPs and Stipulations may serve to reduce impacts to listed eiders in the Action Area. They are further discussed in the relevant section of this effects section.

Loss and impacts to nesting habitat may be reduced through ROP E-5 requires operators to minimize project footprint and use existing infrastructure where possible; and ROPs C-2 and L-1 set standards and requirements for tundra travel to minimize impacts to vegetation and soils. ROPs C-3 and E-6 ensure fish passage and help ensure natural drainage patterns and hence the wetland habitats used by eiders are maintained. ROP A-10d requires operators to control "fugitive dust" from roads and pads which can also change local habitat characteristics.

Stipulations E-2 and K-2 prohibit permanent facilities (except essential road and pipeline crossings) close to fish-bearing and other large waterbodies; while Stipulation K-6 prohibits permanent oil and gas facilities, except for pipelines, within 1 mile of the shoreline of goose molting lakes within the Goose Molting area. ROP E-11 minimizes impacts to breeding sites for Steller's and spectacled eiders from effects of permanent infrastructure by requiring at least 3 years of "site-relevant survey data" if construction is within the USFWS ACP Waterbird Breeding Population Survey Area or the Barrow Triangle Steller's Eider Survey Area. Under ROP E-11 in the Proposed Action, the BLM may require ground nest surveys, depending on the adequacy of the aerial survey data submitted by the permittee. Where Steller's or spectacled eiders are present in a development area, BLM and USFWS will consult on siting of infrastructure and other mitigation to minimize impacts on the birds and their habitat.

ROP E-11 also imposes buffers around lakes used by yellow-billed loons for nesting, which in turn will confer protection for nesting eiders within these buffers. Similarly, Stipulation K-6 requires that no permanent oil and gas facilities, except for pipelines, would be allowed within 1 mile of the shoreline of goose molting lakes, while Stipulation K-8, states that development may be prohibited or activities curtailed within 0.5 miles of all identified brant nesting colonies and brood-rearing areas, and Stipulation K-10 designates the Teshekpuk Caribou Herd (TCH) Movement Corridor, which extends from the eastern shore of Teshekpuk Lake to approximately 6 mi eastward toward the Kogru Inlet and the area adjacent to the northwest corner of Teshekpuk Lake to be unavailable for leasing and no permanent oil and gas facilities, except for pipelines or other infrastructure associated with offshore oil and gas exploration and production, would be allowed.

Stipulation K-4 would make the Kogru River, Dease Inlet, Admiralty Bay, Elson Lagoon, Wainwright Inlet/Kuk and Ivisaruk rivers, Peard Bay, Kasegaluk Lagoon and their associated islands on the Chukchi Sea coast of the NPR-A unavailable for leasing, and no permanent oil and gas facilities would be permitted on or under the water within 0.75 miles seaward of the shoreline (as measured from mean high tide) of the major coastal waterbodies or the natural coastal islands (to the extent that the seaward subsurface is within the NPR-A) with the exception of linear features, such as pipelines. Elsewhere, permanent facilities within the major coastal waterbodies would only be permitted on or under the water if they can meet all of the criteria dictated in Stipulation K-4. Stipulation K-5 provides that no exploratory well drill pads, production well pads, or central processing facilities (CPFs) are permitted on or under the coastal waters within the administrative boundary of the NPR-A, or within 1 mi inland of the shoreline. These stipulations serve to protect coastal waters used by listed eider species during staging, molt, and migration (Sexson et al. 2014).

Many of the ROPs and Stipulations that confer habitat protections will also serve to reduce disturbance to nesting eiders. In addition, ROP E-18 is intended to avoid and reduce temporary disturbance- related impacts to Steller's and/or spectacled eider nests in the NPR-A by restricting various potential disturbances within 200 m (656 ft) of nests. For example, ground- level activity (by vehicle or on foot) would be restricted to existing thoroughfares such as pads and roads from June 1 to August 15. Construction of permanent facilities, placement of fill, alteration of habitat, and introduction of high noise levels would also be prohibited within 656 ft of occupied Steller's and/or spectacled eider nests. In instances where summer support/construction activity must occur off existing thoroughfares, BLM/USFWS-approved nest surveys must be conducted during mid-June prior to the approval of the activity and data would be evaluated to determine if an action could occur with a 656-foot buffer around nests or if the activity would have to be delayed until after mid-August, once ducklings are mobile and have left the nest site. ROP F-1 under the Proposed Action requires aircraft to maintain an altitude of at least 2,000 ft agl (except for takeoffs and landings) over the TCH Habitat Area from May 20 through August 20. While this ROP was intended to minimize disturbance to caribou, eiders nesting in the TCH Habitat Area could benefit from reduced aircraft disturbance as well.

Significant protections for listed eiders are also provided by ROP E-10 which aims to reduce collision risk by minimize attraction of eiders to artificial light sources at oil and gas facilities by the establishment of facility visibility requirements to minimize bird collisions with infrastructure, particularly during migration and in inclement weather. Under the Proposed Action, this would be a year-round requirement; in addition, all elevated utility lines and guy wires must be flagged to minimize bird collisions. Risks of collisions between listed eiders and infrastructure is further reduced by Stipulations K-5 and K-6 which preclude most infrastructure from the coastline reducing the probability of a migrating eider encountering structures.

ROP E-9 requires permittees to incorporate infrastructure design measures that reduce denning and nesting opportunities for known eider predators such as ravens, raptors, and foxes and establishes a reporting requirement. The effect of this ROP should reduce the attraction of infrastructure to predators, which are a major cause of egg and nest loss among listed eiders (Quakenbush et al. 2004; Johnson et al. 2008).

The proposed action also includes a number of ROPs and Stipulations which will govern how fuels and hazardous substances are managed and require spill response and contingency plans be developed (ROPs A-2, A-3, A-4, and A-5 and Lease Stipulation K-4). These ROPs, coupled with setbacks from major rivers (e.g., as required by Lease Stipulation K-1) serve to reduce the potential, and ramifications of spills of oil, fuel, or other hazardous substances which could impact listed eiders and their habitats.

7.1.1- Effects to Eiders in the Terrestrial Portion of the Action Area

Long-term habitat loss – Winter travel

Snow trails, ice roads and pads, and seismic vibroseis could damage tundra vegetation, and indirectly affect nesting habitat for listed eiders. Research indicates damage from winter trails occurs on higher, drier sites with little or no damage in wet or moist tundra areas (Pullman et al. 2003) when ice roads or snow trails are used. Jorgenson (1999) found impacts were limited to isolated patches of scuffed high microsites and crushed tussocks. Similarly, Yokel and VerHoef (2014), found disturbance from seismic and ice road activity was greatest in drier, shrubby habitat than in moist habitat. McKendrick (2003) studied several riparian willow areas and found although some branches were damaged, the affected plants survived. Because spectacled and Steller's eiders nest and rear their broods in low moist tundra areas (Anderson and Cooper 1994; Anderson et al. 2009; Quakenbush et al. 2000, 2004; Rojek 2006, 2007, 2008), and we anticipate limited damage in these habitats from winter routes associated with the proposed action, we conclude these activities are not likely to adversely affect spectacled or Alaska-breeding Steller's eiders. Therefore, we would not anticipate significant long-term habitat loss from winter routes, ice pads, or seismic surveys associated with exploration or development that may result from the proposed action.

Long-term habitat loss – Gravel placement, extraction, and subsequent use of infrastructure
Direct, permanent habitat loss would result from the extraction and placement of gravel fill to support industry development and community infrastructure. We also anticipate indirect habitat loss via disturbance from on-pad activities, road operations, and maintenance activities, which would reduce the use or value of nearby habitat. The two principal mechanisms through which disturbance can adversely affect eiders on their breeding grounds are:

1. Displacing adults and/or broods from preferred habitats during pre-nesting, nesting, brood rearing, and migration; and
2. Displacing females from nests, exposing eggs or small young to inclement weather and predators.

For the purposes of estimating the potential effects of long-term habitat loss, we estimated the number of pairs or nests of spectacled and Steller's eiders potentially affected by habitat loss. The impacts of habitat loss will ultimately depend on the location development occurs in relation to preferred nesting habitat, and the amount of development. In their RFD, BLM projects a range of potential footprints. However, in order to assure that we haven't underestimated potential impacts, we use the "high development scenario" which estimates the total area of direct habitat loss from gravel fill and extraction to be 1,269 acres (BLM 2021).

We then estimated the area of indirect habitat loss, in which disturbance from activities on the directly impacted footprint would affect or dissuade nesting or brood-rearing in an adjacent zone of influence. We assumed this indirect habitat loss would extend for 200 meters (656.2 ft) around the development footprint, including production and processing pads, runways, gravel pits, permanent gravel roads, etc., and we summed the areas of direct and indirect habitat loss. The configuration of facilities which could result from the proposed action is unknown, which makes estimating the area of potential effects from indirect habitat loss challenging. However, in their 2020 BA and subsequent correspondence with the Service (BLM 2020a and BLM email dated 5 August 2020) BLM estimated the RFD with larger and more areas available for leasing could result in 2,475 acres of direct habitat loss with 175km^2 of indirect loss. Using this base estimation, and given the RFD is the same, we therefore anticipate the 1,269 acres of direct habitat loss will result in 29.71km^2 of indirect habitat loss. Hence, a total area of 34.85km^2 is considered to be the upper limit of habitat loss.

Next, we multiplied the estimated area of impacted habitat by the density of listed eiders derived from aerial waterbird surveys on the ACP (Amundson et al. 2019)6, developing separate

6 The aerial survey area (and therefore our density values) is limited to areas of the ACP of the NPR-A that contain suitable waterbird and eider nesting habitat.

estimates for spectacled and Steller's eiders due to differences in density and distribution between species. Because the density of listed eiders is highly variable across the NPR-A, uncertainty in where development would eventually occur could result in substantial differences in potential impacts. Therefore, we developed two estimates for each species, multiplying the estimate of total area impacted by two different values for density, which we considered to represent moderate and high densities for each species. Our intent was to ensure uncertainty in the location of future development would not result in underestimation of potential impacts when evaluating whether or not the proposed action would violate section 7(a)(2) of the ESA.

Therefore, we calculated a range of impacts, including a more likely, moderate level of impacts, and a less likely, but more impactful level, for use when considering the potential for population-level implications. To represent moderate eider density, we used mean density for each species calculated across the entire ACP of the NPR-A. To represent high density, we used the 90th quantile(7) of estimated densities for each species, calculated using only the high and medium development potential areas which contain comparatively higher densities of listed eiders than low development potential areas (BLM 2021). Density estimates used in our calculations were taken from Amundson et al. (2019) and converted from eiders/km^2 to pairs or nests/km^2 by dividing by two (Table 7.1).

Table 7.1 - Density Estimates for Spectacled and Steller's Eiders in NPR-A

	Average Density (Pairs or Nests/km^2)	High Density (Pairs or Nests/km^2)
Spectacled Eiders	0.0606385	0.1742713
Steller's Eiders	0.0030545	0.0309094

We then multiplied the estimate of total area impacted (34.85km^2), by the estimates of density. This provided an estimate of the number of pairs or nests of listed eiders potentially affected by habitat loss (Table 7.2).

Table 7.2 - Number of Listed Eider Nests Potentially Affected by Habitat Loss Each Year

	Moderate Impacts (Nests/Year)	High Impacts (Nests/Year)
Spectacled Eiders	<3	<7
Steller's Eiders	<1	<2

While acknowledging the imprecision of these calculations and the untested nature of the assumptions applied when developing these estimates, using this approach we estimate that if all development were to occur in areas supporting the highest density of listed eiders, then less than 7 spectacled eider and less than 2 Steller's eider nests would be affected by habitat loss each year. Applying the conservative assumption that nesting eiders would not respond to habitat loss by moving elsewhere to nest with comparable or partially reduced success, we consider these

7 Therefore, only 10 percent of the area within medium and high development potential areas contains higher densities of spectacled and Steller's eiders (calculated at the 6 × 6 km pixel scale).

estimates to represent potential annual loss of listed eider production resulting from impacts to nesting habitat under the proposed action.

These estimates represent a range in potential impacts to eider production intended to reflect uncertainty in the locations of proposed development and associated activities, which would have substantial influence on the number of eiders affected and would determine which stipulations and ROPs would apply. It is important to consider that our estimates were based on the footprint estimated for the high petroleum production case from RFD, whereas the actual amount of development that would be proposed is unknown with corresponding implications for impacts. Additionally, several assumptions or considerations used in developing our estimates likely served to bias our estimates high, including: 1) the use of the high petroleum production case for footprint size; 2) the assumption that future production of listed eiders is prevented within 200 meters of infrastructure; and 3) that individual eiders subjected to disturbance do not move elsewhere to breed; and 4) our use of the 90th quantile in density to represent a high impact scenario. Collectively, we believe these factors ensure our estimates are conservative (i.e., err on the side of overestimating) when used to inform our evaluation of whether the proposed action would comply with section 7(a)(2) of the ESA.

Disturbance from aircraft landings and on-tundra activities
Industry and non-industry aircraft capable of landing on unimproved airstrips, tundra, lakes, rivers, and gravel bars provide an important mode of transport for people and equipment in undeveloped portions of the NPR-A. Authorizations for Take-off and landing (TOLs) permits are sought by industry personnel, researchers, government employees, commercial guides etc., for activities including "stick-picking" garbage left over from oil and gas exploration and construction, regulatory compliance monitoring, wildlife research, archaeology, site remediation, and recreation (including camping, hunting, and boating). These activities take place annually from spring through fall, and most of these activities require at least one round trip (i.e., with one TOL) by aircraft to undeveloped areas within NPR-A. There has been a gradual increase in the number of TOLs authorized by BLM with the average number requested from 2017-2020 of 9,225 per annum. This number include both fixed wing and helicopter operations. However, if development increases as a result of the proposed action BLM anticipates the number of TOLs will also increase.

As required by the PDCs, the BLM would consult with the Service in step-down consultations prior to authorizing or permitting activities that could affect listed eiders. These include TOLs during the eider nesting season. Since 2006, the BLM has conducted annual section 7 consultation with the Service on helicopter and fixed-wing aircraft landings during the eider nesting season and we expect to continue this practice. Although we separately consult on the impacts of these on-tundra activities, we have included consideration of the impacts of TOLs and other associated activities in this consultation, as many of the TOLs and associated activities are consequences of actions that would be authorized under the proposed action. Therefore, impacts resulting from TOLs and other on-tundra activities are considered in this BO. In considering disturbance from the suite of on-tundra activities that are supported by TOLs (e.g., stick-picking, compliance monitoring, wildlife research, archaeology, site remediation, and recreation), because these activities are temporary (i.e., the duration of human presence in a given area is limited) and involve little or no ground disturbance (e.g., impacts from archaeological excavations are expected to be minor), we regard the TOL itself as the greatest source of disturbance associated with on-tundra activities.

To estimate the impacts of disturbance from TOLs and associated activities, we consider the number of TOLs (8,100) estimated by BLM), the estimated density of listed eiders (using the same values for density as used for estimating the effects of Habitat Loss, above), and an estimated distance over which we would expect potential response to occur. Then, based on information on the response of listed eiders or other related species, we estimated the potential change in nest success caused by exposure to disturbance from TOLs. Finally, we multiplied our estimates of exposure and response to provide an estimate of the potential loss of listed eider production caused by TOLs and associated activities.

Information with which to estimate the impact of TOLs upon spectacled and Steller's eider reproductive success is limited. Specific information regarding the ground activities supported by TOLs is lacking in regard to the number of people involved, the activities conducted, timing relative to the phases of the eider breeding season (i.e., pre-laying, incubation, brood rearing), and the distance from the landing site over which activities would occur. Further, we do not have species-specific information on how spectacled and Steller's eiders would respond to disturbance, and how that varies from nest to nest, with weather, time of year, and other factors. To consider response, therefore, we applied a series of reasonable generalizations and assumptions in the absence of species-specific studies or controlled-disturbance experiments. First, we assume that a helicopter landing close to a nest would likely flush the incubating female and prevent her from returning for as long as the aircraft and associated human activity remain near the nest. Although we expect there is a gradient effect centered on a given landing site, with effects presumably decreasing with increasing distance between the nest and landing site and activities, we lack the information on how response decreases with increasing distance. Therefore, we assumed all hens with nests within a 600-m radius of a landing site would be flushed, putting nests at increased risk of abandonment or depredation, and no nests further than 600 m from landing sites would be affected. After landing, human activities would take place over an unspecified area. However, the 600 m radius translates to an area of 1.13 km^2 (roughly 0.5 mi^2) around a given landing site, and we believe the estimated spatial extent of this "zone of influence" encompasses disturbance from the TOL itself, as well as disturbance from associated on-tundra activities (e.g., land-based foot traffic, remote camps, scientific research, etc.). We believe the size of this zone of influence likely overestimates the spatial extent of actual disturbance in most cases, but nonetheless, is a reasonable approximation given the paucity of detailed information regarding associated on-tundra activities.

To evaluate the likelihood that nests potentially disturbed near landing sites would be affected, we considered the following information. Studies of spectacled eiders have shown that nest success varies spatially and temporally. Using Mayfield methods, Bowman and Stehn (2003) estimated nest survival for spectacled eiders on the YK-Delta in 1994 – 2002 to be 0.678. At Utqiaġvik, Safine estimated spectacled eider nest survival to be 0.27 (95% CI: 0.08 – 0.51) in 2013 and 0.62 (95% CI: 0.28, 0.83) in 2014 (Safine 2015). Thus, not all nests would survive to hatch regardless of human disturbance, and nest survival rates should be expected to vary among years and areas. Further, we would not expect all nests from which females flush to be abandoned or depredated. For example, a site visit including one helicopter landing and human presence lasting 15 minutes would presumably result in lower risk of nest abandonment than a site visit requiring multiple disturbances from helicopters and prolonged human activities, however, the difference is difficult to quantify. Bowman and Stehn (2003) and Grand and Flint (1997) reported human disturbance at spectacled eider nests on the YK-Delta reduced nest success by a mean of 9.9 percent. Although the likelihood of nest abandonment or depredation resulting from aircraft landings and on-tundra activities would presumably vary with the number of people, and the duration and type of activities at landing sites, we assume effects of human disturbance on nest success reported on the YK-Delta would approximate the effects of aircraft disturbance on spectacled and Steller's eider nests in the Action Area. Therefore, we estimate that single short disturbances at nests of spectacled or Steller's eiders would reduce nest success by 9.9 percent (rounded to 10 percent).

Although information currently provided in permit requests for helicopter-supported activities in NPR-A is insufficient to evaluate the associated activities, it does allow for categorizing activities into short and longer-duration events. In comparison to short-duration disturbance events, we assume that during longer disturbances, the hen could be prevented from returning to the nest for the entire interval, or she could return to the nest, only to be flushed again when the helicopter takes off. Therefore, we consider that activities at these sites could pose two disturbance events (landing and take-off) and assume activities at these sites would pose roughly twice the impact to nest success (19.8 percent, rounded to 20 percent). For computational purposes, we thereby consider short duration events to pose one disturbance event and reduce nest success by 10 percent, and longer-duration events to pose two disturbance events, each reducing nest success by 10 percent (i.e., a collective 20% reduction in nest success).

Thus, we conclude that the annual impacts of TOLs and associated activities, are reasonably approximated as the product of the number of disturbance events at landing sites, nest density (using moderate and high density estimates for each species), the area potentially impacted at each site (600-m radius, area of 1.13 km^2), and the estimated reduction in nest success caused by disturbance events (10 percent) (Table 7.3.)

Thus, estimated potential reduction in production are estimated as:

$$8{,}100 \text{ disturbance events} \times \text{density} \times 1.13 \text{ km}^2 \text{ per site} \times 0.10$$

Table 7.3 - Potential Reduction in Production of Listed Eider Nests by Helicopter TOLs

	Moderate Impacts (Nests/Year)	High Impacts (Nests/Year)
Spectacled Eiders	56	159
Steller's Eiders	3	28

Using this process, we estimate 56–159 spectacled eider nests and 3–28 Steller's eider nests would be lost each summer season due to disturbance from on-tundra aircraft landings and the associated activities (Table 7.3). We acknowledge a number of assumptions and biases inherent in our estimate, which likely caused an over-estimate of impacts. These include:

- Our estimates of nest density assume that all eiders counted in aerial surveys represent breeding adults and all nests; however, an unknown proportion of adults or pairs may not nest. Thus, our estimates of nest density may be biased high.

- The area in which helicopter TOLs affect nesting eiders is likely smaller than the 1.13 km^2 area of disturbance used in the effects analysis. We assume the 1.13 km^2 impact area includes potential nest disturbance from on-tundra activities beyond the discrete location of the landing site, but the available information is inadequate to adjust the area to reflect site-specific activities. Thus, we likely over-estimated the area of impact by assuming all nests within 600 meters of the landing site would be affected similarly.
- We base our estimates of the magnitude to which disturbance may decrease nest success on studies in which researchers intentionally flushed eiders from nests, whereas in the proposed action, permittees would likely attempt to avoid flushing hens.
- We are unable to separate activities into those that occur during the nesting, brood-rearing, and post-fledging periods based on the available information, so we have assumed that all activities have similar impacts on nest success regardless of timing.
- Our estimates of high impacts apply the implicit assumption that thousands of TOLs would take place in areas that contain, on average, exceptionally high densities of eiders, which is very unlikely, particularly for Steller's eiders. Our intent was to evaluate potential population-level implications in the improbable event that nearly all activity would occur in the high and medium development potential areas, and within those areas, in the areas of highest eider density. Steller's eiders have very patchy distribution, with the population concentrated in the Barrow Triangle, especially near Utqiaġvik, with extremely low densities or none at all occurring in most of the NPR-A. Spectacled eiders also have a large gradient in density across the NPR-A, although to a lesser degree. As a result, the exposure of either species to TOL disturbance associated with future development and other activities resulting from the proposed action would vary considerably depending on where infrastructure or activities would occur.

Predators

As discussed in the *Environmental Baseline* for listed eiders, abundance of predators and scavengers has increased near industrial infrastructure on the ACP. Notably, ravens have expanded their breeding range on the ACP by using manmade structures for nesting and perching. Therefore, as the number of structures and anthropogenic attractants associated with development increase, reproductive success of listed eiders may decrease.

Estimating the effects of predators on listed eider production in the NPR-A is extremely difficult. We expect infrastructure authorized under the proposed IAP would increase the number of potential nesting and perching sites for ravens, and increased availability of anthropogenic food sources could also attract predators to infrastructure or other sites where personnel work or reside. However, the proposed IAP contains three ROPs specifically designed to address anthropogenic influences on predators:

- ROP A-1, which, in order to protect the environment by disposing of solid waste and garbage in accordance with all applicable federal, State, and local laws and regulations, requires that areas of operation shall be left clean of all debris;

- ROP A-2, which, in order to avoid attracting wildlife, including predators of birds and their eggs, requires permittees to prepare and implement a comprehensive waste management plan; and
- ROP E-9, which, in order to avoid human-caused increases in predator populations, requires permittees to: incorporate into infrastructure design, measures to deter ravens, raptors and foxes from nesting, denning, or seeking shelter; and provide the AO with an annual report on any instances when, despite use of such measures, the use of infrastructure by ravens, raptors, and foxes did occur; and prohibits the feeding of wildlife.

Based on the best available information, especially the strict requirements of ROPs A-1, A-2, and E-9, we predict no appreciable loss in production of spectacled or Steller's eiders would result from increased predation under the proposed action.

Oil Spills and Exposure to Other Contaminants
Accidental spills of oil or other petroleum products resulting from activities during all phases of oil and gas exploration or development under the proposed action could originate from CPFs and satellite pads, pipelines, storage tanks, drill rigs, remote camps, and vehicles and vessels operating in the Action Area. Spills could include produced water, seawater, produced or refined oil, other petroleum products, or hazardous materials. In the terrestrial Action Area, listed eiders could encounter spills in tundra wetlands or freshwater environments used for breeding, nesting, brood-rearing, foraging, and resting. Oil spills in the MTR are addressed separately, below.

Exposure to oil may impact listed eiders in several ways, depending on the volume, location, and timing of a spill, and severity of exposure. For example, waterfowl directly contacting even small amounts of oil may lose the hydrophobic, insulative properties of their feathers and suffer impaired thermoregulation. These birds may become wet, hypothermic, or potentially drown (Jenssen 1994). Birds sublethaly exposed to oil may also suffer reduced reproductive success. Mortality of embryos and nestlings follows exposure to even small amounts of hydrocarbons (light fuel oil, crude oil, or weathered oil) transferred to eggs or ducklings from adults with lightly oiled plumage (Parnell et al. 1984; Hoffman 1990; Szaro et al. 1980; Stubblefield et al. 1995). Waterfowl ingesting oil in the course of normal foraging or preening behaviors may experience toxicological effects including gastrointestinal irritation, pneumonia, dehydration, red blood cell damage, impaired osmoregulation, immune system suppression, hormonal imbalance, inhibited reproduction, retarded growth, and abnormal parental behavior (Albers 2003; Briggs et al. 1997; Epply 1992; Fowler et al. 1995; Hartung and Hunt 1966; Peakall et al. 1982). Birds also bioaccumulate hydrocarbons and are vulnerable to both acute and sublethal effects from contaminated food supplies (Albers 2003).

The direct and indirect effects of spills on listed eiders and their habitat would depend primarily on the seasonal timing and location of spills and on the volume and type of material released into the environment. For example, direct effects to listed eiders from terrestrial spills in winter would be discountable, because listed eiders would not be present. Furthermore, indirect effects to listed eiders from lingering effects on terrestrial habitat due to winter spills would be unlikely, due to cleanup requirements under ROPs A-3 and A-4.

Using Alaska North Slope crude oil spill data from 2000–2018, (ADEC 2020) and spill-size categories consistent with U.S. Environmental Protection Agency regulations (40 CFR 112), the BLM estimated spill risk for the NPR-A under the proposed IAP over the next 70 years to be 1,585 small spills (< 50 bbl) which could occur in the marine or terrestrial environment, < 21 medium spills (50–858 bbl) which could result from pipeline failures or well blowouts in the terrestrial action area, and up to 3 large spills (> 858 bbl) may occur in the terrestrial environment (BLM 2020 Appendix 1). Thus, small spills are expected to occur frequently, medium spills are expected to occur infrequently, and a large terrestrial spill would be possible but rare.

Although small spills are expected to occur with some regularity, small spills are likely to have less effect upon listed eiders and their habitat, as they are likely to impact a smaller area, and be limited to gravel infrastructure (e.g., CPF or satellite pads) reducing the likelihood of eiders encountering oil. Small spills would also be easier to contain and remediate; and would be reduced in volume to a greater degree through evaporation.

Medium and large spills are less likely to occur but could potentially be more harmful, as they are likely to cover a larger area, which increases the risk of listed eiders being exposed and poses greater challenges to contain and remediate. Additionally, because of their more limited spatial extent, slower rates of dispersion, and higher likelihood of successful containment, terrestrial spills would have a low potential for reaching the marine environment. Most spills, particularly small spills, would likely occur on pads, roads, or other infrastructure that would be avoided by eiders, reducing the likelihood of exposure. In the event that spills occur, disturbance associated with response and clean-up activities would likely dissuade listed eiders from entering or remaining in affected areas, thereby further reducing the risk of exposure and limiting the impacts of disturbance caused by the activities.

Several ROPs and Lease Stipulations which are part of the proposed action serve to reduce the risk of listed eiders being exposed in the event that oil or other substance spills do occur. Lease Stipulations K-1 and K-3 and ROP E-2 require setbacks from major rivers and fish-bearing rivers and streams in the Action Area. Pipelines could still cross these areas so there is no reduction in the likelihood of spills from pipelines entering rivers, but spills from accidents on pads or at compressor stations would be less likely to reach protected rivers, which would also reduce the likelihood that oil would be transported downstream toward the coast.

Lease Stipulation K-4 closes the Kogru River, Dease Inlet, Admiralty Bay, Elson Lagoon, Peard Bay, Wainwright Inlet/Kuk River, Kasegaluk Lagoon, and their associated islands to leasing and no permanent oil and gas facilities are permitted within 0.75 miles seaward of the shoreline, pipelines are not included in this prohibition.

Stipulation K-4 would permit essential pipeline crossings over and under waterbodies only if the permittee could demonstrate year-round spill response capability or alternative methods to prevent blowouts. Project-level environmental impact statements would analyze the possibility of and response to a blowout, including models for season. Lease Stipulation K-5 prohibits all facilities within 1 mi of the coast, except those that necessarily must be at the coast (e.g., barge landings, seawater treatment plants, or oil spill response staging and storage areas). For essential coastal infrastructure, the use of a previously occupied site (Cape Simpson, Peard Bay, Camp Lonely, Husky/USGS drill sites, and DEW-Line sites) would be considered before the use of new and unoccupied sites.

ROPs A-3, A-4, and A-5 minimize potential impacts of contaminants on fish, wildlife, and the environment as a result of hazardous materials, fuel spills, or refueling operations. All oil and gas related activities require the permittee to have a hazardous materials contingency plan. Additionally, permittees with oil storage capacity of 1,320 gallons or greater would be required to prepare a spill prevention, control, and countermeasure plan (40 CFR 112); notify the BLM and other federal, State, and North Slope Borough entities as soon as possible in the event of spills; store sufficient cleanup materials at fueling points and maintenance areas; and clean spills immediately.

To summarize important considerations, the majority of spills of oil and other contaminants are expected to be of low volume, small spills are expected to be contained or weather quickly, and material handling, spill prevention, and response measures required by the BLM through Lease Stipulations and ROPs include several measures to minimize impacts to the environment and wildlife when spills occur. Prohibitions against oil and gas production and processing in offshore waters, on barrier islands, and within one mile of the coast indicates that most spills would occur in terrestrial areas, where containment and response efforts are likely to be effective. The density of listed eiders in the NPR-A is generally low (i.e., high density [90^{th} quantile] for spectacled and Steller‘s eiders in the NPR-A is 0.17 pairs/km^2 and 0.03 pairs/km^2, respectively), minimizing the number of listed eiders likely to be exposed to spills. Further, procedures governing chemical storage and disposal procedures would effectively minimize risk of listed eiders being exposed to other contaminants in NPR-A.

Because 1) most spills during the 70-year life of the IAP are expected to be small and be contained or weather quickly, 2) medium and large spills, although possible, would be subject to immediate response and, due to the terrestrial location, be limited in spatial extent, have slower rates of dispersion, and a higher likelihood of successful containment, 3) the density of spectacled and Steller's eiders in NPR-A is generally low (0.17 pairs/km^2 and 0.03 pairs/km^2, respectively), minimizing the number of listed eiders likely to be exposed to spills, 4) human presence and activity associated with spill response would likely cause eiders to depart spill sites, reducing risk of exposure and the potential for disturbance, 5) material handling, spill prevention, and response measures required by the BLM through Lease Stipulations and ROPs would reduce the risk of spills and the impacts to listed eiders in the event that spills occur, and we anticipate the consequences of spills of oil and other contaminants would, at most, impact low numbers (<10) listed eiders.

Collisions with structures

As discussed in the *Environmental Baseline*, migratory birds are at risk from collisions with human-built structures. Listed eiders migrating east during spring and west during summer/fall would be at risk of colliding with structures in the terrestrial environment. These structures include light poles, communication towers, buildings, drill rigs, and booms. During post-breeding migration in summer and fall, male eiders, which depart the ACP earlier than females, may have greater risk of colliding with structures in terrestrial and nearshore marine habitats, as satellite telemetry studies of spectacled eiders from the eastern ACP indicated males remained closer to shore and sometimes crossed overland during westward migration (TERA 2002; Petersen et al. 1999). In general, however, we anticipate the risk of collisions from mid-May through late July would be greatly reduced by the visibility of structures afforded by constant daylight in the project area. When females and juveniles depart the ACP in late summer/fall, decreasing daylight and increasingly frequent foggy weather could increase collision risk. This is likely compounded by the increasing need for artificial lighting at facilities which is known to disorient birds and increase collision risk.

There is little empirical information that can be used to assess the frequency and number of collisions of listed eiders with oil and gas facilities on the ACP to date. Industry employees occasionally report observations of bird fatalities at facilities, including collisions, but the reported observations have a number of associated biases that prevent their use in numerically estimating collisions. However, of the > 500 bird fatalities reported at North Slope oil and gas facilities between 2000 and early 2020, only three were spectacled eiders colliding with oil and gas facilities in the onshore environment. Although multiple biases likely cause observed and reported cases of mortality to underestimate the actual number of mortalities, the limited number of observed spectacled eider fatalities suggests that spectacled eider collisions with onshore oil and gas infrastructure occur rarely. There are no records of Steller's eider collisions with industrial oil and gas facilities on the North Slope, but the distribution of Steller's eiders has very minimal overlap with existing industrial oil and gas facilities on the North Slope. However, a number of records exist of Steller's eiders being injured or killed in collisions with human-built structures such as overhead powerlines near Utqiaġvik.

The proposed IAP contains two ROPs specifically crafted to reduce the risk of collisions with structures:

- ROP E-10, which, in order to minimize bird collisions with infrastructure, especially during migration and inclement weather, requires flagging of structures, such as elevated utility lines and guy wires. All facility external lighting, during all months of the year, shall be designed to direct artificial exterior lighting inward and downward or be fitted with shields to reduce reflectivity in low visibility conditions, unless otherwise required by the Federal Aviation Administration.
- ROP E-21, which, in order to minimize the impacts upon bird species from direct interaction with aboveground utility infrastructure, requires:
    a. that power and communication lines be buried in access roads or suspended on vertical support members, with exceptions limited to the following situations:

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

b. To reduce the likelihood of bird collisions, communication towers would be located, to the extent practicable, on existing pads and as close as possible to buildings or other structures and on the east or west side of buildings or other structures, if possible. Support wires associated with communication towers, radio antennas, and other similar facilities would be avoided to the extent practicable. If support wires are necessary, they would be clearly marked along their entire length to improve visibility to low-flying birds. Such markings would be developed through consultation with the USFWS.

c. Design of other utility infrastructure, such as wind turbines, would be evaluated under a specific development proposal.

In addition, Lease Stipulation K-5 prohibits siting facilities within 1 mile of the coast (except those that must be at the coast, such as barge landings, seawater treatment plants, or oil spill response staging and storage areas). This stipulation reduces the exposure of migrating eiders to oil and gas infrastructure authorized under the proposed IAP. In light of these considerations, and the RFD scenario provided, we roughly estimate, over the life of the facilities, collisions causing injury or death of spectacled eiders as follows:

2 spectacled eiders per CPF × 0–3 CPFs = 0–6 spectacled eider collisions
1 spectacled eider per satellite pad × 2–20 satellite pads = 2–20 spectacled eider collisions

These estimated collision rates are based on observed collisions with existing onshore North Slope industry structures between 2000 and 2020, and take into consideration a number of unquantifiable biases, including detection bias, crippling bias, and scavenger bias (USFWS 2020b; unpublished data). Therefore, collectively, we estimate that 2–26 spectacled eiders could be killed or injured due to collisions with onshore structures authorized under the Proposed Action over the life of the facilities and program.

To estimate collision risk for Steller's eiders, we adjusted our estimate for spectacled eiders to reflect the relative scarcity of Steller's eiders in NPR-A. We estimated there are 14 spectacled eiders for every Steller's eider (based on recent population size estimates for both species and adjusting for relative proportions of each species' numbers on the ACP occurring within NPR-A [88 percent for spectacled eiders and 100 percent for Steller's eiders]). Using this approach, we anticipate that 0–2 Steller's eiders could be injured or killed due to collisions with onshore structures authorized under the Proposed Action.

Inadvertent harvest
Infrastructure such as roads may increase access to surrounding undeveloped areas for local residents and listed eiders would be at risk of potential increased harvest during subsistence activities. As discussed in the *Environmental Baseline*, data from the annual harvest reports indicate that at least some listed eiders continue to be inadvertently or deliberately taken during subsistence activities on the North Slope, despite local knowledge suggesting spectacled and Steller's eiders are not specifically targeted for subsistence. Listed eiders often fly in mixed

flocks with king and common eiders, and due to similarities in size and female/juvenile plumage, they may be subject to misidentification and inadvertent harvest.

However, undeveloped areas throughout the Action Area, have long been accessed for subsistence purposes despite the absence of permanent infrastructure granting access (e.g., via ATVs and other off-road vehicles), and we anticipate the Action Area will continue to be used for subsistence purposes regardless of improved access facilitated by new infrastructure which may result from the proposed action.

Lacking specificity regarding where infrastructure projects could occur, we expect the likelihood of improved subsistence access would mirror development potential and be more likely in areas with high and medium development potential (eastern and central NPR-A), than in areas with low development potential (i.e., western NPR-A). Instances of inadvertent harvest would likely be concentrated near established communities: Atqasuk, Nuiqsut, Utqiaġvik, and Wainwright; and we expect the frequency of inadvertent harvest would decline with increasing distance from the community and permanent infrastructure. Although inadvertent harvest of listed eiders resulting from improved access from project infrastructure resulting from the proposed action is conceivable, due to the comparatively low density at which listed eiders occur in NPR-A (< 1 listed eider/km^2), harvest of these species would be rare. Therefore, we do not anticipate an appreciable increase in inadvertent harvest of spectacled or Steller's eiders associated with enhanced access that may result from the proposed action.

7.1.2 Effects to eiders in the MTR portion of the Action Area

Disturbance from vessels
During vessel operations which may result from the proposed action barges and support vessels could encounter and disturb listed eiders within the MTR. However, because 1) listed eiders occur at low density throughout the offshore Action Area, 2) few vessels would be likely to operate at any given time, and 3) sealift operations would likely be limited to a 5-year period during the construction phase of future developments; we expect vessels operating under the proposed IAP would encounter very few individuals. We also expect disturbance from sealift operations would be minor and temporary because 1) barges and tugs would move slowly through the MTR, and 2) listed eiders can respond to vessel disturbance by moving away to a safe distance. Because disturbance to non-breeding, migrating, or marine foraging spectacled or Steller's eiders would be so minor that injury or death is not expected, effects of vessel disturbance on these individuals would be insignificant.

Spills
Marine habitats in which listed eiders could potentially encounter spilled substances include marine waters, lagoons, and coastal areas. Listed eiders could encounter spilled substances during spring and fall migrations, and during pre-migration staging and/or molting periods in marine waters. Spilled oil or other contaminants could potentially result from spills vessels in marine waters (including small watercraft), or spills in terrestrial areas being transported downstream to marine waters.

The BLM (2020) expects most spills in the MTR during summer sealift operations would be small, limited to refined products (e.g., diesel fuel), and limited to the vicinities of Dutch Harbor (e.g., during fuel transfers) and potential future docks and barge transfer areas (e.g., during module delivery). Small spills would likely have minor impacts on listed eiders and their habitat, because these spills would be localized and of short duration, reducing the likelihood of eiders encountering oil. Small spills would also be comparatively easier to contain and remediate; and be reduced in volume to a greater degree through evaporation. For example, in marine waters, without mitigation or response, a 3 bbl refined oil spill during summer is expected to evaporate and disperse within 24 hours and a 200 bbl refined oil spill during summer is expected to evaporate and disperse within 3 days (BOEM 2018, cited in BLM 2020a). However, consequences to listed eiders from small spills in the MTR would be avoided and minimized due to spill prevention and response measures in place through ROPs A-3, A-4, and A-5, Although medium to large spills would conceivably be possible if a tug or barge were to run aground, sink, or have its compartments breached, medium and large spills in the MTR would extremely unlikely to occur, therefore impacts of a medium or large spill would be discountable. Furthermore, given that vessels operating as a result of the proposed action would follow established shipping routes, and the duration and frequency of vessel traffic in the MTR would be limited (i.e., sealift operations would only take place during the open-water season over a predicted 5-year construction phase for future development), the likelihood of consequences to listed eiders in the offshore Action Area from small spills would be low.

Collisions with vessels
Listed eiders would also be at risk of colliding with vessels in the MTR. Using the best available information, we estimated collision risk for listed eiders from barge and support traffic. We used king and common eiders as surrogates for Steller's and spectacled eiders due to their greater abundance and observations of vessel collisions collected by biological observers in a structured monitoring and reporting effort. To do that, we used observed collisions of king and common eiders with vessels in the Chukchi Sea. We first calculated a *per capita* risk of collision per vessel operating during a single season in the Chukchi Sea, based on collisions during Royal Dutch Shell's (Shell) 2012 Exploratory Program, and the estimated number of eiders migrating through the region. We then multiplied the estimated *per capita* collision rate (collisions per eider per vessel per season) by the estimated abundance of listed eiders, based on estimates from aerial surveys on the Arctic Coastal Plain. We then approximated the number of collisions expected for spectacled eiders from a predicted 2,400 total vessel trips[8] through the MTR. Finally, because vessels could theoretically operate over a longer period each season than the duration of Shell's 2012 open-water campaign, we adjusted the calculations to estimate collisions over an extended operations period. A typical open-water season in Arctic waters is approximately 150 days. We expect potential sealift operations would be of shorter duration (likely much shorter) than the length of a typical open-water season, but the timing of vessel operations would be difficult to estimate precisely due to several factors including seasonal variation in sea ice conditions and marine forecasts. Therefore, lacking greater certainty in timing, we conservatively extrapolated our estimate to cover a full open-water season. We

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8 The Action Agency estimates up to three major developments in the NPR-A under the IAP. Each development would require up to 4 sealift operations over a 5-year period, and a single sealift operation would consist of up to 20 sealift barges plus tugboats traveling between Dutch Harbor and the North Slope. Therefore, we estimate:

3 Industry developments × 4 sealifts each × 5 years × 40 vessels per sealift (20 barges + 20 tugs) = 2,400 vessels transiting the MTR.

believe this significantly overestimates the number of days vessels would be underway and present in waters where listed eiders occur, and therefore represents a substantial overestimation of collision risk to listed eiders.

Using the rationale described above, we estimate 37 adult or fledged juvenile spectacled eiders, and 2 adult or fledged juvenile Steller's eiders would be injured or killed through collisions with vessels as they migrate through the Bering, Chukchi, and Beaufort seas. While acknowledging the limitations of applying observations from vessels operating in one area to vessels that may differ in size and structure operating in different areas, our estimates are based on the best information available, and we believe are likely to substantially overestimate collision risk.

Summary

In the previous section, we discussed potential impacts of the Proposed Action to listed eiders. We anticipate a loss of production of less than 7 spectacled eider and less than 2 Steller's eiders nests each year from habitat loss, and up to 159 spectacled eider and 28 Steller's eider nests if the maximum amount of development and TOLs estimated were to occur and all be located in the highest density areas. This is a vast over estimation of the potential level of take, particularly for Steller's eiders, whose nesting density is extremely low throughout much of NPR-A, and much of the area in which they nest a higher densities has significant restrictions on the type of activities which could take place, and hence is less likely to be subject to large numbers of TOLs, and certainly not all of them.

Over the life of activities which may result from the proposed action (70 years) we anticipate that 63 spectacled eiders and 4 Steller's eiders maybe killed as a result of collisions with structures in the terrestrial environment and vessels associated with development activities. While oil and hazardous substance spills are possible, and small spills are likely, as described above we do not anticipate more than a few (<10) listed eiders would be impacted.

Several forms of uncertainty figured prominently in our estimates of effects of the proposed action. These include: 1) the amount of development and activities to be proposed, which would determine the area to be impacted; 2) the location of development and activities to be proposed, which would determine the number of listed eiders potentially impacted; and 3) the response of listed eiders to development and associated activities. In light of these uncertainties, to ensure our consideration of potential population-level impacts would not underestimate effects, we: 1) used the "high production case" development footprint from the RFD scenario; 2) calculated both a more likely, moderate level of impacts, and a less likely, but more impactful level by multiplying the estimated area impacted by values representing moderate and high densities for each species; and 3) applied conservative (i.e., potentially over-protective) assumptions when estimating the response of individual eiders exposed to threats. Collectively therefore, these factors have likely caused us to overestimate impacts, possibly substantially.

It is important to note that impacts causing injuries or deaths were numerically estimated over the 70-year life of activities which may result from the proposed action, and our estimates represent < 1 spectacled eider injured or killed per year and < 1 Steller's eider killed per decade.

Finally, although several Lease Stipulations, ROPs, and designations of areas closed to leasing would serve to reduce potential loss of eider production, our estimates were not adjusted accordingly due to uncertainty in the location of future development, which would determine which stipulations and ROPs would apply. Therefore, although we did not adjust our estimates to reflect the benefits of coastal buffers, and other spatial restrictions on activities, the Lease Stipulations, and ROPs, we believe that their implementation, combined with action-specific information provided at the time of future stepdown consultations, will reduce impacts and allow for additional measures, as appropriate, to reduce potential effects of future actions.

7.2 Effects to Polar Bears

In this section we evaluate potential effects of the proposed action to polar bears. First, we review what is known of polar bear use of NPR-A, considering use by denning and non-denning bears. We use this approach because these occur at different times of the year, involve different members of the population; and because denning polar bears are more sensitive to disturbance, and are less capable of moving away from disturbance or other impacts. We then review factors that would serve to influence potential impacts, including relevant restrictions built into the proposed action. Last, we identify and discuss the potential mechanisms of impact to polar bears, which include disturbance, human-polar bear interactions, exposure to spilled oil or other contaminants, impacts to polar bear prey, and possible changes in subsistence practices prompted by increased access for hunters.

Polar Bear Use of NPR-A

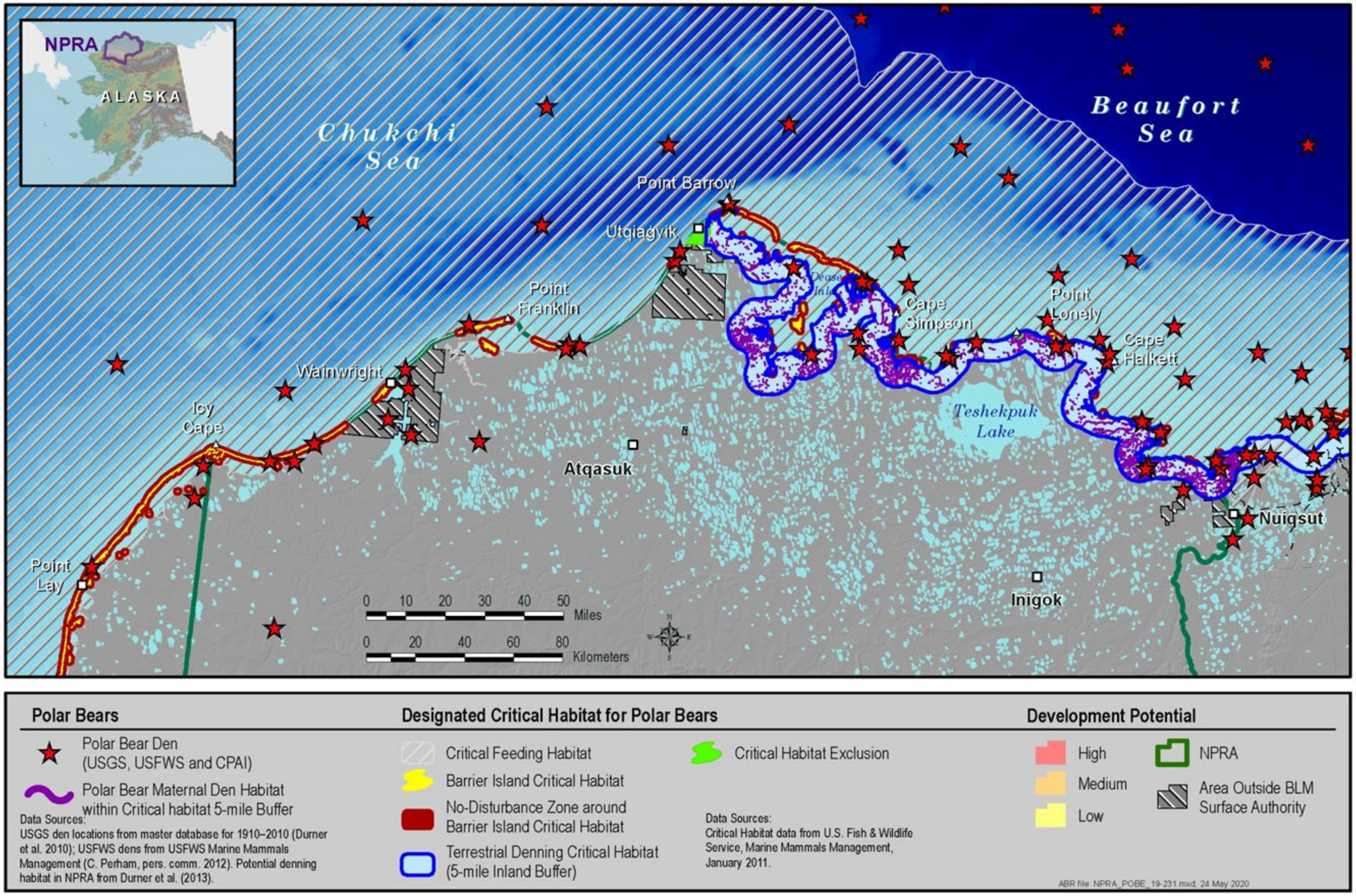
While polar bears from both the Chukchi Sea (CS) and the Southern Beaufort Sea (SBS) subpopulations could occur in and near NPR-A (Bethke et al. 1996, Amstrup 2003, Amstrup et al. 2004, Schliebe et al. 2006, Obbard et al. 2010, Durner and Atwood 2018), the Polar Bear Specialist Group, an international body coordinating management and conservation of polar bears, separates the subpopulations for the purposes of management, at Icy Cape, Alaska (Obbard et al. 2010). Therefore, we apply that boundary in this biological opinion, and assume all polar bears occurring in NPR-A belong to the SBS subpopulation.

Maternal Denning

Polar bears breed on sea ice from March to June, peaking in early April through mid-May (Schliebe et al. 2006). Pregnant females later move from areas and habitats occupied in late summer and autumn, which are generally on pack ice but increasingly on shore as sea ice conditions in late summer deteriorate (Rode et al. 2015), to prospect for den sites in suitable denning habitat in late October or early November (Derocher et al. 2004). Females excavate a den in drifted snow in fall or early winter (Amstrup and Gardner 1994), enter the den in late November, give birth in late December, and emerge in late March or April (Ramsay and Stirling 1988). After emerging from dens, most females with cubs remain near dens (within 100 m; Smith et al. 2007) for several days [range 1 – 18 days (Streever and Bishop 2014); mean 6 – 8 days (Smith et al. 2007)] before permanently abandoning the den site.

Polar bears from the SBS subpopulation den on Alaska's Arctic Coastal Plain (Durner et al. 2013), drifting pack ice, shorefast ice, and land (Amstrup and Gardner 1994), although only terrestrial dens, which can occur on barrier islands, along the coast, or inland, would occur in the boundaries of NPR-A. Key characteristics of maternal denning habitat are surface anomalies or topographic features that collect drifting snow in autumn and early winter, as dens require snow accumulations at least 2.0 m deep (Liston et al. 2015). Terrestrial dens occur on barrier islands and on the lee side of coastal bluffs and banks lining rivers, streams or lakes (Amstrup and Gardner 1994; Durner et al. 2001, 2003, 2006; Fischbach et al. 2007; summarized by USFWS 2010 and USFWS 2016), although 69 percent of dens in terrestrial habitat in Alaska were on coastal banks (Durner et al. 2003).

Historical records of polar bear den sites provide insight on the characteristics of suitable denning habitat, the distribution and extent of suitable habitat, the distribution of known den sites, and the prevalence of dens in NPR-A (Figure 7.2). Durner et al. (2001; 2003) identified characteristic habitat features of terrestrial maternal den sites and Durner et al. (2013) used automated interpretation of fine-grain elevation data to map suitable denning habitat in NPR-A. Within NPR-A, habitat with features suitable for denning was widely distributed but scarce, comprising only 0.1 percent of the area examined (Durner et al. 2013). Further, although seemingly suitable habitat is broadly distributed, most dens west of the Kavik River, including NPR-A, have occurred near the coast. Of 19 dens between the Kavik River and Utqiaġvik prior to 2009, all were within 5 miles of the coast and 95% were within 2.8 miles of the coast (with historical den sites west of Utqiaġvik too few in number to examine for spatial relationships; Durner et al. 2009).



Map 7.2 - Critical habitat and documented den locations of polar bears in the National Petroleum Reserve-Alaska, 1910–2010. (Map from BLM 2020, prepared by ABR, Inc).

Historical records of polar bear den sites include dens found by several means, including targeted den searches, dens found incidentally during other human activities, and radio tracking of collared female polar bears. Because targeted den searches and incidental observations can overemphasize den sites near villages or industrial sites while underemphasizing dens in more remote areas, dens found by tracking females wearing radio collars, particularly those tracked by satellites, reduce or avoid this bias. Across the Arctic Coastal Plain, areas with relatively high density of dens of females from the SBS subpopulation have occurred on the eastern ACP, although some areas with low to moderate den density are indicated in NPR-A (Figure 7.3).

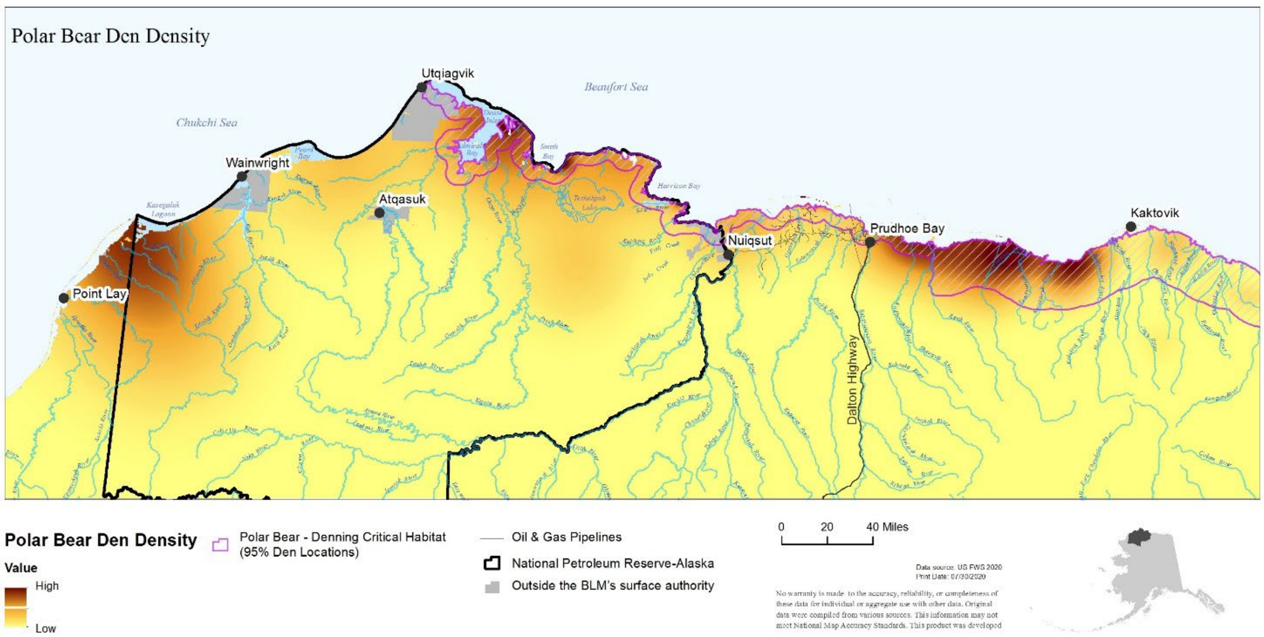


Figure 7.3 - Relative density of polar bear maternal dens on the North Slope of Alaska. (Map is a density kernel map developed Service and U.S. Geologic Survey scientists using Program R [R Core Development Team 2017] based on 33 den locations discovered by tracking VHF-radio telemetry and GPS collared females [den sites from Durner et al. 2010; G. Durner unpublished data] with land management and critical habitat boundaries added by BLM GIS specialists).

Recent observations indicate the distribution of maternal dens in the Beaufort Sea region is shifting from sea ice to onshore areas, and from west to east on sea ice, in response to decreasing quality and stability of sea ice as arctic regions warm (Fischbach et al. 2007). As these trends continue, it may become increasingly difficult for females to access terrestrial denning habitat in autumn and early winter as the distance between pack ice and coastal areas increases (Derocher et al. 2004; USFWS 2016; Olson et al. 2017). This may cause some areas currently used for denning to become abandoned as the widening distance between the edge of pack ice and land reduces access to terrestrial denning habitat (Derocher et al. 2004; Rode et al. 2015; USFWS 2016). The degree to which, and when, the use of NPR-A for denning by polar bears will be affected is unknown at this time.

Non-denning polar bears

Polar bears of the SBS subpopulation historically spent the majority of the year on sea ice (Amstrup 2000; Atwood et al. 2016). Amstrup (2000) noted that for the Chukchi and Beaufort Sea areas of Alaska and northwest Canada, less than 10 percent of radio relocations were on land, the majority of which were females occupying maternal dens during winter. However, polar bears also use terrestrial habitat on the ACP during late summer and fall, particularly where and when sea ice conditions are poor. Schliebe et al. (2008) reporting on weekly aerial surveys of the coast between Utqiaġvik and the Canada border in September – October of 2000 – 2005, reported an average of 4 (± 2) bears/100 km, with a maximum of 8.6 bears/100 km and a maximum total of 122 polar bears observed. Relative to estimates of the number in the SBS subpopulation at that time, Schliebe et al. (2008) estimated that represented an average of 3.7 percent and maximum of 8 percent of polar bears in the SBS subpopulation occurred along the coast of Alaska in last summer and autumn. Density was over six times higher in areas where subsistence-hunted whale carcasses were available, with the highest number (69% of total bears onshore) on Barter Island near Kaktovik, Cross Island (both of which are east of NPR-A), and near Utqiaġvik, at the northern boundary of NPR-A (Schliebe et al. 2008). The highest densities were seen at Barter Island (17.0 ± 6.0 polar bears/100 km), with lower densities seen near Utqiaġvik (2.2 ±1.8 polar bears/ 100 km) and Cross Island (2.0 ± 1.8/100 km). Herreman and Peacock (2013) used genetic mark-recapture methods near Utqiaġvik to document use, turnover, and the number, age, and sex of polar bears visiting carcasses, and estimated that 228 individual bears fed at the bone pile in the winter of 2010 – 2011 (November to February), possibly representing up to 15 percent or more of the SBS subpopulation. Atwood et al. 2016, using radio telemetry data from autumn (just prior to and after subsistence whale hunting in fall), found the greatest percentage of bears near Barter Island (40%), followed by Cross Island (33%), and < 2% were observed in the vicinity of Point Barrow (near Utqiaġvik). In summary, non-denning polar bears generally occur at very low density along the Beaufort Sea coast of NPR-A, with the exception of near Utqiaġvik, where polar bears exploit whale carcasses in late summer, fall, and winter. Even there, however, the density is low (about 2 polar bears/100 km; Schliebe et al. 2008) and < 2 percent of the SBS subpopulation (Atwood et al. 2016) was found there at any given time, although over the course of one winter, a significant number of individuals (228) and proportion (possibly up to 15 percent) of the SBS population visited the bone pile (Herreman and Peacock 2013).

Wilson et al. (2017), analyzed results from the same aerial surveys along the coast as Schliebe et al. (2008), but included later years and a longer interval (2000 – 2014), and reported the mean number of bears onshore was 140 (95% CI 127-157). As in earlier years, polar bears were concentrated near Kaktovik, with 63.8% of observations (95% CI 58.4 – 68.9%) on or adjacent to Barter Island, and 25.1% of observations (95% CI 14.4 – 38.8%) near Cross Island. Bears were more likely to occur in coastal areas with early ice retreat, whale carcasses, and barrier islands. Comparing counts to estimates of population size, Wilson et al. (2017) estimated about 15% of the SBS subpopulation occurred along the Alaska coastline during any given week between late August and late October. There was no trend in the number of bears using the coast, but the highest number occurred in 2012, corresponding to the year with lowest sea ice extent. Atwood et al. (2016) also examined use of the Beaufort Sea coast by polar bears in late summer and fall in the same interval (2000 – 2014) using information from radio-collared female polar bears. They found a marked decline in sea ice during September in the southern Beaufort

Sea and the average duration of the open-water season increased by 36 days. Although most individual bears remained on sea ice during summer, the proportion of the population coming ashore tripled, from 5.8 to 20 percent in 15 years (with a high of 37 percent in 2013). Bears that came ashore did so earlier (5 days/decade on average), departed later (7 days/decade on average) and stayed longer (7 days/decade on average), and these changes related to declines in sea ice extent and changes in sea ice phenology. Including radio-tracking information from the late 1990s, when use of terrestrial habitat during open-water season was rare and limited to short intervals, the average time bears stayed on land increased by 31 days (Atwood et al. 2016). Atwood et al. (2016), using radio telemetry data, found an increase in the *proportion* of the SBS subpopulation coming ashore, although Wilson et al. (2017), using counts in the same area in the same time interval, did not detect an increase in the *absolute number* along the shore. Multiple possible explanations exist, but Wilson et al. (2017) concluded that no detectable trend in the number counted comports with an increasingly larger proportion of a subpopulation (as found by Atwood et al. 2016) that was declining in abundance (from approximately 1,500 in 2004 to 900 in 2010, as found by Bromaghin et al. 2015) coming ashore.

Factors Serving to Minimize Effects to Polar Bears

Under a framework programmatic action, such as the proposed action, take of ESA-listed species would not occur unless and until future actions authorized under the IAP are subjected to step-down consultation. That would ensure that effects of the actions to listed species and designated critical habitat are evaluated for compliance with section 7(a)(2) of the Act, and determinations regarding compliance would be made in full consideration of the status of the species and critical habitat, environmental baseline, and cumulative effects at the time those step-down consultations are conducted.

This framework programmatic consultation includes the following Project Design Criteria (PDCs) designed to minimize and monitor effects of the proposed action to polar bears and other listed species, and to describe how compliance with section 7(a)(2) of the ESA will be ensured. These PDCs are repeated here because these measures are important aspects of the BLM's proposed action.

PDC 1. The lease areas may now or hereafter contain plants, animals, or their habitats determined to be threatened or endangered or to have some other special status. The BLM may recommend modifications to exploration and development proposals to further its conservation and management objectives and to avoid approving activities that would contribute to the need to list such a species or its habitat. The BLM may require modifications to or may disapprove a proposed activity that is likely to adversely affect a proposed or listed endangered species, threatened species, or critical habitat. The BLM would not approve any activity that may affect any such species or critical habitat until it completes its obligations under applicable requirements of the ESA, 16 United States Code 1531 et seq., including completing any required procedure for conference or consultation.

PDC 2. The Service and the BLM will conduct programmatic reviews by meeting annually, to begin one year after a Decision for the NPR-A/

IAP has been issued unless the BLM and FWS both agree to a different interval, or such meetings are no longer needed. These reviews will evaluate, among other things, 1) whether activities proposed are consistent with the IAP, as described, 2) whether the nature and scale of predicted effects remain valid, and 3) whether the programmatic consultation, including the PDCs and determinations reached, remain adequate and appropriate. In addition, these meetings will provide a venue where any new information on the status of species or designated critical habitat, or new methods to avoid or minimize impacts can be shared.

PDC 3. Biological Assessments prepared to initiate formal consultation on actions to be authorized under this program will include: a) an updated, current review of the status of listed species and designated critical habitat that are likely to be adversely affected by the action under consideration; b) a summary of effects, including incidental take authorized under and resulting from the program to date; and c) a review of the need for, and efficacy of, reasonable and prudent measures to minimize the amount or extent of incidental take.

PDC 4. To address uncertainties surrounding the potential impacts of helicopter-supported activities on undeveloped tundra during the nesting and brood-rearing periods of spectacled and Steller's eiders, a collaborative program between the Service and BLM will be developed and implemented. The program will be designed to collect information on the spatial location and extent, temporal duration, dates, number of persons, activities being conducted, and other relevant factors, as appropriate. Depending on results of monitoring and reporting efforts, targeted research may be required to evaluate impacts to nest success and/or duckling/brood survival. Reasonable and prudent measures and terms and conditions to limit or reduce impacts may be required for actions authorized under this program.

<u>Protections Inherent in the Project Description</u>
There are several aspects of the proposed action which will reduce the potential impacts to polar bears from activities which may result from the action. These include areas closed to leasing, ROPs, and Lease Stipulations. For full details please refer to BLM's BE (BLM 2021). However, these factors are summarized below.

Areas Closed to Leasing
Under the proposed action, large areas which provide important habitat for polar bears would be unavailable for leasing, or subject to multiple protective Lease Stipulations and ROPs. Specifically, 90% of polar bear terrestrial denning habitat (approximately 769,000 acres) would be closed to leasing, with a further 21,000 acres available for leasing but subject to no surface occupancy, and 69,000 acres open to leasing. Similarly, the majority of sea ice critical habitat under BLM's jurisdiction would also be closed to leasing (approximately 424,000 acres), with

5,600 acres open for leasing but subject to no surface occupancy, and 1,100 acres open to leasing. The majority of Barrier Island critical habitat (approximately 12,000 acres) would be closed to leasing, with only 2,100 acres available for leasing but subject to no surface occupancy.

Stipulations and Required Operating Procedures
Where and how development may occur are dictated by the designations of areas Closed to Leasing or No Surface Occupancy (where surface occupancy is prohibited) and by application of Lease Stipulations and ROPs. The Lease Stipulations and ROPs which will likely significantly reduce impacts to polar bears are summarized below.

Habitat Loss and Alteration
Lease Stipulations K-1, -2, -3, -4, -5, -6, -9, and -10 incorporate buffers and otherwise spatially restrict development. These stipulations help protect potential polar bear coastal resting areas and denning habitat, particularly those that limit or prohibit development within suitable terrestrial denning habitat (i.e., areas with topographic relief) along some rivers (K-1, K-3), lakes (K-2) and coastline (K-4, K-5). Prohibitions on production or processing pads along selected rivers would reduce the potential for disturbing dens in suitable denning habitat. Pipelines could still cross these areas so the possibility of spills from pipelines would exist, but spills on pads or at compressor stations would be unlikely to reach riverbanks (BLM 2021). Lease Stipulation K-2 places buffers of 0.25 mi around deep-water lakes (>13 feet deep) in the Action Area, and the margins of these lakes could support terrestrial den sites. Many of these lakes are > 5 mi from the coast, but a significant number occur on the Cape Simpson peninsula and the lower portions of watersheds draining into Admiralty Bay.

Lease Stipulation K-4 describes the leasing allocations and infrastructure allowed in coastal marine waterbodies. Under the proposed action, the following areas would be closed to leasing and to infrastructure, except for essential pipeline crossings: Kogru River, Dease Inlet, Admiralty Bay, Elson Lagoon, Peard Bay, Wainwright Inlet/Kuk River, Kasegaluk Lagoon, and their associated islands. These changes would minimize the probability of winter activity in coastal areas associated with seismic surveys and exploration activities where polar bear denning habitat occurs and maternal polar bear dens may be present.

Lease Stipulation K-5 protects coastal areas by prohibiting all facilities but those that necessarily must be at the coast (e.g., barge landings, seawater treatment plants, or oil spill response staging and storage areas) from being located within 1 mi of the coast. For essential coastal infrastructure, the use of a previously occupied site (Cape Simpson, Peard Bay, Camp Lonely, Husky/USGS drill sites, and DEW-Line sites) would be considered before the use of new and unoccupied sites. This Lease Stipulation reduces the potential for disturbance of denning and non-denning polar bears along the coast, which is a highly utilized area by the species. Stipulations K-9 and -10, although designed for caribou, would also limit development in areas with suitable denning habitat for polar bears.

ROPs E-5 and E-7 establish the requirements for design and construction of roads and water-crossings that reduce the effects of habitat alteration on polar bears. The requirements in ROP E-5 to minimize the development footprint limit the acreage of coastal habitat used by polar bears that is likely to be altered or lost. Although ROP E-7 is designed to minimize disruption to caribou movements by elevating the pipelines and separating them from roads by at least 500 feet, these same design considerations will facilitate the movement of polar bears.

Disturbance and Displacement

Several additional protections built into the IAP would directly or indirectly serve to reduce potential disturbance to polar bears and their prey. ROP C-1 prohibits cross-country use of vehicles, equipment, oil and gas activity, and seismic survey activity within one mile of known or observed polar bear dens, unless protective measures are approved by the BLM AO and are consistent with the Marine Mammals Protection Act and the ESA. ROP C-1 requires permittees to conduct polar bear den searches prior to onshore activities during the denning season (November to April) to attempt to locate polar bear dens within and near areas of operation. Observed or suspected polar bear dens would be reported to the Service before initiating activities in coastal habitat. Survey results would be used to prevent heavy equipment operation and seismic surveys within 1 mi of known polar bear dens, and if dens were detected within 1 mi of existing activity, work would cease, and the Service would be contacted for guidance.

Sea ice paths would be limited to 12 feet wide and no unnecessary equipment or operations (e.g., camps) would be placed or used on sea ice. In addition, permittees would be required to conduct sound source verification tests to minimize disturbance to ice seals. On-ice operations after 1 May would require a full-time, trained protected species observer (PSO) to ensure that basking seals are avoided by vehicles and that equipment complies with noise level restrictions.

Polar bears are known to react to sources of noise and the sight of aircraft, especially helicopters (Amstrup 1993; Bishop and Streever 2016; Richardson et al. 1995; Streever and Bishop 2014). ROP F-1 aims to decrease the impact of aircraft overflights on wildlife, subsistence activities, and local communities and will also serve to reduce disturbance impacts to polar bears. ROP F-1 requires aircraft to maintain minimum altitudes above ground level (agl) to protect different resources. These include the requirement to remain 3,000 feet agl within a mile of all ESA-listed species, and marine mammal species, and a prohibition on hazing of wildlife with aircraft.

Injury and Mortality

Polar bears can be attracted to food wastes as well as other forms of garbage, increasing the risk of injury or mortality from interacting with humans. ROPs A-1 and A-2 are intended in part to minimize the likelihood that garbage, including food wastes, would be available to predators. These ROPs are expected to reduce the potential for attracting polar bears to development areas. ROP A-8 includes a specific requirement that facility design include considerations such as building layout and lighting to limit the likelihood of surprise bear-human interactions, and would require annual reporting of bear sightings. These ROPs should make attraction of polar bears less likely, thus limiting the potential that bears would be injured or killed in Defense of Life (DOL). ROP A-8 includes requirements for education of workers on wildlife awareness, interaction avoidance, and protocols for minimizing bear-human interactions.

The following stipulations and ROPs are intended to prevent spills and reduce the likelihood of wildlife contacting hazardous materials. ROP A-2 minimizes the impacts of waste and attraction of bears to human use areas. Under the Proposed Action, permittees are required to prepare and implement a comprehensive waste management plan although this requirement may be waived for minimally impactful activities. Food or other organic waste would be incinerated, backhauled, or composted in a manner that prevents attracting wildlife and the use of bear-resistant containers for waste considered a bear attractant would be required. These measures are intended for the safety of bears and humans. The injection of fluid waste products (drilling muds, wastewater) into approved injection wells in accordance with EPA, ADEC, and the Alaska Oil and Gas Conservation Commission regulations and procedures would avoid any contact with polar bears.

ROP A-3 requires that all permittees have a spill contingency plan to include material handling plans and spill prevention and response plans, which would require training, onsite material location and storage/containment considerations. Under the Proposed Action, a hazardous substances contingency plan would be prepared and implemented, or references made to other existing documents. ROP A-4 addresses spill prevention. These ROPs are meant to ensure rapid and effective reporting and response to any spill and that safe handling practices are followed.

ROP A-5 reduces the probability that polar bears or their environment would be contaminated by refueling operations. Under the Proposed Action, refueling is prohibited within 500 feet of the active floodplain of any waterbody, except for small caches (up to 210 gallons) for motorboats, aircraft, and gas-powered equipment (e.g., water pumps, portable generators).

Summary of Factors Serving to Minimize Effects
In summary, the proposed action has several provisions which will reduce the potential impacts to polar bears. The most significant are areas where leasing will no be permitted or are subject to no surface occupancy restrictions. In addition, there are several Lease Stipulations and ROPs which would directly or indirectly reduce potential impacts to polar bears. Further, the PDCs developed as part of this programmatic consultation are designed to minimize and monitor effects of the proposed action to polar bears and other listed species and ensure compliance with section 7(a)(2) of the ESA.

Effects of the Proposed Action on Polar Bears

Disturbance
Disturbance of both denning and non-denning polar bears could result from activities authorized under the proposed action. Disturbance could originate from human activities and can be from stationary or mobile sources. Stationary sources could include construction, maintenance, repair, operations at staging pads, production and processing facilities, gas flaring, and drilling operations. Mobile sources could include vessel and aircraft traffic, seismic and geophysical surveys, ice and gravel road construction, vehicle traffic, tracked vehicles and snowmobiles, the movement of modules and other equipment along roads, ice roads, and snow trails, drilling, and dredging. Polar bear responses will vary by the type, duration, intensity, and location of the source of disturbance. Disturbance effects to denning and non-denning bears also differ and are therefore evaluated separately below.

Disturbance Effects to Non-Denning Bears
Non-denning polar bears travel year-round through the Action Area. Polar bears passing near exploration and development sites could be exposed to a wide variety of potentially disturbing stimuli resulting from seismic exploration; exploration and development drilling; pipeline, road, and pad construction and other human activity on pads; vehicles on pads and interconnecting access roads; barge traffic in the lagoon system and associated offloading operations at marine

docks, gravel islands, seawater treatment plants; and spill-response drills (including equipment staging) and disturbance to their behavior may occur as a result of these activities.

Non-denning polar bear responses will vary by the type, duration, intensity, and location of the source of disturbance. When disturbed by noise, animals may respond behaviorally (e.g., escape response) or physiologically (e.g., increased heart rate, hormonal response) (Harms et al. 1997; Tempel and Gutierrez 2003), they may move away from the source of disturbance and increase vigilance behavior. The available studies of polar bear behavior indicate that polar bears can be sensitive to noise disturbance based on previous interactions, sex, age and maternal status (Anderson and Aars 2008; Dyck and Baydack 2004). Habituation may also impact individual bear behavior.

The greatest likelihood for non-denning polar bears to encounter infrastructure and activities is along the coast during the open-water season (mainly July–October), as bears move along the coast and congregate near the Utqiaġvik whale-bone pile in advance of the formation of seasonal ice. The most comprehensive dataset of human–polar bear encounters along the coast of Alaska consists of records of Industry encounters during activities on the North Slope submitted to the Service under existing and previous Incidental Take Regulations issued pursuant to the MMPA. While the majority of these records are from outside of NPR-A, the records from 2014-2018 show the number of encounters significantly decreased with distance inland from the coast, with few encounters occurred >1.2 miles from the coast (USFWS 2021c) (Figure 7.4), and that more encounters occurred during the open-water season than the ice season. The average number of encounters was:

- Coastal zone (ice season) = 0.05 bears/km^2
- Coastal zone (open-water season) = 1.48 bears / km^2
- Inland zone (ice season) = 0.004 bears/km^2
- Inland zone (open-water season) = 0.005 bears/km^2

We anticipate a similar encounter rate would occur for facilities and activities which may result from the proposed action. Facilities located directly at the coast, such as the barge landings and seawater treatment plants, would be most likely to be encountered by bears traveling along the coastline. However, other facilities are prohibited within 1 mile of the coast under Lease Stipulation K-5 which will significantly reduce the probability of polar bears encountering facilities.

Polar bears regularly traverse oil and gas facilities along the Beaufort Sea coast to the east of NPR-A, crossing roads and causeways in some situations and moving around them in others. As a result, infrastructure appears to provide only small-scale, local obstructions that polar bears move through or circumvent, depending on location and other circumstances (USFWS 2021c).

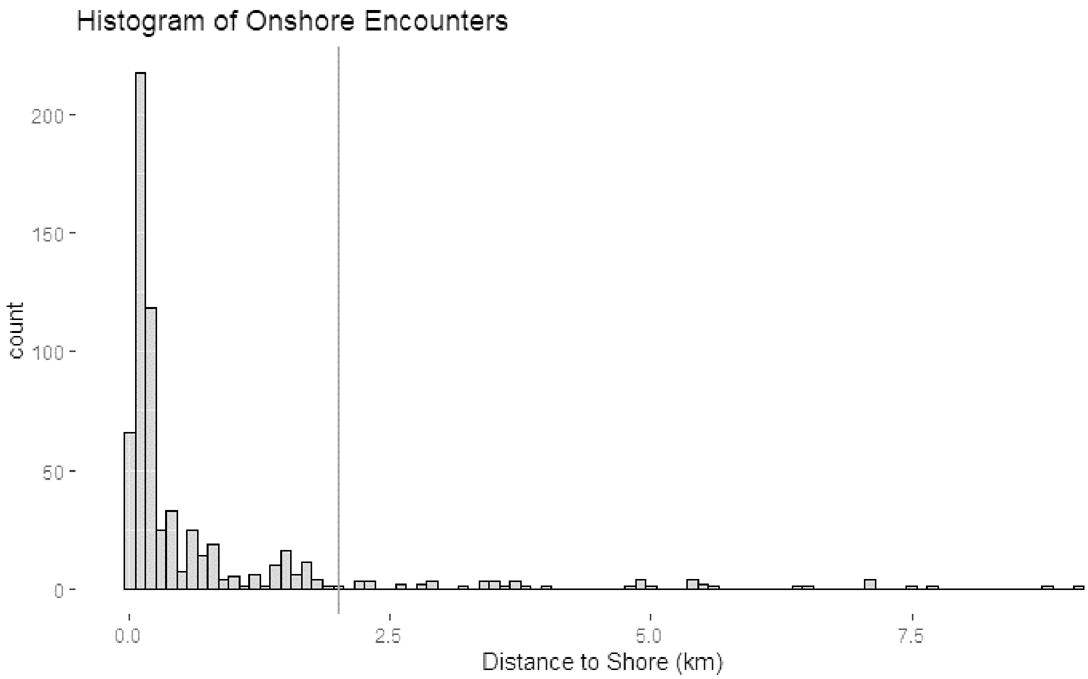


Figure 7.4 — Distribution of onshore polar bear encounters on the North Slope of Alaska in the period 2014–2018 by distance to shore (km). The decrease in encounters was used to designate a “coastal” zone up to 2.0 km (1.2 mi) from shore and an “inland” zone greater than 2.0 km (1.2 mi) from shore (USFWS 2021c).

Mobile sources of sound, such as transport of materials or geophysical surveys in nearshore marine waters, could disturb polar bears, although industry activities are typically conducted in relatively ice-free, open water. Polar bears regularly cross open water: for example, when moving from pack ice to shore, but oil and gas industry records have indicated interactions between polar bears and industry activities in open water have been relatively rare (USFWS - Marine Mammals Management Office, *pers. comm.*). Should encounters occur, polar bears would likely move away from the source of disturbance, resulting in a short-term temporary behavioral disturbance.

Polar bears experience increased noise and visual stimuli when planes or helicopters fly above them. Sound frequencies produced by aircraft will likely fall within the hearing range of polar bears (Nachtigall et al. 2007) and will thus be audible to animals during flyovers or when operating in proximity to polar bears. However, the frequency and level of airborne sounds typically produced by Industry is unlikely to cause temporary or permanent hearing damage unless marine mammals are very close to the sound source (USFWS 2021c).

Observations of polar bears during fall coastal surveys, which flew at much lower altitudes than typical Industry flights indicate the reactions of non-denning polar bears is typically varied but limited to short-term changes in behavior ranging from no reaction to running away. Aircraft activities can impact bears over all seasons; however, during the summer and fall seasons, aircraft have the potential to disturb both individuals and congregations of polar bears. These onshore bears spend the majority of their time resting and limiting their movements on land.

Exposure to aircraft traffic is expected to result in changes in behavior, such as going from resting to walking or running, and therefore has the potential to be energetically costly.

However, in addition to the restrictions on infrastructure close to the coast, which will serve to reduce the amount of activity in that area, there are several ROPs that will reduce potential impacts of disturbance to non-denning bears. ROP F-1 requires aircraft to maintain minimum altitudes above ground level (agl) to protect different resources. These include the requirement to remain 3,000 feet agl within a mile of a of all listed, and marine mammal species, and a prohibition on hazing of wildlife with aircraft. Although ROP E-7 is designed to minimize disruption to caribou movements by elevating the pipelines and separating them from roads by at least 500 ft, these same design considerations will facilitate the movement of polar bears.

Polar bears generally occur at low density along the Beaufort Sea coast, including in the NPR-A. Schliebe et al. (2008), analyzing weekly aerial surveys of the coast between Utqiaġvik and the Canada border in September – October of 2000 – 2005, reported the maximum density of polar bears observed in any single survey of 8.6 bears/100 km and 122 polar bears total, with an average of 4 (± 2) bears/100 km. Relative to estimates of the number in the SBS subpopulation at that time, Schliebe et al. (2008) estimated that indicated an average of 3.7 percent and maximum of 8 percent of polar bears in the SBS subpopulation occurred along the coast of Alaska in last summer and autumn.

However, there are three areas along the Beaufort Sea coast where relatively large number of bears feed on subsistence harvested whale carcasses. Of these locations, only Utqiaġvik is within the Action Area while Cross Island and Kaktovik, are to the east of the Action Area. Herreman and Peacock (2013) used genetic mark-recapture methods near Utqiaġvik to document use, turnover, and the number, age, and sex of polar bears visiting carcasses, and estimated that 228 individual bears fed at the bone pile in the winter of 2010 – 2011 (November to February), possibly representing up to 15 percent or more of the SBS subpopulation. Atwood et al. 2016, using radio telemetry data from autumn (just prior to and after subsistence whale hunting in fall), found the greatest percentage of bears near Barter Island (40%), followed by Cross Island (33%), and < 2% were observed in the vicinity of Point Barrow (near Utqiaġvik).

Given the relatively low density of polar bears within the action area, coupled with protections provided to coastal areas through designations such as no surface occupancy, buffers to the coastline, and areas unavailable for leasing and ROPs such as those governing aviation, activities which may result from the proposed action are unlikely to disturb more than a few non-denning polar bears each year. Disturbance that does occur, may result in short-term changes in behavior such as moving away from any area of human activity by individual polar bears. Polar bears are highly mobile, travelling large distances as conditions and food availability change. For example, Garner et. al. (1990) observed marked non-denning females travelled an average of 10.9km/day ± 13.0 SD (range 0 - 65 km/day) and the total annual distance moved by six non-denning female polar bears was estimated at a minimum to be 5,542km ± 634 SD (Garner et al. 1990). Therefore, short-term behavioral changes such as running away or changing direction of travel in response to a disturbance are not injurious to a non-denning polar bear, and these minor individual level effects are not reasonably expected to rise to the level of population-level impacts to the SBS subpopulation.

Disturbance Effects to Denning Bears
Polar bear dens are known to occur in the Action Area and the incidence of terrestrial denning by the SBS population along the Beaufort Sea coast is increasing (Fischbach et al. 2007; Olson et al. 2017), so the potential for disturbance of maternal dens during the exploration, development, and production phases of post-leasing oil and gas activities is of concern. Activities at infrastructure could also be a source of disturbance for terrestrially denning bears, especially within 5 mi of the coastline.

Various studies have evaluated the effects of anthropogenic disturbance on polar bears. Amstrup (1993) reported that 10 of 12 denning polar bears tolerated exposure to a variety of disturbance stimuli near dens with no apparent change in productivity (survival of cubs). Two females denned successfully (produced young) on the south shore of a barrier island within 1.7 mi of an active oil processing facility and others denned successfully after a variety of human disturbances near their dens. Similarly, during winter 2000–2001, two females denned successfully within 1,320 feet and 2,640 feet of remediation activities being conducted on Flaxman Island (MacGillivray et al. 2003). In contrast, Amstrup (1993) found that several females responded to disturbance early in the denning period by moving to other sites, suggesting that females may be more likely to abandon dens in response to disturbance early in the denning period, rather than later. Initiating intensive human activities during the period when female polar bears seek den sites (October–November) would give them the opportunity to choose sites in less-disturbed locations (Amstrup 1993), at least in areas where oilfield activity occurs consistently throughout the year.

In undeveloped areas subject to seismic exploration or winter activities such as the construction and use of ice roads and pads and snow trails, dens are likely to have been established and occupied by the time sufficient snow has accumulated to allow those activities to proceed, raising the risk of den disturbance and abandonment. Although disturbance to denning bears can be costly at any stage in the denning process, consequences in early denning can be especially high because of the vulnerability of cubs early in their development (Elowe and Dodge 1989, Amstrup and Gardner 1994, Rode et al. 2018). If a female leaves a den during early denning, cub mortality is likely to occur due to a variety of factors including susceptibility to cold temperatures (Blix and Lentfer 1979, Hansson and Thomassen 1983, Van de Velde et al. 2003), predation (Derocher and Wiig 1999, Amstrup et al. 2006) and mobility limitations (Lentfer 1975). If disturbance occurs during late denning the consequences may be less severe as cubs can potentially survive outside the den after reaching approximately 60 days of age. However, because survival increases with time spent in the den during late denning, disturbances that contribute to an early emergence during late denning are still likely to have negative impacts on cub survival.

There are several ROPs and Lease Stipulations which could significantly reduce the potential impacts of activities that may result from the proposed action to denning polar bears. With 90% of terrestrial denning habitat within NPR-A closed to leasing, with a further 21,000 acres available for leasing but subject to no surface occupancy, and only 5,600 acres of sea ice critical habitat and 2,100 acres of Barrier Island critical habitat available for leasing but subject to no surface occupancy large areas of potential denning habitat would remain undisturbed by permanent Industry activities.

In addition, Lease Stipulations K-1, -2, -3, -4, -5, -6, -9, and -10 incorporate buffers and otherwise spatially restrict development. These stipulations help protect potential polar bear denning habitat, particularly those that limit or prohibit development within suitable terrestrial denning habitat (i.e., areas with topographic relief) along some rivers (K-1, K-3), lakes (K-2) and coastline (K-4, K-5). Prohibitions on production or processing pads along selected rivers would reduce the potential for disturbing dens in suitable denning habitat.

Lease Stipulation K-4 describes the leasing allocations and infrastructure allowed in coastal marine waterbodies. Under the proposed action, the following areas would be closed to leasing and to infrastructure, except for essential pipeline crossings: Kogru River, Dease Inlet, Admiralty Bay, Elson Lagoon, Peard Bay, Wainwright Inlet/Kuk River, Kasegaluk Lagoon, and their associated islands. These changes would minimize the probability of winter activity such as seismic surveys and exploration activities in coastal areas where maternal polar bear dens may be present.

ROP C-1 prohibits cross-country use of vehicles, equipment, oil and gas activity, and seismic survey activity within one mile of known or observed polar bear dens, unless protective measures are approved by the BLM AO and are consistent with the Marine Mammals Protection Act and the ESA. ROP C-1 requires permittees to conduct polar bear den searches prior to onshore activities during the denning season (November to April) to attempt to locate polar bear dens within and near areas of operation. Observed or suspected polar bear dens would be reported to the Service before initiating activities in coastal habitat. Survey results would be used to prevent heavy equipment operation and seismic surveys within 1 mi of known polar bear dens, and if dens were detected within 1 mi of existing activity, work would cease, and the Service would be contacted for guidance. However, not all dens will be detected, in part detection is linked to the depth of the den beneath the snow. The most recent estimate of den detection probability based on data from Wilson and Durner (2020) and considering snow depth is 0.41 SD ±0.15 (USFWS 2021c). While the efficacy of different den detection methods and surveys likely varies, implementation of this ROP will significantly reduce the number of undetected dens proximal to winter activities such as seismic operations, exploratory drilling, use and construction of ice roads and winter travel routes, as well as activities at pads and infrastructure sites which could be disturbed.

As described elsewhere in this document, the most recent estimate of the SBS subpopulation is approximately 907 bears (90% CI: 606-1212; Bromaghin et.al. 2015) of which 35% (SD = 3.8) were thought to be adult females (Bromaghin et al. 2015). Using mark-recapture data USGS developed models which provided an estimate of the number of terrestrial dens in any contemporary year for the SBS on land within the boundaries of different management areas: 1002 area of Arctic NWR, NPR-A, the region between the Colville and Canning rivers, and all other terrestrial regions (USGS 2020).

USGS (2020) estimated the SBS polar bear subpopulation produced 123 dens per year (median), with a 95-percent CI ranging from 69 to 198 dens, of which 66 were land-based dens. Of these dens, the model indicated that only 12 were likely to occur in NPR-A each year.

The location of future polar bear dens that could be established within NPR-A is obviously unknown, and will likely vary by year, based on weather, access, and individual responses of female bears. All but 7.7% of the terrestrial denning habitat within NPR-A is closed to leasing, and there are buffers around river systems which provide the topography necessary to form snow drifts suitable for denning polar bears. Hence, we would anticipate that <1 den / year would be proximal to development, and hence at risk from disturbance, and the risk of disturbance would be further reduced by the implementation of den detection surveys.

Winter activities, such as ice road construction and use, and seismic exploration may cross potential denning habitat and encounter a polar bear den and disturb the bears within it. BLM estimated that up to 12 seismic surveys, each covering 400-900 square miles could occur in NPR-A as a result of the proposed action. Each of these surveys could, therefore, potentially impact an area of 57,600 acres, or 0.25% of the area of NPR-A. Given only 12 polar bear dens are predicated to occur in NPR-A each year, the probability of a den being encountered by a seismic survey is very low. The probability is further reduced by ROP C-1 which requires den searches be conducted prior to the start of activities and then the buffering of dens to prevent subsequent disturbance.

Even with these mitigating factors the potential exists for a small number of dens of the SBS population to be disturbed over the 70-year life of the activities which may result from the proposed action.

Human-Polar Bear Interactions
In addition to impacts from disturbance, such as changes in behavior of non-denning bears and den abandonment, which are discussed above, activities that may result from the proposed action could result in potentially harmful interactions between humans and polar bears, specifically: collisions with vehicles on winter routes or gravel roads, collapse of undetected dens caused by winter equipment movements, attraction of bears to facilities or human activities, and deterrence actions, which could result in injury or death of polar bears in defense of human life.

The BLM (2021) notes that polar bears could be susceptible to vehicle strikes when crossing roads. Traffic on seasonal winter roads (and presumably gravel roads) could pose a collision risk to polar bears. However, with the exception of concentrations in late summer and autumn along the coast, polar bears generally occur at low density on the landscape. Further, activities are generally tightly regulated in industry developments, including speed limits on in-field thoroughfares. Therefore, although we acknowledge the possibility, we conclude that vehicle-polar bear collisions would be extremely rare.

Tracked or rubber-tired vehicles moving over snow in winter could encounter and collapse undetected dens. Although vehicles used on snow are designed to distribute ground pressure, dens in drifted snow would be unlikely to withstand any considerable additional weight, therefore, if equipment were to encounter an undetected den, the den would likely collapse, resulting in injury or death of the cubs and/or female. The likelihood of one or more such events would be proportional to a 1) the density of dens in areas within NPR-A in which activities will take place, and 2) the area impacted by winter tundra travel. This risk is reduced through the requirements of ROP C-1 with den searches and establishing protective buffers around dens until they are naturally abandoned. However, the efficacy of the latter approach would be proportional to the probability of detecting all dens during searches. Thus, if activities requiring winter tundra travel (e.g., seismic surveys, ice road construction, and community moves via the CWAT) are proposed to overlap with denning habitat and the period of den occupancy, there would be the potential for den destruction.

Facilities and human activities, including industry and non-industry activities (e.g., coastal camps used for research or recreation), occasionally attract polar bears, which may be motivated by hunger or curiosity. Sightings of polar bears at industrial sites in the Beaufort Sea region of Alaska have increased in recent years, consistent with increasing use of coastal habitats as summer sea-ice cover has diminished (Schliebe et al. 2008; USFWS 2008; 76 FR 47010: 3 August 2011; 86 FR 42982; 5 August 2021). As sea-ice cover continues to diminish the number of encounters between humans and nutritionally stressed bears is expected to increase raising the likelihood of potentially dangerous encounters (Wilder et al. 2017).

To date, the incidence of human/bear encounters and harassment by deterrence (hazing), however, remains relatively low. From 2010 through 2016, industry reported under ITR LOAs that 395 of 2,373 polar bears (16.6 percent) observed near industrial sites in the North Slope oilfields were disturbed either unintentionally or by intentional deterrence (Miller et al. 2018). The percentage of reported take by intentional deterrence decreased over time from a high of 39 percent of the bears observed in 2005 to 14 percent during 2010–2014 (81 FR 52276; 5 August 2016). This decrease in deterrence events is attributed to increased polar bear safety and awareness training of industry personnel, as well as ongoing deterrence education, training, and monitoring programs (76 FR 47010: 3 August 2011; 81 FR 52276; 5 August 2016). Since 1991 when Incidental Take Regulations were first issued under the MMPA to the oil and gas industry operating on the North Slope only one encounter has resulted in the death of a polar bear (killed during a hazing event in 2011).

Most Industry–polar bear observations occur within 2 km (1.2 mi) of the coastline, hence the limitations and restrictions on operations along much of the coastline of NPR-A will serve to reduce the probability of encounters. In addition, the proposed action includes several ROPs which will decrease the probability of human-polar bear encounters and minimize the risk that any encounters that do occur will adversely affect polar bears. Specifically, ROP A-1 which manages solid waste; A-2 which requires specific waste management for garbage and putrescible waste; and A-3 through A-7 which govern hazardous materials and fuels all of which could be attractants to polar bears. ROP A-8 specifically addresses human-polar bear conflicts and requires oil and gas lessees and their contractors and subcontractors shall, as a part of preparation of lease operation planning, prepare and implement bear-interaction plans to minimize conflicts between bears and humans. These plans shall include measures to:

a. Minimize attraction of bears to the drill sites.
b. Organize layout of buildings and work sites to minimize human/bear interactions.
c. Warn personnel of bears near or on work sites and identify proper procedures to be followed.
d. Establish procedures, if authorized, to discourage bears from approaching the worksite.

e. Provide contingencies in the event bears do not leave the site or cannot be discouraged by authorized personnel.
f. Discuss proper storage and disposal of materials that may be toxic to bears.
g. Provide, annually, a systematic record of bears on the work site and in the immediate area.

Given these facets of the proposed action while activities resulting from it are likely to result in human-polar bear encounters significant adverse effects to polar bears are not anticipated, and lethal take of a polar bear would be extremely rare.

Oil Spills and Exposure to Other Contaminants
Accidental spills of oil or other petroleum products resulting from activities during all industry phases, as well as other activities (e.g., operation or remote camps), could originate from CPFs and satellite pads, pipelines, remote camps, and vehicles and vessels (industry and recreational watercraft) operating in the Action Area. Spills of contaminants could reach the marine habitat of polar bears, including sea ice, marine waters, and lagoons and coastal areas including barrier islands, through spills from vehicles on sea ice, spills from vessels in marine waters, or spills in terrestrial areas being transported downstream to coastal areas or marine areas.

Exposure to oil could impact polar bears in several ways, depending on the volume, location, and timing of a spill, and the severity and manner of exposure. Polar bears could make direct contact with spilled oil or ingest it through grooming fouled fur, nursing, or by ingesting contaminated prey, or inhaling vapors (Engelhardt 1983). Consequences could include irritation to eyes, mouth, and mucus membranes, irritation and damage to respiratory organs from inhalation, kidney and liver damage from ingestion of contaminated prey (Ortisland et al. 1981), loss of ability to thermoregulate, hair loss, anemia, anorexia, increased metabolic rate, elevated skin temperatures, and stress response (Derocher and Stirling 1991; St. Aubin 1990). Exposure could range from short-term, sub-lethal impacts to long-term impacts on health including death, depending on the substances contacted, the magnitude and duration of exposure, and the health of exposed individuals.

Records of polar bears encountering spilled oil or other toxic substances in Alaska suggest exposure could occur from the activities authorized under the IAP but would likely be infrequent and/or impact small numbers of individual bears. Since 1993, the Service has interacted with the oil and gas industry in northern Alaska to evaluate, regulate, and monitor effects of oil and gas exploration, production, and processing on polar bears. In this interval, large oil spills impacting polar bears have not occurred. One polar bear died in 1988, after exposure to ethylene glycol and dye (Amstrup et al. 1989), and two bears died in 2012 after chemical exposure, including Rhodamine B (81 FR 52297). Although this compound is used by the oil and gas industry, it is also used by others on the North Slope, so the 2012 events cannot be attributed to industry (81 FR 52297).

Between July 1, 2009 and June 30, 2014, spills averaging about 59,000 gallons per year were reported by industry on the North Slope, with approximately 5.6 percent of the volume comprised of crude oil (81 FR 52299). Two large onshore terrestrial spills have occurred from pipeline failures. The largest spill on the North Slope occurred in the winter of 2006, when 6,190 bbl leaked from flow lines near an oil gathering center, impacting approximately 0.8 ha

(~2 ac). In November 2009, a spill of approximately 1,150 bbl from a pipeline carrying oil, water, and natural gas occurred, impacting approximately 780 m^2 (~8,400 ft^2). In 2012, 1,000 bbl of drilling mud and 100 bbl of crude were spilled in separate incidents; in 2013, approximately 166 bbl of crude oil was spilled, and in 2014, 177 bbl of drilling mud was spilled. These spills occurred primarily in the terrestrial environment in heavily industrialized areas not used by polar bears and therefore the risk of exposure was minimal, and none of these spills were known to impact polar bears, in part due to the locations and timing. (81 FR 52299).

The direct and indirect effects of spills on polar bears and their habitat depend primarily on the seasonal timing and location of the spills and on the volume and type of material released into the environment. Small spills are likely to have less effect upon polar bears and their habitat, as they are likely to impact a smaller area, reducing the likelihood of bears encountering oil; be easier to contain and remediate; and be reduced in volume to a greater degree through evaporation. For example, in marine waters, without mitigation or response, a 3 bbl refined oil spill during summer is expected to evaporate and disperse within 24 hours and a 200 bbl refined oil spill during summer is expected to evaporate and disperse within 3 days (BOEM 2018).

Medium or large spills are less likely to occur but could potentially be more harmful, as they are likely to cover a larger area, which increases the risk of polar bears being exposed and poses greater challenges to contain and remediate. Additionally, because of their more limited spatial extent, slower rates of dispersion, and higher likelihood of successful containment, terrestrial spills would have lower potential to impact on polar bears than would spills in the marine environment. If spills occur, response and clean-up activities are likely to dissuade polar bears from entering or remaining in affected areas, thereby further reducing the risk of exposure.

Alaska North Slope spill data for 2000–2018 (ADEC 2020) were used to project the likelihood of spills to occur in the NPR-A over the next 70 years. Estimates include 1,585 small spills (< 50 bbl), 20.73 medium spills (50–858 bbl), and one or more large spill (> 858 bbl) may occur over the life of production in NPR-A (BLM 2020, Appendix 1).

Spills that originate on land and leave the pads, roadbeds, or remote camps or that enter water sources directly could reach one or more habitat types including wet and dry tundra, tundra ponds, lakes, flowing creeks and rivers, and potentially the adjacent nearshore Beaufort or Chukchi seas. Terrestrial spills could occur at any time during the year. Spills to the marine environment could occur as a result of barge transfer operations in summer and would be expected to be small, limited to refined products (e.g., diesel, lubricating oil), and localized to the immediate area of the barge transfer. A medium to large spill would only occur if a tug or barge transporting modules runs aground, sinks, or its containment compartment(s) were breached and the contents released (USACE 2012).

In addition to large areas along the coastline being designated as unavailable for leasing or no surface occupancy the proposed action has several Lease Stipulations and ROPs which will reduce the risk of polar bears being exposed to spilled oil or other substances. Lease stipulation K-1 requires setbacks from the major rivers in the Action Area. Pipelines could still cross these areas so there is no reduction in the likelihood of spills from pipelines entering rivers, but spills from accidents on pads or at compressor stations would be less likely to reach protected rivers, which would also reduce the likelihood that oil would be transported downstream toward the coast. Lease Stipulation K-2 places buffers of 0.25 mi around deep-water lakes (>13 feet deep) in the Action Area. Many of these lakes are more than 5 mi from the coast, but a significant number occur on the Cape Simpson peninsula and the lower portions of watersheds draining into Admiralty Bay.

ROPs A-3, A-4 and A-5 minimize potential impacts of contaminants on fish, wildlife, and the environment as a result of hazardous materials, fuel spills, or refueling operations. Permittees would be required to have contingency plans for hazardous substances. Additionally, permittees with oil storage capacity of 1,320 gallons or greater would be required to prepare a spill prevention, control, and countermeasure plan (40 CFR 112); notify the BLM and other federal, State, and North Slope Borough entities as soon as possible; store sufficient cleanup materials at fueling points and maintenance areas, and clean spills immediately.

Finally, in 2015, the Service, working with numerous partners, developed a detailed species-specific oil spill response (OSR) plan in the event a spill occurs (USFWS 2015b). This plan provides guidance for the Service's Alaskan Regional Spill Response Coordinator in determining potential risk to polar bear populations and advising the Federal On-Scene Coordinator on recommended response measures. The OSR plan includes information on preventative measures to keep bears out of oil, such as early detection and deterrence, as well as guidance on treatment of oiled bears, such as washing and holding protocol. Appendices include information on collecting and removing oiled wildlife carcasses; location/inventory of equipment and supplies; and a list of potential holding facilities and response partners that would be called upon to assist as needed. Service response efforts would be conducted using the standard three-tiered spill-response approach:

1. **Primary response** – identifying bear use areas and making recommendations to the Incident Command System where to focus containment, dispersion, burning, or clean-up of oil to minimize impacts to polar bears;
2. **Secondary response** – using hazing, herding, preventative capture/relocation, or additional methods to remove un-oiled polar bears from affected or potentially-affected areas; and
3. **Tertiary response** – capture, cleaning, treatment, and release of oiled polar bears.

In summary, we note that spills of oil and other petroleum products are expected to predominantly be of low volume, small spills are expected to be contained or weather quickly, and material handling, spill prevention, and response measures required by the BLM through Lease Stipulations and ROPs include several measures to minimize impacts to polar bears in the event of a spill. Polar bears generally occur at very low density along the Beaufort Sea coast of NPR-A, with the exception of near Utqiaġvik, where polar bears exploit whale carcasses in late summer, fall, and winter. Even there, however, the density is low (about 2 polar bears/100 km; Schliebe et al. 2008) and < 2 percent of the SBS subpopulation (Atwood et al. 2016) was found there at any given time so even were a spill to occur few individuals would be in close to any given spill site and hence at risk of exposure. Further, prohibitions against oil and gas production and processing in offshore waters, on barrier islands, and within one mile of the coast indicates that most spills would occur in terrestrial areas, where the density of bears is low, and containment and response efforts are likely to be effective. Additionally, a polar bear-specific response plan has been developed to guide response efforts in the unexpected event that a spill with potential to affect polar bears occurs. Finally, procedures governing chemical storage and disposal procedures would effectively minimize risk of polar bears being exposed to other contaminants in NPR-A. Therefore, we conclude the effects of exposure to spilled oil and other petroleum products would be limited to individual-level impacts to a small number of polar bears and are not reasonably expected to rise to the level of population-level impacts to the SBS subpopulation.

Impacts to Polar Bear Prey Species
The fecundity or survival rates of polar bears could be affected if the proposed action affects polar bear prey populations. Polar bears are top predators in the Arctic marine ecosystem, and in the SBS region, they prey primarily on ringed, and to a lesser extent, bearded seals, although other food sources, including beach-cast and subsistence-harvested marine mammal carcasses are occasionally important (USFWS 2016). The NMFS manages ringed and bearded seals under the authorities of the MMPA and ESA. NMFS analyzed the effects of BLM's 2020 proposed IAP for NPR-A, which allowed for significantly larger areas to be leased with a correspondingly larger volume of oil anticipated to be produced, and hence the action had a greater potential to impact listed pinnipeds, including ringed and bearded seals (NMFS 2020).

In their analysis, NMFS (2020) noted that exposure to vessel noise and small oil spills may occur, but effects would be immeasurably small and that vessel strikes were extremely unlikely to occur. They described how activities permitted under the 2020 IAP (BLM 2020) could expose seals to either in-air or in-water noise, depending on where the activity took place and during what season, and that undetected seal lairs could be crushed by on-ice activities. However, NMFS concluded the project's mitigation measures, would avoid and minimize adverse effects to ringed and bearded seals and that the individual and cumulative energy costs of the behavioral responses that may be exhibited are not likely to reduce the energy budgets of ringed seals. As a result, their analysis concluded the ringed seal's probable responses (i.e., tolerance, avoidance, short-term masking, and short-term vigilance behavior) to close approaches by vehicles and their probable exposure to noise or human disturbance were not likely to reduce the fitness, or current or expected future reproductive success, or reduce the rates at which they grow, mature, or become reproductively active. Therefore, these exposures are not likely to reduce the abundance, reproduction rates, or growth rates of the populations those individuals represent.

NMFS (2020) notes the best available data on abundance estimates indicates the population in the Chukchi and Beaufort seas to be at least 300,000 ringed seals, while the U.S. portion of the Bering Sea had a model-averaged abundance estimates of 170,000 and 125,000 bearded seals in 2012 and 2013, respectively. Only a very small subset of these populations would be affected by activities which may result from the proposed action, and as described above NMFS concluded impacts to individuals of prey species would not be significant, and hence, impacts to polar bears would be negligible.

Subsistence harvest
Subsistence harvest of ESA listed species by Alaskan natives and qualified non-natives is exempt from prohibitions of the ESA, and while the proposed action may result in improved

access and therefore potentially increased subsistence harvest in the action area, we do not anticipate this will have a measurable effect on the subsistence harvest of polar bears because undeveloped areas throughout the Action Area have long been accessed for subsistence purposes despite the absence of permanent infrastructure granting access (e.g., via ATVs, snow mobiles, and other off-road vehicles), and we anticipate the Action Area will continue to be used for subsistence purposes regardless of improved access facilitated by new infrastructure.

Furthermore, because 1) overall, polar bears occur at low density throughout the Action Area, and 2) the majority of the Action Area, including high and medium development potential areas where new infrastructure and associated community access projects are more likely, is inland from the coast, where polar bears occur much less frequently; we anticipate that changes in the number of polar bears harvested for subsistence purposes would not be appreciable.

Summary
We identify the following five primary mechanisms by which activities that may result from the proposed action could affect polar bears: disturbance to non-denning and denning polar bears, human-polar bear interactions, spills of oil and other petroleum products, impacts to polar bear prey, and potential increase in subsistence harvest. We also identify the multiple aspects of the proposed action (areas unavailable for leasing, Lease Stipulations and ROPs and the PDCs) that will serve to reduce potential impacts to polar bears.

In summary, the vast majority of impacts to non-denning bears and any human-polar bear interactions that may occur as a result from the proposed action will likely result in short term, minor changes in behavior that do not rise to the level of incidental take. We do not anticipate activities that would result from the proposed action will increase subsistence harvest of polar bears or change their access to prey.

The most significant potential impacts would be to denning polar bears. USGS (2020) estimated that 12 polar bears may den within NPR-A each year. While it is possible that undetected dens could be disturbed or destroyed by activities that may result from the proposed action resulting in injury or death of a small number of polar bears over the 70-year life of projected oil and gas activities, only 7.7% of terrestrial denning habitat is available for leasing, and significant protections are afforded to denning bears and habitat via Lease Stipulations and ROPs identified above.

7.3 Effects to Polar Bear Critical Habitat

Within the Action Area, a total of 1,303,000 acres are designated as critical habitat for polar bears, including subsets of all three designated units. The Action Area contains 432,600 acres within Unit 1, Sea Ice Habitat; 856,000 acres within Unit 2, Terrestrial Denning Habitat; and roughly 15,000 acres within Unit 3, Barrier Island Habitat (BLM 2020a). Additionally, effects of the action could extend to designated critical habitat outside the boundaries of NPR-A if and/or when activities are proposed on sea ice or in the Marine Transit Route (MTR).

To evaluate potential effects of the Proposed Action to polar bear critical habitat, we separately consider the Sea Ice, Terrestrial Denning, and Barrier Island units. For each unit, we consider potential impacts to the physical and biological features (PBFs) of the habitat that were identified within the designation. Also, for the Terrestrial Denning and Barrier Island units, we consider whether human presence or activities could compromise the value of critical habitat, because absence of disturbance was described as an attribute of both units.

Unit 1 – Sea Ice Habitat
Sea Ice Habitat comprises roughly 115,506,000 total acres, of which 432,600 acres (< 1 percent) occurs within the NPR-A. However, under the Proposed Action the vast majority of polar bear Sea Ice critical habitat within the NPR-A under the BLM's surface authority would be closed to leasing (approximately 424,000 acres). Approximately 5,600 acres would be open, but subject to no surface occupancy, and only 1,100 acres would be open to leasing under standard terms and conditions (i.e., only 0.005 % and 0.001 % of the total critical habitat unit area, respectively).

When designating polar bear critical habitat, we defined this unit as "sea ice that moves or forms over the shallower waters of the continental shelf (300 meters [982.2 feet] or less)," and that contains adequate prey resources (primarily ringed and bearded seals) to support polar bears. Sea ice is an essential physical feature for polar bears in the southern Beaufort, Chukchi, and Bering seas for food and physiological requirements (75 FR 76086 – 76137). Activities resulting from the IAP could affect this essential physical feature through three mechanisms: 1) damage to the physical characteristics of sea ice caused by vehicular travel across ice, 2) spills of oil or other petroleum products into marine waters that form ice, or directly onto ice, and 3) impacts to ringed and bearded seals, caused by disturbance or spills of oil or other petroleum products. These impacts could affect sea ice in Unit 1 within the limited area of overlap with the NPR-A or elsewhere within the broader Action Area (i.e., in the MTR).

Vehicular transport of materials, equipment, or personnel across sea ice during winter could occur. Vehicle-supported winter seismic surveys could also take place on sea ice. Sea ice routes would presumably consist of narrow linear trails occupying an extremely small proportion of the ice surface. Although seismic surveys may cover a slightly larger area (e.g., a grid rather than a single trail), they would still occur within a comparatively small proportion of designated sea ice critical habitat. As described in ROP C-1 sea ice trails must not be greater than 12-feet wide and no driving will be allowed off the ice trail or off planned routes unless necessary to avoid ungrounded ice or for other human or marine mammal safety reasons. Further, we assume that measures required to ensure safety of personnel and heavy equipment transported across sea ice would require thick, stable, strong ice capable of supporting considerable additional weight, which would presumably ensure, at most, negligible impacts to the physical features of sea ice. Therefore, we conclude impacts to the physical features of sea ice due to vehicular traffic would be insignificant.

It is also plausible that oil or other petroleum products could be spilled during vehicular transport across sea ice, from vessels crossing marine waters within the boundaries of the sea ice unit during summer, when ice is broken or absent, or in terrestrial habitats within NPR-A, possibly allowing spilled oil to be transported into the sea ice unit by fluvial waters or other means. If spills are incompletely remediated, oil or other petroleum products could contaminate sea ice after freeze-up in fall/winter. Spilled products could also affect ice seals, which are an identified component of sea ice habitat for polar bears.

BLM (2021) concluded that while the probability of small (<100 gallons) spills occurring is high, as spills become larger the probability of occurrence declines. Vehicular traffic on sea ice could result in small spills, which could be cleaned up and would hence only cause a short-term effect to a tiny portion of designated sea ice critical habitat. While BLM estimates that one or more large spills (>36,036 gallons) may occur over the life of oil and gas production in NPR-A (assumed to be 1.35 billion barrels), the most likely spill would be of seawater or produced water, with only a 27% probability of a large crude oil spill. Produced water, or seawater would have little impact to sea ice and the effects would be short-term (one season) at most (BLM 2021).

Even if a large spill of crude oil were to occur during oil and gas production within NPR-A there are several Lease Stipulations and ROPs which would reduce the risk of spilled oil reaching marine waters, and hence impacting sea ice critical habitat, or ice seals. Specifically, ROP A-5 prohibits refueling equipment within 500 feet of an active floodplain and only small volumes (<210 gallons) of fuel can be stored within this area; ROP E-2 prohibits permanent oil and gas facilities within 500 feet from ordinary high water of fish-bearing waterbodies (although essential pipeline crossings would be permitted); Lease Stipulation K-1 requires larger setback distances at major river systems; Lease Stipulation K-3 prohibits exploratory drilling in rivers and streams, as determined by the active floodplain; Lease Stipulations K-4 and K-5 prohibit production and processing of oil in coastal waters and lagoons, on barrier islands, and within one mile of the coast. Furthermore, PDCs 1–3 would enhance the conservation benefits accrued during step-down section 7 consultations on future activities proposed under the IAP. All these ROPs, Lease Stipulations, and PDCs serve to further reduce the probability that spills of oil and other petroleum products would reach marine waters and affect the sea ice critical habitat unit, or the ice seals which are a key component of this habitat.

Vehicular traffic on sea ice or in marine waters within the boundaries of the unit could conceivably disturb ice seals, potentially affecting fecundity or survival. However, as described above only a very small portion of the sea ice critical habitat unit may be impacted by travel routes or seismic surveys. In addition, ROP C-1 requires that prior to the initiation of winter seismic survey on marine ice, the permittee will conduct a sound source verification test approved by BLM and NMFS. The test would measure attenuation distance which would be used to buffer all marine on-ice seismic survey activity operations to areas potentially occupied by ice seals. Thus, we do not expect disturbance would affect large numbers of seals, which are a component of the much larger sea ice critical habitat unit.

Unit 2 – Terrestrial Denning Habitat
Terrestrial Denning Habitat comprises roughly 3,618,000 acres, of which approximately 856,000 acres (24 percent) is within NPR-A (BLM 2020). Under the Proposed Action, 90% of the polar bear terrestrial denning habitat (approximately 769,000 acres) within the NPR-A under the BLM's surface authority would be closed to leasing. Approximately 21,000 acres of polar bear terrestrial denning habitat would be open to leasing, but subject to no surface occupancy. Hence, only 66,000 acres (1.8% of the total critical habitat unit area, and 7.7% of the area within NPR-A) would be open to leasing, but subject to the standard Lease

Stipulations and ROPs.

When designating polar bear critical habitat, we "determined that terrestrial denning habitat includes the following features essential to the conservation of the species: coastal bluffs and river banks with (a) steep, stable slopes (range 15.5 – 50.0 degrees), with heights ranging from 1.3 to 34 meters (4.3 to 111.6 feet), and with water or relatively level ground below the slope and relatively flat ground above the slope; (b) unobstructed, undisturbed access between den sites and the coast; (c) sea ice in proximity of terrestrial denning habitat prior to the onset of denning during fall to provide access to terrestrial den sites; and, (d) the absence of disturbance from humans and human activities that may attract other bears (75 FR 76086 – 76137)."

We identify no mechanisms by which the IAP would affect the availability of sea ice proximal to terrestrial denning habitat. Note that specific climate change-related effects that may occur in the Action Area in the future cannot be attributed to any greenhouse gas emissions resulting from consumption of petroleum produced at drilling sites and thus are not considered effects of production; Service Policy Memorandum dated May 14, 2008. Therefore, in this evaluation we will discuss possible impacts from the RFD scenario to coastal bluffs and riverbanks that comprise suitable denning habitat, and disturbance of polar bears, which could dissuade or obstruct movements of females between den sites and the coast or could attract non-denning bears to denning habitat.

While available data indicate polar bears den in areas that are relatively free from disturbance, there are documented instances where man-made features have provided favorable conditions and were successfully used by denning polar bears. These include eight dens in nine years on the margins of an abandoned gravel pad about 4.3 miles (7 km) northeast of Milne Point CPF (USFWS unpublished data), and individual successful dens (i.e., females departed from dens with cubs naturally) on an industrial island under construction (USFWS 2012); on ENI's Spy Island Development (Burke 2011); on an abandoned exploration gravel pad on Cross Island; on a runway ramp at the Bullen Point Long-range Radar Site (USFWS 2012); along an active road causeway (DeMarban 2017); and under a bridge at Endicott Island at Prudhoe Bay (USFWS 2017c). These examples illustrate that whether or not industrial facilities would affect the physical characteristics of denning habitat, preventing its future use for denning, could likely vary with the situation. Some facilities such as active gravel mine sites, large pads with CPFs and other large structures would presumably preclude maternal denning by polar bears. Under the RFD scenario, up to three CPFs, with 20 satellite pads and 250 miles of interconnecting gravel roads could be constructed and operated, impacting up to 2,475 acres.

There are a number of ROPs and Lease Stipulations that serve to reduce potential effects to terrestrial denning habitat, including impacts to the physical characteristics of denning habitat, Lease Stipulation K-5 prohibits facilities within 1 mi of the coast, except those that necessarily must be at the coast (e.g., barge landings, seawater treatment plants, or oil spill response staging and storage areas). For essential coastal infrastructure, the use of existing sites (e.g., Cape Simpson, Peard Bay, Camp Lonely, Husky/USGS drill sites, and DEW-Line sites) would be considered before the use of new and unoccupied sites. Despite the potential exceptions, this stipulation would provide protection for terrestrial denning habitat, as analysis of sites used for denning in terrestrial habitat found that 69 percent have been on coastal banks (Durner et al.

2003), all identified den sites between the Kavik River and Utqiaġvik prior to 2009 were within 5 miles of the coast and 95% were within 2.8 miles of the coast (Durner et al. 2009a). Under the proposed action, permanent exploratory well pads are precluded, but temporary ice pads would be permitted, which could affect coastal habitat used by denning polar bears during 3–4 months of the winter drilling season. Additional protection for denning habitat is provided by Lease Stipulations K-1 and K-3, which limit development within buffers along major rivers, K-2, which prohibits infrastructure within 0.25 mi around deep-water lakes (>13 feet deep) in the Action Area. Topographic relief around the margins of these lakes is often suitable denning habitat. Many of deep-water lakes included are too far from the coast to be suitable for polar bear denning, but a significant number occur on the Cape Simpson peninsula and the lower portions of watersheds draining into Admiralty Bay. ROPs E-5 and E-7 establish the requirements for design and construction of roads and water-crossings that reduce the effects of habitat alteration on polar bears.

BLM also anticipates small spills could occur in the terrestrial Action Area, with the potential for one or more large spills to occur. Hence, a subset of these spills could occur within terrestrial denning habitat. However, measures built into the proposed action would serve to reduce the risk of spills of oil or other substances within terrestrial denning habitat. A five-mile-wide buffer along the west bank of the Colville River would extend from the confluence with the Chandler River to the mouth of the Colville, and sand and gravel mining would be prohibited in a three-mile setback from Fish Creek. Pipelines could still cross these areas so there is no reduction in the likelihood of spills from pipelines entering rivers, but spills from accidents on pads or at compressor stations would be less likely to reach protected rivers, which would also reduce the likelihood that oil would be transported downstream toward coastal areas within terrestrial denning habitat. Furthermore, pre-staged and/or deployed containment boom at pipeline river crossings would reduce potential downstream spread of spills from pipelines (BLM 2021). Stipulation K-4 would permit essential pipeline crossings over waterbodies only if the permittee could demonstrate year-round spill response capability or alternative methods to prevent blowouts.

ROPs A-3, A-4 and A-5 minimize potential impacts of contaminants on fish, wildlife, and the environment as a result of hazardous materials, fuel spills, or refueling operations. Permittees would be required to have contingency plans for hazardous substances. Additionally, permittees with oil storage capacity of 1,320 gallons or greater would be required to prepare a spill prevention, control, and countermeasure plan (40 CFR 112); notify the BLM and other federal, State, and North Slope Borough entities as soon as possible in the event of spills; store sufficient cleanup materials at fueling points and maintenance areas; and clean spills immediately.

In summary, while the eventual location of oil and gas facilities and activities is unknown at this time it is unlikely all these facilities would be constructed in or proximal to terrestrial denning habitat. It is also possible that terrestrial denning habitat could be impacted by spills of oil or hazardous substances. However, as described above, there are several ROPs and Lease Stipulations which reduce the potential for significant impacts to the physical characteristics of large areas of terrestrial denning habitat through habitat modification or spills.

A feature of Terrestrial Denning Critical Habitat is unobstructed, undisturbed access between den sites and the coast. While some infrastructure, such as barge landing sites, and pipelines could be constructed proximal to the coast, under the Proposed Action, the majority of the coastline of NPR-A would be unavailable for leasing or subject to no surface occupancy requirements. There are also several ROPs and Lease Stipulations which help ensure female polar bears and their cubs can access the sea ice. ROP C-1 precludes activities within 1-mile of a known polar bear den through the denning and emergence period until the polar bears have left the area. ROP E-5 requires facilities to be designed and located to minimize footprint through actions such as collocating facilities, using existing facilities etc. ROP E-7 is designed to minimize disruption to caribou movements by elevating the pipelines and separating them from roads by at least 500 feet, these same design considerations would help facilitate the movement of polar bears.

Lease Stipulation K-4 precludes leasing of the Kogru River, Dease Inlet, Admiralty Bay, Elson Lagoon, Peard Bay, Wainwright/Kuk River, and Kasegaluk Lagoon on the coast, while Lease Stipulation K-5 requires that exploratory well drill pads, production well drill pads, or a central processing facility for oil or gas would not be allowed in coastal waters or on islands between the northern boundary of NPR-A and the mainland, or in inland areas within 1 mile of the coast. Prior to infrastructure being abandoned, ROP G-1's objective is to ensure the long-term reclamation of land to its previous condition and use. This presumably would remove any kind of infrastructure that would pose a barrier to polar bear movements.

Given the relatively small portion of terrestrial denning habitat that may be affected by infrastructure, and considering the significant restrictions placed on coastal areas through ROPs and Lease Stipulations, significant disruption of access to den sites, the coast, and/or sea ice is not likely.

Unit 3 – Barrier Islands

When designating critical habitat for polar bears, the Service identified barrier islands as a "physical feature essential to the conservation of polar bears in the United States." The unit was described as "barrier island habitat used for denning, refuge from human disturbance, and movements along the coast to access maternal den and optimal feeding habitat, which includes all barrier islands along the Alaska coast, and their associated spits, within the range of the polar bear in the United States, and the water, ice, and terrestrial habitat within 1.6 kilometers (1 mile) of these islands (no-disturbance zone)" (75 FR 76086 – 76137).

Unit 3, Barrier Island Habitat comprises roughly 240,000 total acres along the Alaska coast, approximately 15,000 acres (7 percent) of which occur within NPR-A (BLM 2021). However, the majority of Barrier Island critical habitat in NPR-A would be closed to leasing (approximately 12,000 acres), with a further 2,100 acres open to leasing but subject to no surface occupancy. Hence, only an extremely small portion of Barrier Island critical habitat could be affected by oil and gas infrastructure (900 acres out of 240,000 or 0.375%).

Based on the description of barrier islands at designation, we consider the physical feature of barrier islands to include the physical characteristics of islands, accompanied by refuge from disturbance necessary for denning, resting, and unimpeded movements. In this light, we consider potential impacts of the proposed IAP to barrier island habitat to include construction of facilities on barrier islands, human activities on, near, or over barrier islands that could disturb or impact use by polar bears, and the risk of spills of oil or other petroleum products reaching barrier islands.

In addition to the very limited area of Barrier Island Critical Habitat that may be impacted by activities authorized by the proposed action, Lease Stipulation K-5 prohibits all facilities (i.e., well drill pads or CPFs) on or under the coastal waters within the administrative boundary of the NPR-A, or within 1 mile inland of the shoreline. Other infrastructure necessary for oil and gas production that must be located within 1 mi of the coast (e.g., barge landings, seawater treatment plants, or spill response staging) would not be precluded, nor would essential pipelines or infrastructure associated with offshore oil and gas exploration and production. Elsewhere, permanent facilities within the major coastal waterbodies would only be permitted on or under the water if the permittee can minimize impacts on subsistence activities and travel corridors and demonstrate year-round oil spill response capability or the availability of alternative methods to prevent well blowouts. For essential coastal infrastructure, the use of a previously occupied site (Cape Simpson, Peard Bay, Camp Lonely, Husky/USGS drill sites, and DEW-Line sites) would be considered before the use of new and unoccupied sites. Thus, these Lease Stipulations provide additional protections for barrier islands that would restrict some specific forms of infrastructure (e.g., processing facilities but not essential pipelines) depending on location, availability of alternative facilities, and whether the infrastructure would be associated with offshore oil and gas exploration and production.

Despite the prohibitions against permanent facilities of Lease Stipulation K-5, some activities could take place on or near Barrier Island Critical Habitat, for example on-ice activities in winter and in open water in summer could disturb polar bears using these areas. However, we would expect activities in proximity barrier islands would be transitory, of short duration, and impact a comparatively small geographic area (i.e., winter equipment transport or seismic surveys). Furthermore, ROP F-1 requires aircraft to maintain a minimum altitude of 3,000 feet above ground level along the coast (and hence over barrier islands) when within 1 mile of listed marine mammal species, unless doing so would endanger human life or violate safe flying practices. The Service's MMM recommends a flight altitude of ≥1,500 ft to minimize impacts to polar bears. Hence, this ROP imparts more protection to polar bears occupying barrier island critical habitat and aircraft disturbance should be minimal in these areas.

Regarding the risk of spilled oil or other petroleum products reaching barrier islands, as described in more detail above for Unit 1 – Sea Ice Critical Habitat, Lease Stipulations K-4 and K-5 would reduce the risk of oil and other petroleum product spills in marine waters. ROPs A-3, A-4, and A-5 would reduce the risk of oil spilled in terrestrial areas being transported to the marine environment by streams or rivers. Additionally, PDCs 1–3 serve to reduce potential impacts to barrier island habitat and enhance the conservation benefits accrued during future step-down section 7 consultations on activities proposed and/or authorized under the IAP. Given these protections, coupled with the relatively low probability of a large spill, significant impacts to Barrier Island Critical Habitat from activities which may be authorized under the IAP are discountable.

In summary, we conclude that potential impacts to barrier island habitat, caused by construction of facilities on barrier islands, disturbance on or within 1 km of barrier islands, and the risk of spilled oil or other petroleum products reaching barrier islands are low, given the limited amount of Barrier Island Habitat within NPR-A, the even smaller amount available for leasing and surface occupancy, and the protections afforded by the Lease Stipulations, ROPs, and PDCs.

8.0 – CUMULATIVE EFFECTS

Under the ESA, cumulative effects are the effects of future State or private activities, not including Federal activities, that are reasonably certain to occur within the Action Area considered in this BO (50 CFR §402.02). Effects from future Federal activities (*i.e.*, activities that require Federal approval, funding, permits or other form of authorization) do not constitute cumulative effects for the purposes of this BO, but would be analyzed separate consultation under the ESA. The subsections below identify the types of activities may occur in the Action Area in the future and discusses their potential to cause cumulative effects. Climate change is not discussed further within the *Cumulative Effects* because climate change and the mechanisms through which it could alter the Action Area, and thereby affect listed species and/or their habitat over the course of the proposed action has already been described in earlier sections of the document, i.e., *Status of the Species* and *Environmental Baseline*.

Industry Development
Future oil and gas exploration, development, and production, and associated mechanisms of impact (i.e., habitat loss, disturbance, listed eider collision risk, increased predators, human-polar bear interactions etc.), whether in Federal or State waters or in the terrestrial environment on State, private, Native-owned, or Federal lands, would require Federal permits (e.g., section 404 of the Clean Water Act authorization from the U.S. Army Corps of Engineers [USACE], National Pollution Discharge Elimination System permits from the Environmental Protection Agency, or from the Bureau of Ocean Energy Management in Federal off-shore areas). Therefore, these actions would constitute Federal activities and are not considered cumulative effects under the ESA.

Community Growth
North Slope communities, particularly those that serve as transportation and shipping hubs (e.g., Utqiaġvik) and those connected by infrastructure to industry developments (e.g., Nuiqsut) are likely to grow in the coming decades. As industry, private sector developments, and community footprints expand so does associated infrastructure (e.g., gravel roads, powerlines, communication towers, landfills, and gravel pits). The scale of potential adverse impacts would depend not only on the amount of growth, but the location and how it intersects with the habitats of listed species.

Similarly, as populations of Arctic coastal communities increase, so does the probability of human-polar bear encounters, and/or subsistence harvest of polar bears. Since 2010, USFWS has provided funding and technical support to the North Slope Borough for implementing a Polar Bear Patrol program in rural communities. This program provides critical safety for coastal communities and has contributed to polar bear conservation by repeatedly, and non-lethally, deterring polar bears from areas of human habitation (Miller et al. 2018). This program will likely continue into the future, and the impact of any changes to the Program will also be evaluated in future consultations.

Furthermore, the majority of the onshore Action Area is classified as wetlands (https://www.fws.gov/wetlands/data/mapper.html). Therefore, a section 404 permit from the USACE would likely be necessary for any major infrastructure expansion projects. The issuance of these permits would also trigger consultation under the ESA. Smaller private sector projects may not require a Federal permit, but would also likely result in insignificant, if any, impact to listed eiders or polar bears.

Subsistence Harvest
As the population of North Slope communities increases so does the number of subsistence hunters. This could adversely affect listed eiders through inadvertent harvest of these birds and contamination of habitat if lead shot is illegally used. However, subsistence hunting regulations are developed annually and are subject to section 7 consultation. Therefore, potential increased impacts from inadvertent harvest of listed eiders would be addressed through this consultation each year (e.g., USFWS 2020a). Furthermore, although lead shot is still occasionally found in North Slope communities, there are indications compliance with these regulations has improved as a result of outreach, education, and enforcement, and these efforts are on-going

Given established quotas for subsistence harvest of polar bears, conservation practices, and reporting requirements afforded through the 1973 Polar Bear Agreement, Inuvialuit-Inupiat Polar Bear Management Agreement, and MMM's Marking Tagging and Reporting Program; subsistence harvest of polar bears is expected to continue at or near current levels. Increased subsistence polar bear harvest would be unlikely without future engagement by these management bodies and subsistence users.

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). Increased shipping along the Northern Sea Route (part of the Northeast Passage that follows Norway and Russia's coast down into the Chukchi and Bering seas), and the Northwest Passage (which follows Canada's eastern coast north along Canada and Alaska's Beaufort Sea coast) could result in increased fragmentation of sea ice habitat and disturbance/injury to marine mammals, increased human-bear encounters, and the introduction of waste/litter, and toxic pollutants, including spilled oil (PBRS 2015). All of these threats could potentially affect polar bears and listed eiders.

The Arctic Council conducted a comprehensive Arctic marine shipping assessment for the Arctic Ocean, focusing on potential impacts of humans and the arctic environment (Arctic Council 2009). The AMSA Report includes a comprehensive estimate of the number of ships (excluding naval vessels) operated in the Arctic by year and identified Arctic natural resource development and regional trade as the key drivers of future Arctic marine activity. The release of oil was identified as one of the most significant environmental threats related to shipping. The report specifically recommended that Arctic countries address impacts on marine mammals from shipping, and work with the International Maritime Organization (IMO) to develop and implement mitigation strategies.

Since then, significant advances have been made in implementing recommendations set forth in the AMSA Report. For example, several reports that identify Arctic marine areas of special ecological and cultural importance have been published (Smith et al. 2010), and voluntary guidelines to reduce underwater noise to avoid adverse impacts on marine biota have been developed (PAME 2015). Additionally, vessel routing and speed restrictions have been recognized as effective measures to mitigate impacts on marine mammals (Brigham and Sfraga 2010). In 2015, the IMO adopted the environmental provisions of the Polar Code, which include standardized safety procedures addressing design, construction, equipment, operational, training, environmental protection standards, and use of designated shipping lanes. The Polar Code was entered into force on January 1, 2017 (IMO 2019) and should reduce impacts to listed species and their habitats.

Commercial fishing
Reduction in the extent and duration of sea ice may increase the potential for commercial fishing within the MTR portion of the Action Area, but the likelihood and magnitude of these activities are unknown at this time. Future commercial fisheries within the MTR portion of the Action Area would likely be managed by the National Marine Fisheries Service, and the issuance of regulations would require section 7 consultations and are therefore not considered cumulative effects.

Increased Scientific Research, Monitoring, Surveying, and Site Restoration
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, these activities frequently require permit authorizations from the National Science Foundation (NSF) or other Federal agencies (e.g., BLM for research in NPR-A) if scientific activities are related to industry development. Large scale projects that may overlap the MTR are generally funded by the NSF or operate off USCG ice breaking vessels. These activities would be considered in separate section 7 consultations.

Several types of non-oil and gas related activities such as research activities including archeological / geological / soil sampling and collection, recreation and film permits, excavation and solid and hazardous waste removal and associated transportation via aircraft and boats may also occur within the NPR-A. Many of these activities are small scale, temporary, and localized and hence their impacts to listed resources would be extremely limited. Larger scale projects, such as contaminated site cleanups or commercial activities such as surveying and sampling a potential gravel mine site would require authorization from BLM and further Section 7 consultation and hence potential impacts from these activities are not considered cumulative effects.

Recreation
Purely private activities within the Action Area or on nearby private lands meet the definition of cumulative effects under the ESA. Private party access to the proposed Action Area, or users of nearby private lands could disturb a few individual listed eiders or polar bears each year. However, these species occur at such low density, and with increasing scarcity inland from the

coast. In addition, because the Action Area is remote and mostly undeveloped, access is difficult and there are no data to suggest widespread use by large numbers of private individuals. In addition, polar bears primarily occur in the Action Area during limited times of the year (late fall/winter) and at low densities which further reduces the likelihood of private party encountering them, or such encounters resulting in significant impacts to the species. Therefore, we expect the likelihood of private party encounters or resulting impacts to listed species would be low.

Conclusion

In summary, we anticipate the scope and scale of industry and community development, infrastructure expansion, subsistence hunting, marine traffic, commercial fishing, scientific activities, and recreation in the Action Area will continue, and may increase in the future. However, activities with the potential to affect significant numbers of individuals of listed species (such as industry development and infrastructure expansion) are expected to require consultation under the ESA; whereas those that may not require consultation (e.g., small private activities) would likely have at most, minor impacts to listed species.

9 - CONCLUSION

This section provides our opinion regarding whether the effects of the proposed action are likely to jeopardize listed species or result in the destruction or adverse modification of critical habitat. We considered the potential effects of the Action as a whole, while recognizing that specific actions and activities that would result from the proposed action remain uncertain. Therefore, we conducted a framework programmatic consultation, which required the identification of potential effects of the action and the development of guidelines to minimize effects to listed species and critical habitat. Thus, step-down consultations would be required when specific actions and activities are proposed and project-specific information is provided, and we defer authorization of incidental take until that time.

Our opinion as to whether the action is likely to jeopardize listed species or result in the destruction or adverse modification of critical habitat was formulated by adding the effects of the action and cumulative effects to the environmental baseline, in light of the status of the species and critical habitat. These determinations were made by applying regulations (50 CFR § 402.02) that implement section 7(a)(2) of the ESA and define "jeopardize the continued existence of" as "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species." "Destruction or adverse modification of critical habitat" is defined as a "direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species."

We note that we concurred with BLM's determinations that the Proposed Action is not likely to adversely affect the short-tailed albatross, southwest Alaska DPS of northern sea otters or critical habitat for northern sea otters, and concluded the proposed action is not likely to adversely affect designated critical habitat for spectacled eiders, or Alaska-breeding Steller's eiders. Therefore, we do not revisit these listed species or designated critical habitat units in this conclusion.

9.1 Spectacled Eiders

In evaluating impacts of the proposed action to listed eiders, we identified that adverse effects to spectacled eiders could result from long-term habitat loss, aircraft disturbance, spills of oil and other contaminants, and collisions with infrastructure in the onshore Action Area and vessels in the offshore Action Area. Using methods explained in the *Effects of the Action* section, over the 70-year life of activities that may result from the proposed action we estimate:

- Loss of production from <7 nests each year from to habitat loss and associated disturbance.
- Loss of production from at most 56–159 nests each year from on-tundra aircraft operations and associated activities (assuming all activities were to occur in moderate-high density nesting areas).
- Loss of, at most, low numbers (estimated <10) spectacled eiders from exposure to spills of oil or other contaminants; and
- Up to 63 adult or fledged juvenile spectacled eiders injured or killed from collisions, over the 70-year life of activities which may result from the proposed action.

These estimates were based on the best information currently available, and were developed using conservative assumptions, so are likely to overestimate impacts. We also acknowledge these estimates could change as the species' abundance changes over the duration of the proposed action, specific details of actions and activities are identified, and the PDCs and applicable Lease Stipulations and ROPs are applied. However, re-evaluation during step-down consultations will provide any additional reasonable and prudent measures deemed necessary and appropriate to reduce the amount of take would be developed, particularly for actions proposed for areas with higher density of spectacled eiders.

The current global population abundance for spectacled eiders is unknown. Aerial surveys in 2020 provided a minimum population count of 76,592, but detection was likely less than 100%. The aerial surveys of the global population (the listed entity) in 2010 still provide the most robust estimate of population size at 369,122 (90% CI = 364,190–374,054; Larned et al. 2012 (USFWS 2021). Larned et al. (2012) estimated the sex ratios of the wintering flocks were 100 males: 74-84 females. Based on common eider data, we would anticipate that only 75% of females attempt to breed each year producing, at minimum 44,000 broods. Hence, after reviewing the current status of spectacled eiders, the environmental baseline for the action area, the cumulative effects, and considering the level of take which may result from the proposed action (summarized above), it is the Service's biological opinion that activities resulting from the proposed action are *not likely to jeopardize the continued existence* of the spectacled eider.

9.2 Alaska-Breeding Steller's Eiders

In evaluating impacts of the proposed action on Steller's eiders, we identified potential adverse effects from long-term habitat loss, aircraft disturbance, spills of oil and other contaminants, and collisions with infrastructure in the onshore Action Area and vessels in the offshore Action Area. Using methods explained in the *Effects of the Action* section, we estimate activities resulting from the proposed action may result in:

- Loss of production from <2 nests each year from habitat loss and associated disturbance;
- Loss of production from, at most, 28 nests each year assuming that all anticipated on-tundra aircraft operations and associated activities occur in the highest density nesting areas which comprises a very small area of NPR-A;
- Loss of, at most, low numbers (<10) of Steller's eiders from exposure to spills of oil or other contaminants; and
- Up to 4 adult or fledged juvenile spectacled eiders injured or killed from collisions, over the 70-year life of activities which may result from the proposed action.

These estimates were based on the best information currently available, but were developed using very conservative assumptions, so are likely significantly overestimates of impacts. Importantly, Steller's eiders have very clumped distribution on the ACP of the NPR-A and predominantly, and most regularly, occur in and near the Barrow Triangle, south of Utqiaġvik and west of Dease Inlet and Admiralty Bay. Much of these areas are unavailable for leasing or subject to no surface occupancy provisions which will significantly reduce the amount of activity which could impact Steller's eiders. Elsewhere in the NPR-A, Steller's eiders occur unpredictably and at extremely low density, and hence activities occurring elsewhere in NPR-A would affect, at most one or two nesting birds.

Implicit in our estimate of impacts using the 90^{th} quantile of estimated densities for Steller's eiders is the assumption that habitat loss, disturbance from aircraft, and infrastructure posing collision risk in onshore areas, would on average, occur within areas with exceptionally high densities of Steller's eiders. For that to occur, most future activities which may result from the proposed action would have to occur within the Utqiaġvik Triangle. However, much of that area is closed to leasing or is subject to no surface occupancy restrictions. While recognizing the uncertainty over where activities will occur as a result of the proposed action, it would be very unlikely that the majority of impacts from the Proposed Action would occur in or near the Utqiaġvik Triangle. In part this is because the area with high development potential does not overlap with the small subset of the NPR-A in which Steller's eiders concentrate, and the majority of Steller's eiders occur in areas which would be closed to leasing under the proposed action. Therefore, while we provide these estimates, we note that our evaluation of potential impacts likely significantly overestimates actual future impacts.

If, actions are proposed for the Utqiaġvik Triangle (the area of highest density of nesting Steller's eiders), protective measures included in this framework programmatic consultation would apply to ensure adequate protection, including stepdown consultation on each proposed action, and application of relevant PDCs, stipulations, and ROPs. In particular, PDC 5, specifically designed to address and monitor potential impacts of helicopter-supported activities, would be important if actions with potential to disturb nests or broods are proposed for during the breeding season. Also, ROP E-11 requires "a minimum of 3 years of site-relevant survey data…" before the approval of infrastructure construction within Steller's eider habitat. Further, "If spectacled and/or Steller's eiders are determined to be to be present within the proposed development area, the applicant shall work with the USFWS and the BLM early in the design process to site roads and infrastructure to minimize impacts on nesting and brood-rearing eiders and their habitats. Such consultation shall address timing restrictions and other temporary mitigating measures, location of permanent infrastructure, placement of fill, alteration of eider habitat, aircraft operations, and management of noise levels." We expect the requirement for site-relevant surveys, coupled with timing restrictions and other mitigating measures, would provide mechanisms for protecting Steller's eiders and their habitat in the event that: a) development were proposed for areas where Steller's eiders predictably occur; or b) Steller's eiders were found elsewhere as a result of pre-construction surveys, as required by ROP E-11. Therefore, we conclude the proposed action would not appreciably reduce the likelihood of survival and recovery of this species. After reviewing the current status of Alaska-breeding Steller's eiders, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that activities that may result from the proposed action are *not likely to jeopardize the continued existence* of the Alaska-breeding Steller's eider.

9.3 Polar Bears

In evaluating impacts of the proposed action to polar bears, we have identified that adverse effects may result from activities that could result through disturbance to non-denning and denning polar bears, human-polar bear interactions, and spills of oil and other petroleum products. These impacts are summarized below.

Disturbance of Non-Denning Polar Bears

Given the relatively low density of polar bears within the action area, coupled with protections provided to coastal areas through designations such as no surface occupancy, buffers to the coastline, and areas unavailable for leasing and ROPs such as those governing aviation, activities which may result from the proposed action are unlikely to disturb more than a few non-denning polar bears each year. Disturbance that does occur will result in short-term changes in behavior such as moving away from any area of human activity by individual polar bears which are not reasonably expected to rise to the level of population-level impacts to the SBS subpopulation.

Disturbance of Denning Polar Bears

The location of polar bear dens within NPR-A is obviously unknown and will likely vary by year based on weather, access, and individual responses of female bears. All but 7.7% of the terrestrial denning habitat within NPR-A is closed to leasing, and there are buffers around river systems which provide the topography necessary to form snow drifts suitable for denning polar bears. Hence, we would anticipate that <1 den / year would be proximal to development, and at risk from disturbance. Further, while winter activities such as ice road construction and use may cross potential denning habitat and encounter a polar bear den and disturb the bears within it, the probability of this is reduced by ROP C-1 which requires den searches be conducted prior to the start of activities and then the buffering of dens to prevent subsequent disturbance.

Even with these mitigating factors the potential exists for a small number of dens of the SBS population to be disturbed over the 70-year life of the activities which may result from the proposed action.

Human-Polar Bear Interactions

The proposed action is likely to result in human-polar bear encounters. However, these encounters are likely to result in minor behavioral changes to individual animals and significant adverse effects are not anticipated. While we acknowledge that it is possible an interaction could result in the lethal take of a polar bear, this outcome would be extremely rare.

Oil Spills

Spills of oil and other hazardous substances are likely to result from activities that could be authorized by the proposed action. However, spills are expected to predominantly be of low volume which will be contained or weather quickly, and material handling, spill prevention, and response measures required by the BLM through Lease Stipulations and ROPs include several measures to minimize impacts to polar bears in the event of a spill. Further, prohibitions against oil and gas production and processing in offshore waters, on barrier islands, and within one mile of the coast indicates that most spills would occur in terrestrial areas where the density of bears is low, and containment and response efforts are likely to be effective. Additionally, a polar bear-specific response plan has been developed to guide response efforts in the unexpected event that a spill with potential to affect polar bears occurs. Finally, procedures governing chemical storage and disposal procedures would effectively minimize risk of polar bears being exposed to other contaminants in NPR-A. Therefore, we conclude the effects of exposure to spilled oil and other petroleum products would be limited, at most, to individual-level impacts to a small number of polar bears.

Summary

We acknowledge that activities which could be authorized by the proposed action could affect an increasingly higher proportion of the SBS stock of polar bears in the future (e.g., due to polar bears' increased use of terrestrial areas as sea ice decreases, a decline in the SBS stock population, or other factors). We also acknowledge that polar bears in the Action Area could become increasingly sensitive to disturbance or other impacts due to food stress or other factors indirectly associated with climate change. Regardless, we anticipate future activities authorized under the proposed action could impact low numbers of individual polar bears of the SBS over the 70-year timeframe of activities which may result from the proposed action. This level of potential impact would not appreciably affect the survival and recovery of the polar bear species as a whole, which currently numbers approximately 19,000 individuals. When considering effects from the Proposed Action in combination with cumulative effects, we arrive at a similar conclusion, because any future activities in the action area (which is largely Federally-managed land and almost entirely comprised of jurisdictional wetlands) with the potential for significant effects are likely to have a federal nexus and therefore would require separate, or step-down, section 7 consultation. Other smaller scale activities, which may not have a federal nexus, would likely have smaller impacts and therefore would not appreciably contribute to cumulative effects.

Our analysis also finds that several aspects of the proposed project would serve to limit the potential for associated oil and gas development actions and activities to impact polar bears. Key protections inherent in the Project Description include: lease stipulations which prohibit, restrict, or discourage disruptive activities in areas where polar bears are more likely to be present (i.e., coastal waters, coastal areas, lagoons, barrier islands, river and stream corridors); and required operating procedures that prescribe safe and environmentally responsible methods for conducting oil and gas activities.

Based on these factors, and after reviewing the current status of polar bears, the environmental baseline for the Action Area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion the proposed action, is *not likely to jeopardize the continued existence* of polar bears by reducing appreciably the likelihood of survival and recovery in the wild by reducing reproduction, numbers, or distribution of this species.

We further note that additional consultations required under the framework programmatic approach applied to this Proposed Action will help ensure that the Action remains complaint with section 7(a)(2) going forward. The BLM and the Service will conduct step-down consultations on all future activities proposed and authorized under the revised IAP that may affect listed species or designated critical habitat. This is required in all framework programmatic consultations but has been intentionally strengthened and reiterated through the PDCs which are additional procedures to be used to ensure adequacy of the future consultation process.

9.4 Polar Bear Critical Habitat

In evaluating impacts of the proposed action to polar bear critical habitat, we separately considered potential effects to all three units: Sea Ice, Terrestrial Denning, and Barrier Island habitat. For each unit, we evaluated potential adverse effects to the physical and biological features (PBFs) of the habitat. For the Terrestrial Denning and Barrier Island units, we also evaluated the potential for human presence and activities to affect the value of critical habitat through disturbance, which could dissuade use or prevent access. We evaluated impacts based on the Project Description, which provided reasonable projections about the potential nature of future oil and gas exploration and development. A summary, by unit, of the considerations that informed our conclusions follows.

Unit 1, Sea Ice Habitat

Sea Ice Habitat comprises roughly 115,506,000 total acres, of which 432,600 acres (<1 percent) occurs within the boundaries of NPR-A. Of this area, approximately 5,600 acres would be open, but subject to no surface occupancy, and only 1,100 acres would be open to leasing under standard terms and conditions.

Although there is little overlap between the Action Area and Unit 1, we identified that activities resulting from the proposed action could potentially affect this essential physical feature through three mechanisms: 1) damage to the physical characteristics of sea ice caused by vehicular travel across ice, 2) spills of oil or other petroleum products into marine waters that form ice, or directly onto ice, and, 3) impacts to ringed and bearded seals, caused by disturbance or spills of oil or other petroleum products.

Due to restrictions described in ROP C-1 restricting the width of sea ice trails, the measures required to ensure safety of personnel and heavy equipment transported across sea ice which require thick, stable, strong ice capable of supporting considerable additional weight, we anticipate that only negligible impacts would occur to the physical features of sea ice, affecting only a small fraction of the available critical habitat.

Lease Stipulations K-4 and K-5 restrict surface occupancy leases within coastal waters, lagoons, or barrier islands within the administrative boundary of NPR-A. Lease Stipulations K-1, K-2, and K-3 (protective corridors along selected rivers and streams, deep water lakes, and in waterbodies and riparian areas) reduce the risk of spilled oil or other petroleum products reaching marine waters, and hence potentially impacting the sea ice critical habitat unit.

In addition, these constraints on potential oil and gas activities would serve to limit potential disturbance- and spill-related impacts to polar bears as well as to the ringed and bearded seals on which they prey. Given the extremely small portion of the sea ice critical habitat unit within the action area, coupled with the Lease Stipulations, ROPs, and PDCs, and low probability of a large oil spill event, the proposed action is not anticipated to appreciably reduce the value of designated Sea Ice Critical Habitat for the survival and recovery of the polar bear.

Unit 2, Terrestrial Denning Habitat
Terrestrial Denning Habitat comprises roughly 3,618,000 acres, of which approximately 856,000 acres (24 %) is within NPR-A (BLM 2020). Under the Proposed Action, 90% of the polar bear terrestrial denning habitat (approximately 769,000 acres) within the NPR-A under the BLM's surface authority would be closed to leasing. Approximately 21,000 acres of polar bear terrestrial denning habitat would be open to leasing, but subject to no surface occupancy. Hence, only 66,000 acres (1.8% of the total critical habitat unit area) would be open to leasing, but subject to the standard Lease Stipulations and ROPs.

When designating polar bear critical habitat, we "determined that terrestrial denning habitat includes the following features essential to the conservation the species: coastal bluffs and river banks with (a) steep, stable slopes (range 15.5 – 50.0 degrees), with heights ranging from 1.3 to 34 meters (4.3 to 111.6 feet), and with water or relatively level ground below the slope and relatively flat ground above the slope; (b) unobstructed, undisturbed access between den sites and the coast; (c) sea ice in proximity of terrestrial denning habitat prior to the onset of denning during fall to provide access to terrestrial den sites; and, (d) the absence of disturbance from humans and human activities that may attract other bears (75 FR 76086 – 76137)."

We identified no mechanisms by which the activities which may result from the proposed action would affect the availability of sea ice proximal to terrestrial denning habitat. Activities resulting from the proposed action could affect the other essential features of terrestrial denning critical habitat through the construction and operation of infrastructure such as barge landings, CPFs, gravel roads and pads etc. as well as temporary disturbance within the habitat unit from ice road construction and operation and winter seismic surveys. However, several aspects of the proposed action would serve to minimize the likelihood that infrastructure would be built where it would affect suitable denning habitat. Two lease stipulations would effectively steer the siting of infrastructure away from suitable denning habitat in the Action Area. Lease Stipulation K-5 prohibits siting facilities within 1 mile of the coast, except those that necessarily must be at the coast (e.g., barge landings, seawater treatment plants, or oil spill response staging and storage areas). This stipulation would provide substantial protection for terrestrial denning habitat, as 69% of terrestrial den sites were on coastal banks (Durner et al. 2003) and 95% of all known den sites between the Kavik River and Utqiaġvik prior to 2009, occurred within 2.8 miles of the coast (Durner et al. 2009). Additional protection for denning habitat is provided by Lease Stipulations K-1 and K-3, which limit development within buffers along major rivers, and K-2, which prohibits infrastructure within 0.25 mi around deep-water lakes (>13 feet deep) in the Action Area.

Therefore, while the eventual location of oil and gas facilities and activities is unknown at this time, it is unlikely all, or even the majority of facilities would be constructed in, or proximal to, terrestrial denning habitat and significant loss of terrestrial denning habitat is not likely to result from the proposed action.

Given the relatively small portion of terrestrial denning habitat that may be affected by infrastructure, and considering the significant restrictions placed on coastal areas through ROPs and Lease Stipulations, significant disruption of access between den sites and the coast and/or sea ice is not likely. Finally, the Terrestrial Denning Habitat Unit also includes the absence of disturbance from humans and human activities that may attract other bears as a feature.

In addition to permanent infrastructure and associated human disturbance, the RFD also projects seismic surveys, exploratory drilling, and up to 50 miles of annual ice road operations and associated levels of disturbance. Regardless, 1) those facilities and activities will likely occupy only a very small proportion of terrestrial denning critical habitat in NPR-A, 2) most of those activities, and their associated impacts, would be temporary (i.e., limited to winter seasons) and would not result in measurable impacts to the physical features of terrestrial denning habitat, and 3) those activities would be governed by ROPs and Lease Stipulations which further reduces impacts to terrestrial denning habitat through disturbance.

In sum, we expect that limitations inherent to the proposed action, with its implementing ROPs, Lease Stipulations, and PDCs will serve to preclude oil and gas activities from appreciably diminishing the value of the Terrestrial Denning Critical Habitat Unit for the survival and recovery of the polar bear.

Unit 3 - Barrier Islands

The Barrier Island Critical Habitat Unit comprises roughly 240,000 acres along the Alaska coast, approximately 15,000 acres (7 %) of which occur within NPR-A (BLM 2020). However, the majority of Barrier Island critical habitat in NPR-A would be closed to leasing (approximately 12,000 acres), with a further 2,100 acres open to leasing but subject to no surface occupancy. Hence, only an extremely small portion of Barrier Island critical habitat could be affected by oil and gas infrastructure (900 acres out of 240,000 or 0.375%).

We considered potential impacts of the proposed IAP to barrier island habitat to include construction of facilities on barrier islands, human activities on, near, or over barrier islands that could disturb or impact use by polar bears, and the risk of spills of oil or other petroleum products reaching barrier islands.

In addition to the very limited area of Barrier Island Critical Habitat that may be impacted by activities authorized by the proposed action, Lease Stipulation K-5 serves to limit the development of many facilities on or under the coastal waters within the administrative boundary of the NPR-A, or within 1 mile inland of the shoreline. This Lease Stipulation therefore provides additional protections for barrier islands that would restrict some specific forms of infrastructure and their associated disturbance.

Despite the prohibitions against permanent facilities of Lease Stipulation K-5, some activities could take place on or near Barrier Island Critical Habitat, for example on-ice activities in winter and in open water in summer could disturb polar bears using these areas. However, we would expect activities in proximity barrier islands would be transitory, of short duration, and impact a comparatively small geographic area (i.e., winter equipment transport or seismic surveys). Furthermore, ROP F-1 requires aircraft to maintain a minimum altitude of 3,000 feet above ground level along the coast (and hence over barrier islands) when within 1 mile of listed marine mammal species. Because the Service's MMM recommends a flight altitude of ≥1,500 ft, this ROP imparts more protection to polar bears occupying barrier island critical habitat and hence, aircraft disturbance should be minimal in these areas.

Regarding the risk of spilled oil or other petroleum products reaching barrier islands, as described in more detail above for Unit 1 – Sea Ice Critical Habitat, Lease Stipulations K-4 and K-5 reduce the risk of oil and other petroleum product spills in marine waters. ROPs A-3, A-4, and A-5 would reduce the risk of oil spilled in terrestrial areas being transported to the marine environment by streams or rivers. Additionally, PDCs 1–3 serve to reduce potential impacts to barrier island habitat and enhance the conservation benefits accrued during future step-down section 7 consultations on activities proposed and/or authorized under the proposed action. Given these protections, coupled with the relatively low probability of a large spill occurring, significant impacts to Barrier Island Critical Habitat from activities which may be authorized under the IAP are not reasonably foreseeable.

In summary, we conclude that potential impacts to barrier island habitat, caused by construction of facilities on barrier islands, disturbance on or within 1 km of barrier islands, and the risk of spilled oil or other petroleum products reaching barrier islands are low, given the limited amount of Barrier Island Habitat within NPR-A, the even smaller amount available for leasing and surface occupancy, and the protections afforded by the Lease Stipulations and ROPs the proposed action is not anticipated to appreciably reduce the value of the Barrier Island Critical Habitat Unit for the survival and recovery of the polar bear.

Summary Conclusion
While some adverse effects may occur to limited areas of all three designated critical habitat units, for the reasons explained in detail above, we conclude the proposed action is not likely to result in the destruction or adverse modification of any unit of designated polar bear critical habitat.

10. CONSERVATION RECOMMENDATIONS

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

1. Continue to monitor threatened eiders, polar bears, and BLM special status species in the

NPR-A. Results will allow the Service and BLM to better evaluate abundance, distribution, and population trends of listed eiders, polar bears, and other special status species. These efforts will enhance the likelihood that future oil and gas development within the NPR-A will not jeopardize listed species, impact the conservation value of critical habitat, or increase the need to list additional species.

2. Work with the Service and other Federal and State agencies in implementing recovery actions identified in the Steller's and spectacled eider recovery plans and the Polar Bear Conservation Management Plan. Research to determine habitat requirements, sensitivity to disturbance and other program-related impacts, and response to current population threats is an important step toward minimizing conflicts with current and future North Slope oil and gas activities.

11. REINITIATION NOTICE

As provided in 50 CFR §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. New information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered;
2. The action is modified in a manner causing effects to listed or critical habitat designated that may be affected by the action; or
3. A new species is listed or critical habitat designated that may be affected by the action.

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APPENDIX A

Required Operating Procedures

Waste Prevention, Handling, Disposal, Spills, Air Quality, and Public Health and Safety

ROP A-1

Objective: Protect the health and safety of oil and gas field workers and the general public by disposing of solid waste and garbage in accordance with applicable federal, State, and local law and regulations.

Requirement/Standard: Areas of operation shall be left clean of all debris.

ROP A-2

Objective: Minimize impacts on the environment from non-hazardous and hazardous waste generation. Encourage continuous environmental improvement. Protect the health and safety of oil field workers and the general public. Avoid human-caused changes in predator populations.

Requirement/Standard: Lessees/permittees shall prepare and implement a comprehensive waste management plan for all phases of exploration and development, including seismic activities. The plan shall be submitted to the authorized officer for approval, in consultation with federal, State, and North Slope Borough regulatory and resource agencies, as appropriate (based on agency legal authority and jurisdictional responsibility), as part of a plan of operations or other similar permit application.

Management decisions affecting waste generation shall be addressed in the following order of priority: 1) prevention and reduction, 2) recycling, 3) treatment, and 4) disposal. The plan shall consider and take into account the following requirements:

a. Methods to avoid attracting wildlife to food and garbage. The plan shall identify precautions that are to be taken to avoid attracting wildlife to food and garbage.

b. Disposal of putrescible waste. Requirements prohibit the burial of garbage. Lessees and permitted users shall have a written procedure to ensure that the handling and disposal of putrescible waste will be accomplished in a manner that prevents the attraction of wildlife. All putrescible waste shall be incinerated, backhauled, or composted in a manner approved by the authorized officer. All solid waste, including incinerator ash, shall be disposed of in an approved waste-disposal facility in accordance with EPA and Alaska Department of Environmental Conservation regulations and procedures. The burial of human waste is prohibited except as authorized by the authorized officer.

c. Disposal of pumpable waste products. Except as specifically provided, the BLM requires that all pumpable solid, liquid, and sludge waste be disposed of by injection in accordance with EPA, Alaska Department of Environmental Conservation, and the Alaska Oil and Gas Conservation Commission regulations and procedures. On-pad temporary muds and cuttings storage, as approved by Alaska Department of Environmental Conservation, will be allowed as necessary to facilitate annular injection and/or backhaul operations.

d. Disposal of wastewater and domestic wastewater. The BLM prohibits wastewater discharges or disposal of domestic wastewater into bodies of fresh, estuarine, and marine water, including wetlands, unless authorized by a National Pollutant Discharge Elimination System or State permit.

ROP A-3

<u>Objective:</u> Minimize pollution through effective hazardous-materials contingency planning.

<u>Requirement/Standard:</u> For oil- and gas-related activities, a hazardous materials emergency contingency plan shall be prepared and implemented before transportation, storage, or use of fuel or hazardous substances. The plan shall include a set of procedures to ensure prompt response, notification, and cleanup in the event of a hazardous substance spill or threat of a release. Procedures in the plan applicable to fuel and hazardous substances handling (associated with transportation vehicles) shall consist of ROPs if approved by the authorized officer. The plan shall include a list of resources available for response (e.g., heavy-equipment operators, spill-cleanup materials or companies), and names and phone numbers of federal, State, and North Slope Borough contacts. Other federal and State regulations may apply and require additional planning requirements. All appropriate staff shall be instructed regarding these procedures. In addition contingency plans related to facilities developed for oil production shall include requirements to:

a. provide refresher spill-response training to North Slope Borough and local community spill-response teams on a yearly basis,
b. plan and conduct a major spill-response field-deployment drill annually,

c. prior to production and as required by law, develop spill prevention and response contingency plans and participate in development and maintenance of the North Slope Subarea Contingency Plan for Oil and Hazardous Substances Discharges/Releases for the National Petroleum Reserve-Alaska operating area. Planning shall include development and funding of detailed (e.g., 1:26,000 scale) environmental sensitivity index maps for the lessee's/permittee's operating area and areas outside the lessee's/permittee's operating area that could be affected by their activities. (The specific area to be mapped shall be defined in the lease agreement and approved by the authorized officer in consultation with appropriate resource agencies.) Maps shall be completed in paper copy and geographic information system format in conformance with the latest version of the U.S. Department of Commerce, National Oceanic and Atmospheric Administration's Environmental Sensitivity Index Guidelines. Draft and final products shall be peer reviewed and approved by the authorized officer in consultation with appropriate federal, State, and North Slope Borough resource and regulatory agencies.

ROP A-4

Objective: Minimize the impact of contaminants on fish, wildlife, and the environment, including wetlands, marshes and marine waters, as a result of fuel, crude oil, and other liquid chemical spills. Protect subsistence resources and subsistence activities. Protect public health and safety.

Requirement/Standard: Before initiating any oil and gas or related activity or operation, including field research/surveys and/or seismic operations, lessees/permittees shall develop a comprehensive spill prevention and response contingency plan per 40 CFR § 112 (Oil Pollution Act). The plan shall consider and take into account the following requirements:

a. On-site Clean-up Materials. Sufficient oil-spill-cleanup materials (absorbents, containment devices, etc.) shall be stored at all fueling points and vehicle-maintenance areas and shall be carried by field crews on all overland moves, seismic work trains, and similar overland moves by heavy equipment.
b. Storage Containers. Fuel and other petroleum products and other liquid chemicals shall be stored in proper containers at approved locations. Except during overland moves and seismic operations, fuel, other petroleum products, and other liquid chemicals designated by the authorized officer that in total exceed 1,320 gallons shall be stored within an impermeable lined and diked area or within approved alternate storage containers, such as over packs, capable of containing 110% of the stored volume. In areas within 500 feet of water bodies, fuel containers are to be stored within appropriate containment.
c. Liner Materials. Liner material shall be compatible with the stored product and capable of remaining impermeable during typical weather extremes expected throughout the storage period.
d. Permanent Fueling Stations. Permanent fueling stations shall be lined or have impermeable protection to prevent fuel migration to the environment from overfills and spills.
e. Proper Identification of Containers. All fuel containers, including barrels and propane tanks, shall be marked with the responsible party's name, product type, and year filled or purchased.
f. Notice of Reportable Spills. Notice of any reportable spill (as required by 40 CFR § 300.125 and 18 AAC § 75.300) shall be given to the authorized officer as soon as possible, but no later than 24 hours after occurrence.
g. Identification of Oil Pans *("duck ponds")*. All oil pans shall be marked with the responsible party's name.

ROP A-5

Objective: Minimize the impact of contaminants from refueling operations on fish, wildlife and the environment.
Requirement/Standard: Refueling of equipment within 500 feet of the active floodplain of any water body is prohibited. Fuel storage stations shall be located at least 500 feet from any water body with the exception that small caches (up to 210 gallons) for motor boats, float planes, ski planes, and small equipment, e.g. portable generators and water pumps, are permitted. The authorized officer may allow storage and operations at areas closer than the stated distances if properly designed to account for local hydrologic conditions.

ROP A-6
Objective: Minimize the impact on fish, wildlife, and the environment from contaminants associated with the exploratory drilling process.
Requirement/Standard: Surface discharge of reserve-pit fluids is prohibited.

ROP A-7
Objective: Minimize the impacts to the environment of disposal of produced fluids recovered during the development phase on fish, wildlife, and the environment.
Requirement/Standard: Discharge of produced water in upland areas and marine waters is prohibited.

ROP A-8
Objective: Minimize conflicts resulting from interaction between humans and bears during oil and gas activities.
Requirement/Standard: Oil and gas lessees and their contractors and subcontractors will, as a part of preparation of lease operation planning, prepare and implement bear-interaction plans to minimize conflicts between bears and humans. These plans shall include measures to:

a. Minimize attraction of bears to the drill sites.
b. Organize layout of buildings and work sites to minimize human/bear interactions.
c. Warn personnel of bears near or on work sites and identify proper procedures to be followed.
d. Establish procedures, if authorized, to discourage bears from approaching the work site.
e. Provide contingencies in the event bears do not leave the site or cannot be discouraged by authorized personnel.
f. Discuss proper storage and disposal of materials that may be toxic to bears.
g. Provide a systematic record of bears on the work site and in the immediate area.

ROP A-9

Objective: Reduce air quality impacts.

Requirement/Standard: All oil and gas operations (vehicles and equipment) that burn diesel fuels must use "ultra-low sulfur" diesel as defined by the Alaska Department of Environmental Conservation-Division of Air Quality.

ROP A-10

Objective: Prevent unnecessary or undue degradation of the lands and protect health.

Requirement/Standard: This measure includes the following elements:

a. Prior to initiation of a NEPA analysis for an application to develop a central production facility, production pad/well, airstrip, road, gas compressor station, or other potential substantial air pollutant emission source (hereafter project), the authorizing officer (BLM) may require the project proponent to provide a minimum of one year of baseline ambient air monitoring data for any pollutant(s) of concern as determined by BLM if no representative air monitoring data are available for the project area, or existing representative ambient air monitoring data are insufficient, incomplete, or do not meet minimum air monitoring standards set by the Alaska DEC or the EPA. If BLM determines that baseline monitoring is required, this pre-analysis data must meet Alaska DEC and EPA air monitoring standards, and cover the year immediately prior to the submittal. Pre-project monitoring may not be appropriate where the life of the project is less than one year.
b. The BLM may require monitoring for the life of the project depending on the magnitude of potential air emissions from the project, proximity to a federally mandated Class I area, sensitive Class II area (as identified on a case-by-case basis by Alaska DEC or a federal land management agency), or population center, location within or proximity to a non-attainment or maintenance area, meteorological or geographic conditions, existing air quality conditions, magnitude of existing development in the area, or issues identified during NEPA undertaken for the project.
c. For an application to develop a central production facility, production pad/well, airstrip, road, gas compressor station, or other potential substantial air pollutant emission source, the project proponent shall prepare (and submit for BLM approval) an emissions inventory that includes quantified emissions of regulated air pollutants from all direct and indirect sources related to the proposed project, including reasonably foreseeable air pollutant emissions of criteria air pollutants, volatile organic compounds, hazardous air pollutants, and greenhouse gases estimated for each year for the life of the project. The BLM will use this estimated emissions inventory to identify pollutants of concern and to determine the appropriate level of air analysis to be conducted for the proposed project.
d. For an application to develop a central production facility, production pad/well, airstrip, road, gas compressor station, or other potential substantial air pollutant emission source, the BLM may require the proponent to provide an emissions reduction plan that includes a detailed description of operator committed measures to reduce project related air pollutant emissions including, but not limited to greenhouse gases and fugitive dust.
e. For an application to develop a central production facility, production pad/well, airstrip, road, gas compressor station, or other potential substantial air pollutant emission source, the authorized officer may require air quality modeling for purposes of analyzing project direct, indirect or cumulative impacts to air quality. The BLM may require air quality

modeling depending on the magnitude of potential air emissions from the project or activity, duration of the proposed action, proximity to a federally mandated Class I area, sensitive Class II area (as identified on a case-by-case basis by Alaska DEC or a federal land management agency), or population center, location within a non-attainment or maintenance area, meteorological or geographic conditions, existing air quality conditions, magnitude of existing development in the area, or issues identified during NEPA undertaken for the project. The BLM will determine the information required for a project specific modeling analysis through the development of a modeling protocol for each analysis. The authorized officer will consult with appropriate federal, State, and/or local agencies regarding modeling to inform his/her modeling decision and avoid duplication of effort. The modeling shall compare predicted impacts to all applicable local, State, and federal air quality standards and increments, as well as other scientifically defensible significance thresholds (such as impacts to air quality related values, incremental cancer risks, etc.).

f. The BLM may require air quality mitigation measures and strategies within its authority (and in consultation with local, state, federal, and tribal agencies with responsibility for managing air resources) in addition to regulatory requirements and proponent committed emission reduction measures, and for emission sources not otherwise regulated by Alaska DEC or EPA, if the air quality analysis shows potential future impacts to NAAQS or AAAQS or impacts above specific levels of concern for air quality related values (AQRVs).
g. If ambient air monitoring indicates that project-related emissions are causing or contributing to impacts that would cause unnecessary or undue degradation of the lands, cause exceedances of NAAQS, or fail to protect health (either directly or through use of subsistence resources), the authorized officer may require changes in activities at any time to reduce these emissions to comply with the NAAQS and/or minimize impacts to AQRVs. Within the scope of BLM's authority, the BLM may require additional emission control strategies to minimize or reduce impacts to air quality.
h. Publicly available reports on air quality baseline monitoring, emissions inventory, and modeling results developed in conformance with this best management procedure shall be provided by the project proponent to the North Slope Borough and to local communities and Tribes in a timely manner.

ROP A-11

Objective: Ensure that permitted activities do not create human health risks through contamination of subsistence foods.

Requirement/Standard: A lessee proposing a permanent oil and gas development shall design and implement a monitoring study of contaminants in locally-used subsistence foods. The monitoring study shall examine subsistence foods for all contaminants that could be associated with the proposed development. The study shall identify the level of contaminants in subsistence foods prior to the proposed permanent oil and gas development and monitor the level of these contaminants throughout the operation and abandonment phases of the development. If ongoing monitoring detects a measurable and persistent increase in a contaminant in subsistence foods, the lessee shall design and implement a study to determine how much, if any, of the increase in the contaminant in subsistence foods originates from the lessee's activities. If the study determines that a portion of the increase in contamination in subsistence foods is caused by the lessee's activities, the authorized officer may require changes in the lessee's processes to reduce or eliminate emissions of the contaminant. The design of the study/studies must meet the approval of the authorized officer. The authorized officer may consult with appropriate federal, State, and North Slope Borough agencies prior to approving the study/studies design. The authorized officer may require/authorize changes in the design of the studies throughout the operations and abandonment period, or terminate or suspend studies if results warrant.

ROP A-12

Objective: To minimize negative health impacts associated with oil spills.

Requirement/Standard: If an oil spill with potential impacts to public health occurs, the BLM, in undertaking its oil spill responsibilities, will consider:

a. Immediate health impacts and responses for affected communities and individuals.
b. Long-term monitoring for contamination of subsistence food sources.
c. Long-term monitoring of potential human health impacts.
d. Perceptions of contamination and subsequent changes in consumption patterns.
e. Health promotion activities and communication strategies to maintain the consumption of traditional food.

Water Use for Permitted Activities

ROP B-1

Objective: Maintain populations of, and adequate habitat for, fish and invertebrates.

Requirement/Standard: Withdrawal of unfrozen water from rivers and streams during winter is prohibited. The removal of ice aggregate from grounded areas ≤4-feet deep may be authorized from rivers on a site-specific basis.

ROP B-2

Objective: Maintain natural hydrologic regimes in soils surrounding lakes and ponds, and maintain populations of, and adequate habitat for, fish, invertebrates, and waterfowl.

Requirement/Standard: Withdrawal of unfrozen water from lakes and the removal of ice aggregate from grounded areas ≤4-feet deep may be authorized on a site-specific basis depending on water volume and depth and the waterbody's fish community. Current water use requirements are:

a. Lakes with sensitive fish (i.e., any fish except ninespine stickleback or Alaska blackfish): unfrozen water available for withdrawal is limited to 15% of calculated volume deeper than 7 feet; only ice aggregate may be removed from lakes that are ≤7-feet deep.
b. Lakes with only non-sensitive fish (i.e., ninespine stickleback or Alaska blackfish): unfrozen water available for withdrawal is limited to 30% of calculated volume deeper than 5 feet; only ice aggregate may be removed from lakes that are ≤5.
c. Lakes with no fish present, regardless of depth: water available for use is limited to 35% of total lake volume.
d. In lakes where unfrozen water and ice aggregate are both removed, the total use shall not exceed the respective 15%, 30%, or 35% volume calculations.
e. Additional modeling or monitoring may be required to assess water level and water

quality conditions before, during, and after water use from any fish-bearing lake or lake of special concern.

f. Any water intake structures in fish bearing or non-fish bearing waters shall be designed, operated, and maintained to prevent fish entrapment, entrainment, or injury. Note: All water withdrawal equipment must be equipped and must utilize fish screening devices approved by the Alaska Department of Fish and Game, Division of Habitat.
g. Compaction of snow cover or snow removal from fish-bearing waterbodies shall be prohibited except at approved ice road crossings, water pumping stations on lakes, or areas of grounded ice.

Winter Overland Moves and Seismic Work

The following ROPs apply to overland moves, seismic work, and any similar cross-country vehicle use of heavy equipment on non-roaded surfaces during the winter season. These restrictions do not apply to the use of such equipment on ice roads after they are constructed.

ROP C-1
Objective: Protect grizzly bear, polar bear, and marine mammal denning and/or birthing locations.
Requirement/Standard:

a. Grizzly bear dens—Cross-country use of all vehicles, equipment, and oil and gas activity is prohibited within 0.5 miles of occupied grizzly bear dens identified by the ADF&G or the U.S. Fish and Wildlife Service (USFWS), unless alternative protective measures are approved by the BLM AO, in consultation with the ADF&G.
b. Polar bear dens—Cross-country use of vehicles, equipment, oil and gas activity, and seismic survey activity is prohibited within 1 mile of known or observed polar bear dens, unless alternative protective measures are approved by the BLM AO and are consistent with the Marine Mammal Protection Act and the Endangered Species Act (ESA).
c. In order to limit disturbance around known polar bear dens, implement the following:
    i. Attempt to locate polar bear dens—Permittees seeking to carry out onshore activities in known or suspected polar bear denning habitat during the denning season (approximately November to April) must make efforts to locate occupied polar bear dens within and near areas of operation, utilizing den detection techniques approved in consultation with the USFWS. All observed or suspected polar bear dens must be reported to the USFWS prior to the initiation of activities.
    ii. Observe the exclusion zone around known polar bear dens—Permittees must observe a 1-mile operational exclusion zone around all known polar bear dens during the denning season (approximately November–April, or until the female and cubs leave the areas). Should previously unknown occupied dens be discovered within 1 mile of activities, work must cease and the USFWS must be contacted for guidance. The USFWS will evaluate these instances to recommend the appropriate action. Potential actions may

range from cessation or modification of work to conducting additional monitoring, and the holder of the authorization must comply with any additional measures specified.

iii. Use the den habitat map developed by the U.S. Geological Survey—This measure ensures that the location of potential polar bear dens is considered when conducting activities in the coastal areas of the Beaufort Sea.

iv. Polar bear den restrictions—Restrict the timing of the activity to limit disturbance around dens.

d. In order to limit disturbance of activities to seal lairs in the nearshore area (< 9.8-foot water depth):

i. Specific to seismic operations:

a) Prior to the initiation of winter seismic surveys on marine ice, the permittee will conduct a sound source verification test approved by the BLM and National Marine Fisheries Service (NMFS). The test is to measure the attenuation distance to the 120 decibels re 1 micro Pascal of project-associated sound levels through grounded ice to areas potentially occupied by ice seals (ungrounded ice and open water). The permittee will share the results with the BLM and the NMFS. The attenuation distance will be used to buffer all marine on-ice seismic survey activity operations to areas potentially occupied by ice seals.

ii. For all activities:

a) Maintain airborne sound levels of equipment below 100 decibels re 20 micro Pascals at 66 feet. If equipment will be used that differs from what was originally proposed, the permittee must inform the BLM AO and share sound levels and air and water attenuation information for the new equipment.

b) On-ice operations after May 1 will employ a full-time, trained, protected species observer on vehicles to ensure that all basking seals are avoided by vehicles by at least 500 feet and will ensure that all equipment with airborne noise levels above 100 decibels re 20 micro Pascals are operating at distances from observed seals that allow for the attenuation of noise to levels below 100 decibels. All sightings of seals will be reported to the BLM using a NMFS-approved observation form.

c) Sea ice trails must not be greater than 12 feet wide. No driving will be allowed beyond the shoulder of the ice trail or off planned routes unless necessary to avoid ungrounded ice or for other human or marine mammal safety reasons. On-ice driving routes shall minimize travel over snow/ice/topographical features that could foster the development of birthing lairs.

d) No unnecessary equipment or operations (e.g., camps) will be placed or used on sea ice.

ROP C-2

Objective: Protect stream banks, minimize compaction of soils, and minimize the breakage, abrasion, compaction, or displacement of vegetation.

Requirement/Standard:

a. Ground operations shall be allowed only when frost and snow cover are at sufficient depths to protect the tundra. Ground operations shall cease when the spring snowmelt begins (approximately May 5 in the foothills area where elevations reach or exceed 500 feet and approximately May 15 in the northern coastal areas). The exact dates will be determined by the authorized officer.

b. Low-ground-pressure vehicles shall be used for on-the-ground activities off ice roads or pads. Low-ground-pressure vehicles shall be selected and operated in a manner that eliminates direct impacts to the tundra by shearing, scraping, or excessively compacting the tundra mat. Note: This provision does not include the use of heavy equipment such as front-end loaders and similar equipment required during ice road construction.
c. Bulldozing of tundra mat and vegetation, trails, or seismic lines is prohibited; however, on existing trails, seismic lines or camps, clearing of drifted snow is allowed to the extent that the tundra mat is not disturbed.
d. To reduce the possibility of ruts, vehicles shall avoid using the same trails for multiple trips unless necessitated by serious safety or superseding environmental concern. This provision does not apply to hardened snow trails for use by low-ground-pressure vehicles such as Rolligons.
e. The location of ice roads shall be designed and located to minimize compaction of soils and the breakage, abrasion, compaction, or displacement of vegetation. Offsets may be required to avoid using the same route or track in the subsequent year.
f. Motorized ground-vehicle use within the Colville River Special Area associated with overland moves, seismic work, and any similar use of heavy equipment shall be minimized within an area that extends 1 mile west or northwest of the bluffs of the Colville River, and 2 miles on either side of the Kogosukruk and Kikiakrorak rivers and tributaries of the Kogosukruk River from April 15 through August 5, with the exception that use will be minimized in the vicinity of gyrfalcon nests beginning March 15. Such use will remain 1/2 mile away from known raptor nesting sites, unless authorized by the authorized officer.

ROP C-3
Objective: Maintain natural spring runoff patterns and fish passage, avoid flooding, prevent streambed sedimentation and scour, protect water quality, and protect stream banks.
Requirement/Standard: Crossing of waterway courses shall be made using a low-angle approach. Crossings that are reinforced with additional snow or ice ("bridges") shall be removed, breached, or slotted before spring breakup. Ramps and bridges shall be substantially free of soil and debris.

ROP C-4
Objective: Avoid additional freeze-down of deep-water pools harboring over-wintering fish and invertebrates used by fish.
Requirement/Standard: Travel up and down streambeds is prohibited unless it can be demonstrated that there will be no additional impacts from such travel to over-wintering fish or the invertebrates they rely on. Rivers, streams, and lakes shall be crossed at areas of grounded ice whenever possible.

ROP C-5
Objective: Minimize the effects of high-intensity acoustic energy from seismic surveys on fish.
Requirement/Standard:

a. When conducting vibroseis-based surveys above potential fish overwintering areas (water 6 feet deep or greater, ice plus liquid depth), operators shall follow recommendations by Morris and Winters (2005): only a single set of vibroseis shots should be conducted if possible; if multiple shot locations are required, these should be conducted with minimal delay; multiple days of vibroseis activity above the same overwintering area should be avoided if possible.
b. When conducting air gun-based surveys in freshwater, operators shall follow standard marine mitigation measures that are applicable to fish (e.g., Minerals Management Service 2006): operators will use the lowest sound levels feasible to accomplish their data-collection needs; ramp-up techniques will be utilized (ramp-up involves the gradual increase in emitted sound levels beginning with firing a single air gun and gradually adding air guns until the desired operating level of the full array is obtained).
c. When conducting explosive-based surveys, operators shall follow setback distances from fish-bearing waterbodies based on requirements outlined by Alaska Department of Fish and Game (1991).

Oil and Gas Exploratory Drilling

ROP D-1
Objective: Minimize surface impacts from exploratory drilling.
Requirement/Standard: Construction of permanent or gravel oil and gas facilities shall be prohibited for exploratory drilling. Use of a previously constructed road or pad may be permitted if it is environmentally preferred.

Facility Design and Construction
ROP E-1
Objective: Protect subsistence use and access to subsistence hunting and fishing areas and minimize the impact of oil and gas activities on air, land, water, fish, and wildlife resources.
Requirement/Standard: All roads must be designed, constructed, maintained, and operated to create minimal environmental impacts and to protect subsistence use and access to subsistence hunting and fishing areas. The authorized officer will consult with appropriate federal, State, and North Slope Borough regulatory and resources agencies prior to approving construction of roads. Subject to approval by the authorized officer, the construction, operation, and maintenance of oil and gas field roads is the responsibility of the lessee unless the construction, operation, and maintenance of roads are assumed by the appropriate governing entity.
ROP E-2
Objective: Protect fish-bearing water bodies, water quality, and aquatic habitats.
Requirement/Standard: Permanent oil and gas facilities, including roads, airstrips, and pipelines, are prohibited upon or within 500 feet as measured from the ordinary high water mark of fish-bearing waterbodies. Essential pipeline and road crossings will be permitted on a case-by-case basis. Note: Also refer to Stipulations K-1 and K-2.
Construction camps are prohibited on frozen lakes and river ice. Siting of construction camps on river sand and gravel bars is allowed and encouraged. Where leveling of trailers or modules is required and the surface has a vegetative mat, leveling shall be accomplished through blocking rather than use of a bulldozer.

ROP E-3

Objective: Maintain free passage of marine and anadromous fish and protect subsistence use and access to subsistence hunting and fishing.

Requirement/Standard: Linear infrastructure that connects to the shoreline (e.g., causeways and docks) is prohibited in river mouths or deltas. Artificial gravel islands and permanent bottom-founded structures are prohibited in river mouths or active stream channels on river deltas. In areas where it is permissible, linear infrastructure that connects to the shoreline shall be designed to ensure free passage of marine and anadromous fish and to prevent significant changes to nearshore oceanographic circulation patterns and water quality characteristics. The BLM will require submittal of a minimum of 2 years of site-relevant data on fish, circulation patterns, and water quality before approving a permit for construction. If such data do not exist, the permittee may be required to gather these data. A post-construction monitoring program, developed in consultation with appropriate federal, State, and NSB regulatory and resource agencies, shall be required to track circulation patterns, water quality, and fish movements around the structure.

ROP E-4

Objective: Minimize the potential for pipeline leaks, the resulting environmental damage, and industrial accidents.

Requirement/Standard: All pipelines shall be designed, constructed, and operated under an authorized officer-approved Quality Assurance/Quality Control plan that is specific to the product transported and shall be constructed to accommodate the best available technology for detecting and preventing corrosion or mechanical defects during routine structural integrity inspections.

ROP E-5

Objective: Minimize impacts of the development footprint.

Requirement/Standard: Facilities shall be designed and located to minimize the development footprint. Issues and methods that are to be considered include:

a. Use of maximum extended-reach drilling for production drilling to minimize the number of pads and the network of roads between pads;
b. Sharing facilities with existing development;
c. Collocation of all oil and gas facilities, except airstrips, docks, and seawater-treatment plants, with drill pads;
d. Integration of airstrips with roads;
e. Use of gravel-reduction technologies, e.g., insulated or pile-supported pads,
f. Coordination of facilities with infrastructure in support of offshore development.

Note: *Where aircraft traffic is a concern, consideration shall be given to balancing gravel pad size and available supply storage capacity with potential reductions in the use of aircraft to support oil and gas operations.*

ROP E-6

Objective: Reduce the potential for ice-jam flooding, impacts to wetlands and floodplains, erosion, alteration of natural drainage patterns, and restriction of fish passage.

Requirement/Standard: Stream and marsh crossings shall be designed and constructed to ensure free passage of fish, reduce erosion, maintain natural drainage, and minimize adverse effects to natural stream flow. Note: Bridges, rather than culverts, are the preferred method for crossing rivers. When necessary, culverts can be constructed on smaller streams, if they are large enough to avoid restricting fish passage or adversely affecting natural stream flow.

ROP E-7

Objective: Minimize disruption of caribou movement and subsistence use.

Requirement/Standard: Pipelines and roads shall be designed to allow the free movement of caribou and the safe, unimpeded passage of the public while participating in subsistence activities. Listed below are the accepted design practices:

a. Above ground pipelines shall be elevated a minimum of 7 feet as measured from the ground to the bottom of the pipeline at vertical support members.
b. In areas where facilities or terrain may funnel caribou movement, ramps over pipelines, buried pipelines, or pipelines buried under roads may be required by the authorized officer after consultation with federal, State, and North Slope Borough regulatory and resource agencies (as appropriate, based on agency legal authority and jurisdictional responsibility).
c. A minimum distance of 500 feet between pipelines and roads shall be maintained. Separating roads from pipelines may not be feasible within narrow land corridors between lakes and where pipelines and roads converge on a drill pad. Where it is not feasible to separate pipelines and roads, alternative pipeline routes, designs and possible burial within the road will be considered by the authorized officer.

ROP E-8

Objective: Minimize the impact of mineral materials mining activities on air, land, water, fish,

and wildlife resources.
Requirement/Standard: Gravel mine site design and reclamation will be in accordance with a plan approved by the authorized officer. The plan shall be developed in consultation with appropriate federal, State, and North Slope Borough regulatory and resource agencies and consider:

a. Locations outside the active flood plain.
b. Design and construction of gravel mine sites within active flood plains to serve as water reservoirs for future use.
c. Potential use of the site for enhancing fish and wildlife habitat.
d. Potential storage and reuse of sod/overburden for the mine site or at other disturbed sites on the North Slope.

ROP E-9
Objective: Avoidance of human-caused increases in populations of predators of ground nesting birds.

Requirement/Standard:

a. Lessee shall utilize best available technology to prevent facilities from providing nesting, denning, or shelter sites for ravens, raptors, and foxes. The lessee shall provide the authorized officer with an annual report on the use of oil and gas facilities by ravens, raptors, and foxes as nesting, denning, and shelter sites.

b. Feeding of wildlife is prohibited and will be subject to non-compliance regulations.

ROP E-10
Objective: Minimize bird collisions with infrastructure, especially during migration and inclement weather.
Requirement/Standard: Flagging of structures, such as elevated utility lines and guy wires, shall be required to minimize bird collision. All facility external lighting, during all months of the year, shall be designed to direct artificial exterior lighting inward and downward or be fitted with shields to reduce reflectivity in clouds and fog conditions, unless otherwise required by the Federal Aviation Administration.

ROP E-11
Objective: Minimize impacts on bird species, particularly those listed under the ESA and BLM special status species, resulting from direct or indirect interaction with infrastructure.
Requirement/Standard: Bird species with special status are protected under **ROP E-10** and **ROP E-21**, and by the protections outlined below. In accordance with the guidance below, before the approval of infrastructure construction, the following studies shall be conducted, and recommended design elements shall be incorporated.
Special Conditions in Spectacled and/or Steller's Eiders Habitats:

a. The BLM will require submittal of a minimum of 3 years of site-relevant survey data before authorization of construction, if such construction is within spectacled and Steller's eider habitats, as defined by the area contained within the USFWS Arctic Coastal Plain Aerial Waterbird Breeding Population Survey area or the Barrow Triangle Steller's Eider Survey area. The BLM will evaluate adequacy of survey data and ecological mapping (as required under **ROP E-12**) to determine if ground-based nest surveys are required. If required, spectacled and/or Steller's eider ground nest surveys shall be conducted, following accepted BLM protocol. Information gained from these surveys shall be used to make infrastructure siting decisions, as discussed in subparagraph "b," below. Data shall be transmitted to theBLM in a GIS format (ESRI shapefiles referencing the North American Datum of 1983).

b. If spectacled and/or Steller's eiders are determined to be present within the proposed development area, the applicant shall work with the USFWS and BLM early in the design process to site roads and facilities in order to minimize impacts to nesting and brood-rearing eiders and their habitats. Such consultation shall address timing restrictions and other temporary mitigating measures, location of permanent facilities, placement of fill, alteration of eider habitat, aircraft operations, and management of high noise levels.

Special Conditions in Yellow-billed Loon Habitats:
The permittee shall determine and submit to the BLM information on the presence of yellow-billed loon habitat within a project area, using the most current data and analysisresults from research conducted within the NPR-A.

a. If yellow-billed loon habitat is determined to be present within the project area, the BLM will require submittal of a minimum of 3 years of site-relevant survey data of lakes greater than 25 acres within 1 mile of the proposed infrastructure. If required, surveys along shorelines of lakes shall be conducted, following accepted BLM protocol, during nesting in late June and during brood rearing in late August.

b. The design and location of infrastructure must be such that disturbance is minimized. The default standard mitigation shall be a minimum 0.5-mile buffer around all recorded nest sites and shall be up to 1 mile, where feasible. Lakes withyellow-billed loon occupancy shall also include a minimum 1,625-foot buffer aroundthe shoreline. Development would generally be prohibited within buffers. The BLM would consider waivers or modifications to this requirement if no other feasible option exists.

ROP E-12
Objective: Use ecological mapping as a tool to assess wildlife habitat before development of permanent facilities to conserve important habitat types during development.
Requirement/Standard: An ecological land classification map of the development area shall be developed before approval of facility construction. The map will integrate geomorphology, surface form, and vegetation at a scale, level of resolution, and level of positional accuracy adequate for detailed analysis of development alternatives. The map shall be prepared in time to plan one season of ground-based wildlife surveys, if deemed necessary by the authorized officer, before approval of the exact facility location and facility construction.

ROP E-13
Objective: Protect cultural and paleontological resources.
Requirement/Standard: Lessees shall conduct a cultural and paleontological resources survey prior to any ground-disturbing activity. Upon finding any potential cultural or paleontological resource, the lessee or their designated representative shall notify the authorized officer and suspend all operations in the immediate area of such discovery until written authorization to proceed is issued by the authorized officer.

ROP E-14

Objective: Ensure the passage of fish at stream crossings.
Requirement/Standard: To ensure that crossings provide for fish passage, all proposed crossing designs shall adhere to the ROPs outlined in "Stream Crossing Design Procedure for Fish Streams on the North Slope Coastal Plain" by McDonald et al. (1994), "Fundamentals of Culvert Design for Passage of Weak-Swimming Fish" by Behlke et al. (1991), and other generally accepted best management procedures prescribed by the authorized officer. To adhere to these ROPs, at least 3 years of hydrologic and fish data shall be collected by the lessee for any proposed crossing of a stream whose structure is designed to occur, wholly or partially, below the stream's ordinary high watermark. These data shall include, but are not limited to, the range of water levels (highest and lowest) at the location of the planned crossing, and the seasonal distribution and composition of fish populations using the stream.

ROP E-15
Objective: Prevent or minimize the loss of nesting habitat for cliff nesting raptors.
Requirement/Standard:

a. Removal of greater than 100 cubic yards of bedrock outcrops, sand, and/or gravel from cliffs shall be prohibited.
b. Any extraction of sand and/or gravel from an active river or stream channel shall be prohibited unless preceded by a hydrological study that indicates no potential impact by the action to the integrity of the river bluffs.

ROP E-17
Objective: Manage permitted activities to meet Visual Resource Management class objectives described below.

Class I: Natural ecological changes and very limited management activity are allowed. The level of change to the characteristic landscape should be very low and must not attract attention.

Class II: The level of change to the characteristic landscape should be low. Management activities may be seen, but should not dominate the view of the casual observer. Any changes should repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.

Class III: The level of change to the characteristic landscape should be moderate. Management activities may attract attention, but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

Class IV: The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize impacts through location and design by repeating form, line, color, and texture.

Requirement/Standard: At the time of application for construction of permanent facilities, the lessee/permittee shall, after consultation with the authorized officer, submit a plan to best minimize visual impacts, consistent with the Visual Resource Management class for the lands on which facilities would be located. A photo simulation of the proposed facilities may be a necessary element of the plan.
VRM classes:

a. Class II – Wainwright Inlet and those areas where new infrastructure is not allowed.

b. Class III – Except for those areas designated as VRM Class II, rivers and lands within 3 miles of segments of rivers identified as eligible for WSR designation in the 2013 IAP, the 2033 Northwest NPR-A IAP, or the 2008 Northeast NPR-A Supplemental IAP; also Kasegaluk Lagoon, Peard Bay, Elson Lagoon, Dease Inlet, and Admiralty Bay and lands within 3 miles of those waterbodies.
c. Class IV – The rest of the area.

ROP E-18

Objective: Avoid and reduce temporary impacts to productivity from disturbance near Steller's and/or spectacled eider nests.

Requirement/Standard: Ground-level activity (by vehicle or on foot) within 200 meters of occupied Steller's and/or spectacled eider nests, from June 1 through August 15, will be restricted to existing thoroughfares, such as pads and roads. Construction of permanent facilities, placement of fill, alteration of habitat, and introduction of high noise levels within 200 meters of occupied Steller's and/or spectacled eider nests will be prohibited. In instances where summer (June 1 through August 15) support/construction activity must occur off existing thoroughfares, USFWS-approved nest surveys must be conducted during mid-June prior to the approval of the activity. Collected data will be used to evaluate whether the action could occur based on employment of a 200-meter buffer around nests or if the activity would be delayed until after mid-August once ducklings are mobile and have left the nest site.

Also, in cases in which oil spill response training is proposed to be conducted within 200 meters of shore in riverine, marine, or inter-tidal areas, the BLM will work with the USFWS to schedule the training at a time that is not a sensitive nesting/brood-rearing period or require that nest surveys be conducted in the training area prior to the rendering a decision on approving the training. The protocol and timing of nest surveys for Steller's and/or spectacled eiders will be determined in cooperation with the USFWS, and must be approved by the USFWS. Surveys should be supervised by biologists who have previous experience with Steller's and/or spectacled eider nest surveys.

ROP E-19

Objective: Provide information to be used in monitoring and assessing wildlife movements during and after construction.

Requirement/Standard: A representation, in the form of ArcGIS-compatible shape-files, of all new infrastructure construction shall be provided to the authorized officer. During the planning and permitting phase, shape-files representing proposed locations shall be provided. Within 6 months of construction completion, shape-files (within GPS accuracy) of all new infrastructure shall be provided. Infrastructure includes all gravel roads and pads, facilities built on pads, pipelines and independently constructed powerlines (as opposed to those incorporated in pipeline design). Gravel pads shall be included as polygon feature. Roads, pipelines, and powerlines may be represented as line features but must include ancillary data to denote width, number pipes, etc. Poles for power lines may be represented as point features. Ancillary data shall include construction beginning and ending dates.

ROP E-21

Objective: Minimize the impacts on bird species from direct interaction with abovegroundutility infrastructure.
Requirement/Standard:

a. To reduce the possibility of birds colliding with aboveground utility lines (power and communication), such lines would either be buried in access roads or would be suspended on VSMs. Exceptions are limited to the following situations:
    i. Overhead power or communication lines may be allowed when located entirely within the boundaries of a facility pad.
    ii. Overhead power or communication lines may be allowed when engineering constraints at the specific and limited location make it infeasible to bury or connect the lines to a VSM.
    iii. Overhead power or communication lines may be allowed in situations when human safety would be compromised by other methods.
b. To reduce the likelihood of birds colliding with them, communication towers would be located, to the extent practicable, on existing pads and as close as possible to buildings or other structures and on the east or west side of buildings or other structures, if possible. Support wires associated with communication towers, radio antennas, and other similar facilities would be avoided to the extent practicable. If support wires are necessary, they would be clearly marked along their entire lengthto improve visibility to low-flying birds. Such markings would be developed through consultation with the USFWS.
c. Design of other utility infrastructure, such as wind turbines, would be evaluated under a specific development proposal.
d. The permittee shall comply with current industry-accepted practices for raptor protection on power lines, such as the most recent Avian Power Line Interaction Committee suggested practices.

Use of Aircraft for Permitted Activities

ROP F-1
Objective: Minimize the effects of low-flying aircraft on wildlife, subsistence activities, and local communities.
Requirement/Standard: The lessee shall ensure that aircraft used for permitted activities maintain altitudes according to the following guidelines (Note: This ROP is not intended to restrict flights necessary to survey wildlife to gain information necessary to meet the stated objectives of the stipulations and ROPs. However, flights necessary to gain this information will be restricted to the minimum necessary to collect such data.):

a. Aircraft shall maintain an altitude of at least 1,500 feet above ground level when within ½ mile of cliffs identified as raptor nesting sites from April 15 through August 15 and an altitude of at least 1,500 feet above ground level when within ½ mile of known gyrfalcon nest sites from March 15 to August 15, unless doing so would endanger human life or violate safe flying practices. Permittees shall obtain information from the BLM necessary to plan flight routes when routes may go near falcon nests.

b. Aircraft shall maintain an altitude of at least 1,000 feet above ground level (except for takeoffs and landings) over caribou winter ranges from December 1 through May 1, unless doing so would endanger human life or violate safe flying practices. Caribou wintering areas will be defined annually by the authorized officer. The BLM will consult directly with the Alaska Department of Fish and Game in annually defining caribou winter ranges.

c. Land user shall submit an aircraft use plan as part of an oil and gas exploration or development proposal. The plan shall address strategies to minimize impacts to subsistence hunting and associated activities, including but not limited to the number of flights, type of aircraft, and flight altitudes and routes, and shall also include a plan to monitor flights.

d. Proposed aircraft use plans should be reviewed by appropriate federal, State, and borough agencies. Consultations with these same agencies will be required if unacceptable disturbance is identified by subsistence users. Adjustments, including possible suspension of all flights, may be required by the authorized officer if resulting disturbance is determined to be unacceptable.

e. The number of takeoffs and landings to support oil and gas operations with necessary materials and supplies should be limited to the maximum extent possible. During the design of proposed oil and gas facilities, larger landing strips and storage areas should be considered to allow larger aircraft to be employed, resulting in fewer flights to the facility.

f. Use of aircraft, especially rotary wing aircraft, near known subsistence camps and cabins or during sensitive subsistence hunting periods (spring goose hunting and fall caribou and moose hunting) should be kept to a minimum.

g. Aircraft used for permitted activities shall maintain an altitude of at least 2,000 feet above ground level (except for takeoffs and landings) over the Teshekpuk Lake Caribou Habitat Area (Map 2) from May 20 through August 20, unless doing so would endanger human life or violate safe flying practices. Aircraft use (including fixed wing and helicopter) by oil and gas lessees in the Goose Molting Area (Map 2) should be minimized from May 20 through August 20, unless doing so would endanger human life or violate safe flying practices.

h. Aircraft used for permitted activities shall maintain an altitude of at least 2,000 feet above ground level (except for takeoffs and landings) over the Utukok River Uplands Special Area (Map 2) from May 20 through August 20, unless doing so would endanger human life or violate safe flying practices.

i. Hazing of wildlife by aircraft is prohibited. Pursuit of running wildlife is hazing. If wildlife begins to run as an aircraft approaches, the aircraft is too close and must break away.

j. Fixed wing aircraft used as part of a BLM-authorized activity along the coast shall maintain minimum altitude of 2,000 feet when within a ½-mile of walrus haulouts, unless doing so would endanger human life or violate safe flying practices. Helicopters used as part of a BLM-authorized activity along the coast shall maintain minimum altitude of 3,000 feet and a 1-mile buffer from walrus haulouts, unless doing so would endanger human life or violate safe flying practices.

k. Aircraft used as part of a BLM-authorized activity along the coast and shore fast ice zone shall maintain minimum altitude of 3,000 feet when within 1 mileof all listed marine mammal species, unless doing so would endanger human life or violate safe flying practices.

Oil Field Abandonment

ROP G-1

Objective: Ensure long-term reclamation of land to its previous condition and use.

Requirement/Standard: Prior to final abandonment, land used for oil and gas infrastructure—including but not limited to well pads, production facilities, access roads, and airstrips—shall be reclaimed to ensure eventual restoration of ecosystem function. The leaseholder shall develop and implement an abandonment and reclamation plan approved by the BLM. The plan shall describe short-term stability, visual, hydrological, and productivity objectives and steps to be taken to ensure eventual ecosystem restoration to the land's previous hydrological, vegetative, and habitat condition. The BLM may grant exceptions to satisfy stated environmental or public purposes.

Subsistence Consultation for Permitted Activities

ROP H-1

Objective: Provide opportunities for participation in planning and decision making to prevent unreasonable conflicts between subsistence uses and other activities.

Requirement/Standard: Lessee/permittee shall consult directly with affected communities using the following guidelines:

a. Before submitting an application to the BLM, the applicant shall consult with directly affected subsistence communities, the North Slope Borough, and the National Petroleum Reserve-Alaska Subsistence Advisory Panel to discuss the siting, timing, and methods of their proposed operations to help discover local traditional and scientific knowledge, resulting in measures that minimize impacts to subsistence uses. Through this consultation, the applicant shall make every reasonable effort, including such mechanisms as conflict avoidance agreements and mitigating measures, to ensure that proposed activities will not result in unreasonable interference with subsistence activities. In the event that no agreement is reached between the parties, the authorized officer shall consult with the directly involved parties and determine which activities will occur, including the timeframes.
b. The applicant shall submit documentation of consultation efforts as part of its operations plan. Applicants should submit the proposed plan of operations to the National Petroleum Reserve-Alaska Subsistence Advisory Panel for review and comment. The applicant must allow time for the BLM to conduct formal government-to-government consultation with Native Tribal governments if the proposed action requires it.
c. A plan shall be developed that shows how the activity, in combination with other activities in the area, will be scheduled and located to prevent unreasonable conflicts with subsistence activities. The plan will also describe the methods used to monitor the effects of the activity on subsistence use. The plan shall be submitted to the BLM as part of the plan of operations. The plan should address the following items:
    i. A detailed description of the activity(ies) to take place (including the use of aircraft).
    ii. A description of how the lessee/permittee will minimize and/or deal with any potential impacts identified by the authorized officer during the consultation process.
    iii. A detailed description of the monitoring effort to take place, including process, procedures, personnel involved and points of contact both at the work site and in the local community.

iv. Communication elements to provide information on how the applicant will keep potentially affected individuals and communities up-to-date on the progress of the activities and locations of possible, short-term conflicts (if any) with subsistence activities. Communication methods could include holding community meetings, open house meetings, workshops, newsletters, radio and television announcements, etc.
v. Procedures necessary to facilitate access by subsistence users to the permitees' area of activity or facilities during the course of conducting subsistence activities.

d. During development, monitoring plans must be established for new permanent facilities, including pipelines, to assess an appropriate range of potential effects on resources and subsistence as determined on a case-by-case basis given the nature and location of the facilities. The scope, intensity, and duration of such plans will be established in consultation with the authorized officer and NPR-A Subsistence Advisory Panel.
e. Permittees that propose barging facilities, equipment, supplies, or other materials to NPR-A in support of oil and gas activities in the NPR-A shall notify, confer, and coordinate with the Alaska Eskimo Whaling Commission, the appropriate local community whaling captains' associations, and the North Slope Borough to minimize impacts from the proposed barging on subsistence whaling activities.
f. Barge operators requiring a BLM permit are required to demonstrate that barging activities will not have unmitigable adverse impacts on the availability of marine mammals to subsistence hunters.
g. All vessels over 50 ft. in length engaged in operations requiring a BLM permit must have an Automatic Identification System (AIS) transponder system on the vessel.

ROP H-2

Objective: Prevent unreasonable conflicts between subsistence activities and geophysical (seismic) exploration.

Requirement/Standard: In addition to the consultation process described in ROP H-1 for permitted activities, before activity to conduct geophysical (seismic) exploration commences, applicants shall notify the local search and rescue organizations of proposed seismic survey locations for that operational season. For the purpose of this standard, a potentially affected cabin/campsite is defined as any camp or campsite used for subsistence purposes and located within the boundary of the area subject to proposed geophysical exploration and/or within 1 mile of actual or planned travel routes used to supply the seismic operations while it is in operation.

a. Because of the large land area covered by typical geophysical operations and the potential to impact a large number of subsistence users during the exploration season, the permittee/operator will notify all potentially affected subsistence-use cabin and campsite users.
b. The official recognized list of subsistence-use cabin and campsite users is the North Slope Borough's most current inventory of cabins and campsites, which have been identified by the subsistence users' names.
c. A copy of the notification, a map of the proposed exploration area, and the list of potentially affected users shall also be provided to the office of the appropriate Native Tribal government.
d. The authorized officer will prohibit seismic work within 1 mile of any known subsistence-use cabin or campsite unless an alternate agreement between the cabin/campsite owner/user is reached through the consultation process and presented to

the authorized officer. (Regardless of the consultation outcome, the authorized officer will prohibit seismic work within 300 feet of a known subsistence-use cabin or campsite.)

e. The permittee shall notify the appropriate local search and rescue (e.g., Nuiqsut Search and Rescue, Atqasuk Search and Rescue) of their current operational location within the NPR-A on a weekly basis. This notification should include a map indicating the current extent of surface use and occupation, as well as areas previously used/occupied during the course of the operation in progress. The purpose of this notification is to allow hunters up-to-date information regarding where seismic exploration is occurring, and has occurred, so that they can plan their hunting trips and access routes accordingly. Identification of the appropriate search and rescue offices to be contacted can be obtained from the coordinator of the NPR-A Subsistence Advisory Panel in the BLM's Arctic Field Office.

ROP H-3

Objective: Minimize impacts to sport hunting and trapping species and to subsistence harvest of those animals.

Requirement/Standard: Hunting and trapping by lessee's/permittee's employees, agents, and contractors are prohibited when persons are on "work status." Work status is defined as the period during which an individual is under the control and supervision of an employer. Work status is terminated when the individual's shift ends and he/she returns to a public airport or community (e.g., Fairbanks, Barrow, Nuiqsut, or Deadhorse). Use of lessee/permittee facilities, equipment, or transport for personal access or aid in hunting and trapping is prohibited.

Orientation Programs Associated with Permitted Activities

ROP I-1

Objective: Minimize cultural and resource conflicts.

Requirement/Standard: All personnel involved in oil and gas and related activities shall be provided information concerning applicable stipulations, ROPs, standards, and specific types of environmental, social, traditional, and cultural concerns that relate to the region. The lessee/permittee shall ensure that all personnel involved in permitted activities shall attend an orientation program at least once a year. The proposed orientation program shall be submitted to the authorized officer for review and approval and should:

a. provide sufficient detail to notify personnel of applicable stipulations and ROPs as well as inform individuals working on the project of specific types of environmental, social, traditional and cultural concerns that relate to the region.
b. Address the importance of not disturbing archaeological and biological resources and habitats, including endangered species, fisheries, bird colonies, and marine mammals, and provide guidance on how to avoid disturbance.
c. Include guidance on the preparation, production, and distribution of information cards on endangered and/or threatened species.
d. Be designed to increase sensitivity and understanding of personnel to community values, customs, and lifestyles in areas in which personnel will be operating.
e. Include information concerning avoidance of conflicts with subsistence, commercial fishing activities, and pertinent mitigation.

f. Include information for aircraft personnel concerning subsistence activities and areas/seasons that are particularly sensitive to disturbance by low-flying aircraft. Of special concern is aircraft use near traditional subsistence cabins and campsites, flights during spring goose hunting and fall caribou and moose hunting seasons, and flights near North Slope communities.
g. Provide that individual training is transferable from one facility to another except for elements of the training specific to a particular site.
h. Include on-site records of all personnel who attend the program for so long as the site is active, though not to exceed the 5 most recent years of operations. This record shall include the name and dates(s) of attendance of each attendee.
i. Include a module discussing bear interaction plans to minimize conflicts between bears and humans.
j. Provide a copy of 43 CFR 3163 regarding Non-Compliance Assessment and Penalties to on-site personnel.
k. Include training designed to ensure strict compliance with local and corporate drug and alcohol policies. This training should be offered to the North Slope Borough Health Department for review and comment.
l. Include training developed to train employees on how to prevent transmission of communicable diseases, including sexually transmitted diseases, to the local communities. This training should be offered to the North Slope Borough Health Department for review and comment.

Endangered Species Act—Section 7 Consultation Process

ROP J.

The lease areas may now or hereafter contain plants, animals, or their habitats determined to be threatened, endangered, or to have some other special status. The BLM may recommend modifications to exploration and development proposals to further its conservation and management objective to avoid BLM-approved activities that will contribute to the need to list such a species or their habitat. The BLM may require modifications to or disapprove a proposed activity that is likely to adversely affect a proposed or listed endangered species, threatened species, or critical habitat. The BLM will not approve any activity that may affect any such species or critical habitat until it completes its obligations under applicable requirements of the Endangered Species Act as amended, 16 USC § 1531 et seq., including completion of any required procedure for conference or consultation.

Summer Vehicle Tundra Access

ROP L-1

Objective: Protect stream banks and water quality; minimize compaction and displacement of soils; minimize the breakage, abrasion, compaction, or displacement of vegetation; protect cultural and paleontological resources; maintain populations of, and adequate habitat for birds, fish, and caribou and other terrestrial mammals; and minimize impacts to subsistence activities.

Requirement/Standard: On a case-by-case basis, BLM may permit low-ground-pressure vehicles to travel off of gravel pads and roads during times other than those identified in ROP C-2a. Permission for such use would only be granted after an applicant has:

a. Submitted studies satisfactory to the authorized officer of the impacts on soils and vegetation of the specific low-ground-pressure vehicles to be used. These studies should reflect use of such vehicles under conditions similar to those of the route proposed for use and should demonstrate that the proposed use would have no more than minimal impacts to soils and vegetation.

b. Submitted surveys satisfactory to the authorized officer of subsistence uses of the area as well as of the soils, vegetation, hydrology, wildlife and fish (and their habitats), paleontological and archaeological resources, and other resources as required by the authorized officer.
c. Designed and/or modified the use proposal to minimize impacts to the authorized officer's satisfaction. Design steps to achieve the objectives and based upon the studies and surveys may include, but not be limited to, timing restrictions (generally it is considered inadvisable to conduct tundra travel prior to August 1 to protect ground-nesting birds), shifting of work to winter, rerouting, and not proceeding when certain wildlife are present or subsistence activities are occurring. At the discretion of the authorized officer, the plan for summer tundra vehicle access may be included as part of the spill prevention and response contingency plan required by 40 CFR 112 (Oil Pollution Act) and ROP A-4.

General Wildlife and Habitat Protection

ROP M-1
Objective: Minimize disturbance and hindrance of wildlife, or alteration of wildlife movements through the NPR-A.
Requirement/Standard: Chasing wildlife with ground vehicles is prohibited. Particular attention will be given to avoid disturbing caribou.

ROP M-2
Objective: Prevent the introduction, or spread, of non-native, invasive plant species in the NPR-A.
Requirement/Standard: Certify that all equipment and vehicles (intended for use either off or on roads) are weed-free prior to transporting them into the NPR-A. Monitor annually along roads for non-native invasive species, and initiate effective weed control measures upon evidence of their introduction. Prior to operations in the NPR-A, submit a plan for the BLM's approval, detailing the methods for cleaning equipment and vehicles, monitoring for weeds and weed control.

ROP M-3
Objective: Minimize loss of populations of, and habitat for, plant species designated as Sensitive by the BLM in Alaska.
Requirement/Standard: If a development is proposed in an area that provides potential habitat for a BLM Sensitive Plant Species, the development proponent would conduct surveys at appropriate times of the summer season and in appropriate habitats for the Sensitive Plant Species that might occur there. The results of these surveys will be submitted to the BLM with the application for development.

ROP M-4

Objective: Minimize loss of individuals of, and habitat for, mammalian species designated as Sensitive by the BLM in Alaska.
Requirement/Standard: If a development is proposed in an area that provides potential habitat for the Alaska tiny shrew, the development proponent would conduct surveys at appropriate times of the year and in appropriate habitats in an effort to detect the presence of the shrew. The results of these surveys will be submitted to BLM with the application for development.

Lease Stipulations and Required Operating Procedures that Apply in Select Biologically Sensitive Areas[9]

Lease Stipulation K-1 – River Setbacks

- NSO
- No new infrastructure, except essential road and pipeline crossings
- Sand and gravel mining (mineral materials disposal) authorized on a case-by-case basis

This measure would be applied to relevant new leases. On lands unavailable for leasing in the respective alternatives, K-1 would be a ROP. The decision indicated below in subparagraphs (a) and (d) modify Protection 1 of the Colville River Special Area Management Plan by widening its applicability to 2 miles.

Objective: Minimize the disruption of natural flow patterns and changes to water quality; the disruption of natural functions resulting from the loss or change to vegetative and physical characteristics of floodplain and riparian areas; the loss of spawning, rearing or over-wintering habitat for fish; the loss of cultural and paleontological resources; the loss of raptor habitat; impacts to subsistence cabin and campsites; the disruption of subsistence activities; and impacts to scenic and other resource values.

Requirement/Standard: Permanent oil and gas facilities, including gravel pads, roads, airstrips, and pipelines, are prohibited in the streambed and adjacent to the rivers listed below at the distances identified. (Gravel mines may be located within the active floodplain consistent with ROP E-8). On a case-by case basis, and in consultation with federal, State, and North Slope Borough regulatory and resource agencies (as appropriate, based on agency legal authority and jurisdictional responsibility), essential pipeline and road crossings to the main channel will be permitted through setback areas. The below setbacks may not be practical within river deltas; in such deltas, permanent facilities shall be designed to withstand a 200-year flood event. In the below list, if no upper limit for the setback is indicated, the setback extends to the head of the stream as identified in the National Hydrography Dataset.

a. **Colville River:** a 2-mile setback from the boundary of NPR-A where the river determines the boundary along the Colville River as determined by cadastral survey to be the highest high watermark on the left (western or northern) bank and from both banks' ordinary high watermark where BLM-manages both sides of the river up through T5S, R30W, U.M. Above that point to its source at the juncture of Thunder and Storm creeks the setback will be ½ mile. Note: The planning area excludes conveyed Native lands along the lower reaches of the Colville River. Development of road crossings intended to support oil and gas activities shall be consolidated with other similar projects and uses to the maximum extent possible. Note: This provision does not apply to intercommunity or other permanent roads constructed with public funds for general transportation purposes, though the BLM would encourage minimal use of the setback area. This preserves the opportunity to plan, design, and construct public transportation systems to meet the

9 Protections outline in this section act as both lease stipulations and ROPs. For oil and gas leases, these protections attach to the lease at the time of sale and cannot be superseded by future ROPs in subsequent IAPs. They govern all on-lease infrastructure associated with development of the lease. For oil and has infrastructure not associated with development of the lease and for non-oil and gas activities permitted in the NPR-A, these protections act as ROPs and attach at the time the permit is issued.

economic, transportation, and public health and safety needs of the State of Alaska and/or communities within National Petroleum Reserve-Alaska.

b. **Ikpikpuk River**: a 2-mile setback from of the ordinary high watermark of the Ikpikpuk River extending from the mouth upstream through T7 N, R11W, U.M.; above that the setback would be for 1 mile to the confluence of the Kigalik River and Maybe Creek.
c. **Miguakiak River**: a ½-mile setback from the ordinary high watermark.
d. **Kikiakrorak and Kogosukruk Rivers**: A 2-mile setback from the top of the bluff (or ordinary high watermark if there is no bluff) on the Kikiakrorak River downstream from T2N., R4W, U.M. and on the Kogosukruk River (including Branch of Kogosukruk River, Henry Creek, and two unnamed tributaries off the southern bank) downstream from T2N, R3W, U.M. The setback from these streams in the named townships and further upstream as applicable will be a ½-mile from the top of the bluff or bank if there is no bluff.
e. **Fish Creek**: a 3-mile setback from the highest high watermark of the creek downstream from the eastern edge of section 31, T11N, R1E., U.M. and a ½-mile setback from the bank's highest high watermark farther upstream.
f. **Judy Creek**: a ½-mile setback from the ordinary high watermark.
g. **Ublutuoch (Tiŋmiaqsiugvik) River:** a ½-mile setback from the ordinary high water mark.
h. **Alaktak River**: a 1-mile setback from the ordinary high water mark.
i. **Chipp River**: a 1-mile setback from the ordinary high water mark.
j. **Oumalik River**: a ½-mile setback from the Oumalik River ordinary high water mark from the mouth upstream to section 5, T8N, R14W, U.M., and a ½ mile setback in and above section 5, T8N, R14W, U.M.
k. **Titaluk River**: a 2-mile setback from the ordinary high water mark from its confluence with the Ikpikpuk River upstream through T7N, R12W, U.M.; above that point the setback would be ½-mile from the ordinary high water mark.
l. **Kigalik River**: a ½-mile setback from the ordinary high water mark.
m. **Maybe Creek**: a ½-mile setback from the ordinary high water mark.
n. **Topagoruk River**: a 1-mile setback from the ordinary high water mark.
o. **Ishuktak Creek**: a ½-mile setback from the ordinary high water mark.
p. **Meade River**: a 1-mile setback from the ordinary high water mark on BLM-managed lands.
q. **Usuktuk River**: a 1-mile setback from the ordinary high water mark on BLM-managed lands.
r. **Pikroka Creek**: a ½-mile setback from the ordinary high water mark.
s. **Nigisaktuvik River**: a 1-mile setback from the ordinary high water mark.
t. **Inaru River**: a 1-mile setback from the ordinary high water mark.
u. **Kucheak Creek**: a ½-mile setback from the ordinary high water mark.
v. **Avalik River**: a 1-mile setback from the ordinary high water mark.
w. **Niklavik Creek**: a ½-mile setback from the ordinary high water mar*k*.
x. **Kugrua River**: a ½-mile setback from the ordinary high water mark.
y. **Kungok River**: a 1-mile setback from the ordinary high water mark on BLM-managed lands.
z. **Kolipsun Creek**: a ½-mile setback from the ordinary high water mark upstream through T13N, R28W, U.M.

aa. **Maguriak Creek**: a ½-mile setback from the ordinary high water mark upstream through T12N, R29W, U.M.
ab. **Mikigealiak River**: a ½-mile setback from the ordinary high water mark upstream through T12N, R30W, U.M.
ac. **Kuk River**: a 1-mile setback from the ordinary high water mark on BLM-managed lands.
ad. **Ketik River**: a 1-mile setback from the ordinary high water mark.
ae. **Kaolak River**: a 1-mile setback from the ordinary high water mark.
af. **Ivisaruk River**: a 1-mile setback from the ordinary high water mark.
ag. **Nokotlek River**: a ½-mile setback from the ordinary high water mark.
ah. **Ongorakvik River**: a ½-mile setback from the ordinary high water mark.
ai. **Tunalik River**: a ½-mile setback from the ordinary high water mark.
aj. **Avak River**: a ½-mile setback from the ordinary high water mark within the NPR-A.
ak. **Nigu River**: a ½-mile setback from the ordinary high water mark from the confluence with the Etivluk River upstream to the boundary of NPR-A
al. **Etivluk River**: a ½-mile setback from the ordinary high water mark.
am. **Ipnavik River**: a ½-mile setback from the ordinary high water mark.
an. **Kuna River**: a ½-mile setback from the ordinary high water mark.
ao. **Kiligwa River**: a ½-mile setback from the ordinary high water mark.
ap. **Nuka River**: a ½-mile setback from the ordinary high water mark.
aq. **Driftwood Creek**: a ½-mile setback from the ordinary high water mark.
ar. **Utukok River**: a 1-mile setback from the ordinary high water mark within the NPR-A.
as. **Awuna River**: a ½-mile setback from the ordinary high water mark.
at. **Carbon Creek**: a ½-mile setback from the ordinary high water mark.
au. **Kokolik River**: a 1-mile setback from the ordinary high water mark within the NPR-A.
av. **Keolok Creek:** a ½-mile setback from the ordinary high water mark.

The decisions in subparagraphs K-1(a) and K-1(d) modify Colville River Management Plan Protection 1 by widening the setback in that measure to 2 miles. Protection 1 thus is modified to the following:

Colville River Special Area Management Plan-Protection 1
<u>Objective</u>: Minimize the loss of arctic peregrine falcon nesting habitat in the Colville River Special Area.
<u>Requirement/Standard</u>: To minimize the direct loss of arctic peregrine falcon nesting habitat and to protect nest sites in the Colville River Special Area the following protective measures apply: Permanent oil and gas facilities, including gravel pads, roads, airstrips, and pipelines, are prohibited in the stream bed and adjacent to the rivers listed below at the distances identified. On a case-by-case basis, and in consultation with federal, State, and North Slope Borough regulatory and resource agencies (as appropriate; based on agency legal authority and jurisdictional responsibility), essential pipeline and road crossings perpendicular to the main channel will be permitted through setback areas.

a. Colville River: downstream of the Etivluk River a continuous 2-mile setback measured from the highest high watermark on the left bank (facing downstream); upstream of the Etivluk River a 2-mile setback measured from the ordinary high watermark of the bank on both sides of the river. Development of road crossings intended to support oil and gas activities shall be consolidated with other similar projects and uses to the maximum extent possible. This provision does not apply to intercommunity or other permanent roads constructed with public funds for general transportation purposes.

b. Kikiakrorak River: downstream from T2N, R4W, U.M., a continuous 2-mile setback as measured from the top of the bluff (or bank if there is no bluff) of both sides of the river.
c. Kogosukruk River: downstream from T2N, R3W, U.M., a continuous 2-mile setback as measured from the top of the bluff (or bank if there is no bluff) of both sides of the river and several of its tributaries.

Lease Stipulation K-2 – Deep Water Lakes

- NSO
- ROP for new infrastructure
- Sand and gravel mining authorized on a case-by-case basis

Note: This measure would be applied to relevant new leases. On lands unavailable for leasing, K-2 would be a ROP.
Objective: Minimize the disruption of natural flow patterns and changes to water quality; the disruption of natural functions resulting from the loss or change to vegetative and physical characteristics of deep water lakes; the loss of spawning, rearing or over wintering habitat for fish; the loss of cultural and paleontological resources; impacts to subsistence cabin and campsites; and the disruption of subsistence activities.
Requirement/Standard: Generally, permanent oil and gas facilities, including gravel pads, roads, airstrips, and pipelines, are prohibited on the lake or lakebed and within ¼ mile of the ordinary high water mark of any deep lake as determined to be in lake zone III (i.e., depth greater than 13 feet [4 meters]; Mellor 1985). On a case-by-case basis in consultation with federal, State and North Slope Borough regulatory and resource agencies (as appropriate based on agency legal authority and jurisdictional responsibility), essential pipeline(s), road crossings, and other permanent facilities may be considered through the permitting process in these areas where the lessee can demonstrate on a site-specific basis that impacts will be minimal.

Lease Stipulation K-3 – Waterbodies and Riparian Areas

Objectives: Protect fish-bearing rivers, streams, and lakes from blowouts and minimize alteration of riparian habitat.
Requirement/Standard: Exploratory drilling is prohibited in rivers and streams, as determined by the active floodplain, and fish-bearing lakes.

Lease Stipulation K-4 - Kogru River, Dease Inlet, Admiralty Bay, Elson Lagoon, Peard Bay, Wainwright Inlet/Kuk River, and Kasegaluk Lagoon, and their associated islands

- No leasing
- No new infrastructure, except essential pipeline crossings (see ROP for pipeline crossings)
- Sand and gravel mining authorized on a case-by-case basis

Objective: Protect fish and wildlife habitat (including, but not limited to, that for waterfowl and shorebirds, caribou insect-relief, and marine mammals), preserve air and water quality, and minimize impacts to subsistence activities and historic travel routes on the major coastal waterbodies.
Requirement/Standard (Development):
The Kogru River, Dease Inlet, Admiralty Bay, Elson Lagoon, Peard Bay, Wainwright Inlet/Kuk River, and Kasegaluk Lagoon, and their associated Islands are unavailable for leasing.

With the exception of linear features such as pipelines, no permanent oil and gas facilities are permitted on or under the water within ¾ mile seaward of the shoreline (as measured from mean high tide) of the major coastal waterbodies or the natural coastal islands (to the extent that the seaward subsurface is within NPR-A). Elsewhere, permanent facilities within the major coastal waterbodies will only be permitted on or under the water if they can meet all the following criteria:

a. Design and construction of facilities shall minimize impacts to subsistence uses, travel corridors, seasonally concentrated fish and wildlife resources.
b. Daily operational activities, including use of support vehicles, watercraft, and aircraft traffic, alone or in combination with other past, present, and reasonably foreseeable activities, shall be conducted to minimize impacts to subsistence uses, travel corridors, and seasonally concentrated fish and wildlife resources.
c. The location of oil and gas facilities, including artificial islands, platforms, associated pipelines, ice or other roads, bridges or causeways, shall be sited and constructed so as to not pose a hazard to navigation by the public using traditional high-use subsistence-related travel routes into and through the major coastal waterbodies as identified by the North Slope Borough.
d. Demonstrated year-round oil spill response capability, including the capability of adequate response during periods of broken ice or open water, or the availability of alternative methods to prevent well blowouts during periods when adequate response capability cannot be demonstrated. Such alternative methods may include seasonal drilling restrictions, improvements in blowout prevention technology, equipment and/or changes in operational procedures, and "top-setting" of hydrocarbon-bearing zones.
e. Reasonable efforts will be made to avoid or minimize impacts related to oil spill response activities, including vessel, aircraft, and pedestrian traffic that add to impacts or further compound "direct spill" related impacts on area resources and subsistence uses.
f. Before conducting open water activities, the permittee shall consult with the Alaska Eskimo Whaling Commission and the North Slope Borough to minimize impacts to the fall and spring subsistence whaling activities of the communities of the North Slope.

Lease Stipulation K-5 – Coastal Area Setbacks

- NSO
- No new infrastructure, except essential coastal infrastructure (see ROP for essential coastal infrastructure)
- Sand and gravel mining authorized on a case-by-case basis.

Note: This measure would be applied to relevant new leases. On lands unavailable for leasing in the respective alternatives, K-5 would be a ROP.

<u>Objective</u>: Protect coastal waters and their value as fish and wildlife habitat (including, but not limited to, that for waterfowl, shorebirds, and marine mammals), minimize hindrance or alteration of caribou movement within caribou coastal insect-relief areas; protect the summer and winter shoreline habitat for polar bears, and the summer shoreline habitat for walrus and seals; prevent loss of important bird habitat and alteration or disturbance of shoreline marshes; and prevent impacts to subsistence resources and activities.
<u>Requirement/Standard</u>:

a. Exploratory well drill pads, production well drill pads, or a central processing facility for oil or gas would not be allowed in coastal waters or on islands between the northern boundary of the Reserve and the mainland, or in inland areas within one mile of the coast. (Note: This would include the entirety of the Kasegaluk Lagoon and Peard Bay Special Areas.) Other facilities necessary for oil and gas production within NPR-A that necessarily must be within this area (e.g., barge landing, seawater treatment plant, or spill response staging and storage areas) would not be precluded. Nor would this stipulation preclude infrastructure associated with offshore oil and gas exploration and production or construction, renovation, or replacement of facilities on existing gravel sites. Lessees/permittees shall consider the practicality of locating facilities that necessarily must be within this area at previously occupied sites such as various Husky/USGS drill sites and Distant Early Warning-Line sites. All lessees/permittees involved in activities in the immediate area must coordinate use of these new or existing sites with all other prospective users. Before conducting open water activities, the lessee shall consult with the Alaska Eskimo Whaling Commission, the North Slope Borough, and local whaling captains associations to minimize impacts to the fall and spring subsistence whaling activities of the communities of the North Slope. In a case in which the BLM authorizes a permanent oil and gas facility within the Coastal Area, the lessee/permittee shall develop and implement a monitoring plan to assess the effects of the facility and its use on coastal habitat and use.
b. Marine vessels used as part of a BLM-authorized activity shall maintain a 1-mile buffer from the shore when transiting past an aggregation of seals (primarily spotted seals), Steller's sea lions, or walruses using a terrestrial haulout unless doing so would endanger human life or violate safe boating practices. Marine vessels shall not conduct ballast transfers or discharge any matter into the marine environment within 3 miles of the coast except when necessary for the safe operation of the vessel.
c.

Lease Stipulation K-6 – Goose Molting Area

- No leasing
- ROP for new infrastructure
- Sand and gravel mining authorized on a case-by-case basis

Note: Except for less than 10,000 acres east of the mouth of the Ikpikpuk River, new non-subsistence infrastructure would be prohibited in the goose molting area. None of the area is available for oil and gas leasing or exploratory drilling.
Objective: Minimize disturbance to molting geese and loss of goose molting habitat in and around lakes in the Goose Molting Area.
Requirement/Standard (General): Within the Goose Molting Area no permanent oil and gas facilities, except for pipelines, will be allowed within 1 mile of the shoreline of goose molting lakes. No waiver, exception, or modification will be considered. Prior to the permitting of a pipeline in the Goose Molting Area, a workshop will be convened to determine the best corridor for pipeline construction in efforts to minimize impacts to wildlife and subsistence resources. The workshop participants will include but will not be limited to federal, state, and North Slope Borough representatives. In addition, only "in field" roads will be authorized as part of oil and gas field development.
Requirement/Standard (Development): In the Goose Molting Area, the following standards will

be followed for permitted activities:

a. Within the Goose Molting Area from June 15 through August 20, all off-pad activities and major construction activities using heavy equipment (e.g., sand/gravel extraction and transport, pipeline and pad construction, but not drilling from existing production pads) shall be suspended (see also ROP K-9), unless approved by the authorized officer in consultation with the appropriate federal, State, and North Slope Borough regulatory and resource agencies. The intent of this requirement is to restrict activities that will disturb molting geese during the period when geese are present.
b. Water extraction from any lakes used by molting geese shall not alter hydrological conditions that could adversely affect identified goose-feeding habitat along lakeshore margins. Considerations will be given to seasonal use by operators (generally in winter) and geese (generally in summer), as well as recharge to lakes from the spring snowmelt.
c. Oil and gas activities will avoid altering (i.e., damage or disturbance of soils, vegetation, or surface hydrology) critical goose-feeding habitat types along lakeshore margins (grass/sedge/moss) and salt marsh habitats.
d. Permanent oil and gas facilities (including gravel roads, pads, and airstrips, but excluding pipelines) and material sites will be sited outside the identified buffers and restricted surface occupancy areas. Additional limits on development footprint apply
e. Between June 15 and August, 20 within the Goose Molting Area, oil and gas facilities shall incorporate features (e.g., temporary fences, siting/orientation) that screen/shield human activity from view of any Goose Molting Area lake, as identified by the authorized officer in consultation with appropriate federal, State, and North Slope Borough regulatory and resource agencies.
f. Strategies to minimize ground traffic shall be implemented from June 15 through August 20. These strategies may include limiting trips, use of convoys, different vehicle types, etc. to the extent practicable. The permittee shall submit with the development proposal a vehicle use plan that considers these and any other mitigation. The vehicle use plan shall also include a vehicle-use monitoring plan. Adjustments will be required by the authorized officer if resulting disturbance is determined to be unacceptable.
g. Within the Goose Molting Area aircraft use (including fixed wing and helicopter) shall be restricted from June 15 through August 20 unless doing so endangers human life or violates safe flying practices. Restrictions may include: (1) limiting flights to two round-trips/week, and (2) limiting flights to corridors established by the BLM after discussions with appropriate federal, State, and North Slope Borough regulatory and resource agencies. The permittee shall submit with the development proposal an aircraft use plan that considers these and other mitigation. The aircraft use plan shall also include an aircraft monitoring plan. Adjustments, including perhaps suspension of all aircraft use, will be required by the authorized officer if resulting disturbance is determined to be unacceptable. Note: This site-specific ROP is not intended to restrict flights necessary to survey wildlife to gain information necessary to meet the stated objective of the stipulations and ROPs. However, flights necessary to gain this information will be restricted to the minimum necessary to collect such data.
h. Any permit for development issued under this IAP/EIS will include a requirement for the permittee to conduct monitoring studies necessary to adequately determine consequences of development and any need for change to mitigations. Monitoring studies will be site- and development-specific within a set of over-arching guidelines developed by the BLM

after conferring with appropriate federal, State, North Slope Borough agencies. The study(ies) will include the construction period and will continue for a minimum of 3 years after construction has been completed and production has begun. The monitoring studies will be a continuation of evaluating the effectiveness of ROP K-6 requirements in meeting the objective of K-6 and determine if any changes to the ROP or any project specific mitigation(s) are necessary. If changes are determined to be necessary, the BLM, with the permittee and/or their representative, will conduct an assessment of the feasibility of altering development operation (e.g., reduced human activity, visibility barriers, noise abatement). Any changes determined necessary will be implemented prior to authorization of any new construction.

Lease Stipulation K-8 – Brant Survey Area

- No leasing
- ROP for new infrastructure
- Sand and gravel mining authorized on a case-by-case basis

Objective: Minimize the loss or alteration of habitat for, or disturbance of, nesting and brood rearing brant in the Brant Survey Area. None of the area is available for oil and gas leasing or exploratory drilling.

Requirement/Standard:

a. Aerial surveys for brant nesting colonies and brood-rearing areas shall be conducted for a minimum of 2 years before authorization of construction of permanent facilities. At a minimum, the survey area shall include the proposed development site(s) (i.e., the footprint) and the surrounding ½-mile area. These surveys shall be conducted following accepted BLM protocol.
b. Development may be prohibited or activities curtailed within ½-mile of all identified brant nesting colonies and brood-rearing areas identified during the 2-year survey

Lease Stipulation K-9 –Teshekpuk Lake Caribou Habitat Area

Note: None of the area is available for oil and gas leasing or exploratory drilling. Therefore, K-9 will apply as a ROP. Portions of K-9 that apply to permanent infrastructure are only relevant to the portion of the Teshekpuk Lake Caribou Habitat Area available to application for such infrastructure, i.e., to those areas outside of the approximately 1.1 million acres near the lake where no new non-subsistence permanent infrastructure will be permitted.

Objective: Minimize disturbance and hindrance of caribou, or alteration of caribou movements through portions the Teshekpuk Lake Caribou Habitat Area that are essential for all season use, including calving and rearing, insect-relief, and migration.

Requirement/Standard: In the Teshekpuk Lake Caribou Habitat Area the following standards will be applied to permitted activities:

a. Before authorization of construction of permanent facilities (limited as they may be by surface occupancy restrictions established in this decision), the permittee shall design and implement and report a study of caribou movement unless an acceptable study(s) specific to the Teshekpuk Caribou Herd has been completed within the last 10 years. The study shall include a minimum of four years of current data on the Teshekpuk Caribou Herd movements and the study design shall be approved by the authorized officer in consultation with the appropriate federal, State, and North Slope Borough wildlife and resource agencies. The study should provide information necessary to determine facility (including pipeline) design and location. Permittee may submit individual study proposals or they may combine with other permittees in the area to do a single, joint study for the entire Teshekpuk Lake Caribou Habitat Area. Study data may be gathered concurrently with other activities as approved by the authorized officer and in consultation with the appropriate federal, State, and North Slope Borough wildlife and resource agencies. A final report of the study results will be prepared and submitted. Prior to the permitting of a pipeline in the Teshekpuk Lake Caribou Habitat Area, a workshop will be convened to identify the best corridor for pipeline construction in efforts to minimize impacts to wildlife (specifically the Teshekpuk Caribou Herd) and subsistence resources. The workshop participants will include but will not be limited to federal, State, and North Slope Borough representatives. All of these modifications will increase protection for caribou and other wildlife that utilize the Teshekpuk Lake Caribou Habitat Area during all seasons.

b. Within the Teshekpuk Lake Caribou Habitat Area, permittee shall orient linear corridors when laying out oil and gas field developments to address migration and corralling effects and to avoid loops of road and/or pipeline that connect facilities.
c. Ramps over pipelines, buried pipelines, or pipelines buried under the road may be required by the authorized officer, after consultation with appropriate federal, State, and North Slope Borough regulatory and resource agencies, in the Teshekpuk Lake Caribou Habitat Area where pipelines potentially impede caribou movement.
d. Major construction activities using heavy equipment (e.g., sand/gravel extraction and transport, pipeline and pad construction, but not drilling from existing production pads) shall be suspended within Teshekpuk Lake Caribou Habitat Area from May 20 through August 20, unless approved by the authorized officer in consultation with the appropriate federal, State, and North Slope Borough regulatory and resource agencies. The intent of this requirement is to restrict activities that will disturb caribou during calving and insect-relief periods. If caribou arrive on the calving grounds prior to May 20, major construction activities will be suspended. The permittee shall submit with the development proposal a “stop work” plan that considers this and any other mitigation related to caribou early arrival. The intent of this latter requirement is to provide flexibility to adapt to changing climate conditions that may occur during the life of fields in the region.
e. The following ground and air traffic restrictions shall apply in the areas and time periods indicated. Ground traffic restrictions apply to permanent oil and gas-related roads:
    i. Within the Teshekpuk Lake Caribou Habitat Area, from May 20 through August 20, traffic speed shall not exceed 15 miles per hour when caribou are within ½ mile of the road. Additional strategies may include limiting trips, using convoys, using different vehicle types, etc., to the extent practicable. The permittee shall submit with the development proposal a vehicle use plan that considers these and any other mitigation. The vehicle use plan shall also include a vehicle-use monitoring plan. Adjustments will be required by the authorized officer if resulting disturbance is determined to be unacceptable.
    ii. The permittee or a contractor shall observe caribou movement from May 20 through August 20, or earlier if caribou are present prior to May 20. Based on these observations, traffic will be stopped:

a) Temporarily to allow a crossing by 10 or more caribou. Sections of road will be evacuated whenever an attempted crossing by a large number of caribou appears to be imminent. The permittee shall submit with the development proposal a vehicle use plan that considers these and any other mitigation.
b) By direction of the authorized officer throughout a defined area for up to four weeks to prevent displacement of calving caribou.
c) The vehicle use plan shall also include a vehicle-use monitoring plan. Adjustments will be required by the authorized officer if resulting disturbance is determined to be unacceptable.

iii. Major equipment, materials, and supplies to be used at oil and gas work sites in the Teshekpuk Lake Caribou Habitat Area shall be stockpiled prior to or after the period of May 20 through August 20 to minimize road traffic during that period.

Lease Stipulation K-10 – Teshekpuk Lake Caribou Movement Corridor

- No leasing
- No new infrastructure/ ROP for new infrastructure
- Sand and gravel mining authorized on a case-by-case basis

Note: None of the area is available for oil and gas leasing or exploratory drilling. Therefore, K-9 will apply as a ROP. All of the former movement corridor northwest of Teshekpuk Lake and all but the eastern-most part of the other corridor that lies north of the Kogru River are within an area prohibiting new non-subsistence infrastructure. Therefore, this ROP only applies to the lands in the former corridor north of the Kogru River in Ts. 14-15 N., R. 2 W., U.M.
Objective: Minimize disturbance and hindrance of caribou, or alteration of caribou movements (that are essential for all season use, including calving and rearing, insect-relief, and migration) in the area extending from the eastern shore of Teshekpuk Lake eastward to the Kogru River.
Requirement/Standard: Within the Teshekpuk Lake Caribou Movement Corridor, no permanent oil and gas facilities, except for pipelines or other infrastructure associated with offshore oil and gas exploration and production, will be allowed. Prior to the permitting of permanent oil and gas infrastructure in the Caribou Movement Corridor, a workshop will be convened to identify the best corridor for pipeline construction in efforts to minimize impacts to wildlife and subsistence resources. The workshop participants will include but will not be limited to federal, State, and North Slope Borough representatives.

Lease Stipulation K-11 – Southern Caribou Calving Area

Note: None of the area is available for oil and gas leasing or exploratory drilling. Therefore, K-11 will apply as a ROP. All but the eastern-most part of the former Southern Caribou Calving Area lies within an area prohibiting new non-subsistence infrastructure. Therefore, this ROP only applies to the lands in the former area T. 14 N., Rs. 1-2 W., U.M.; T. 14 N., R. 1 E., U.M; and T. 15 N., R. 2 W., U.M.

Objective: Minimize disturbance and hindrance of caribou, or alteration of caribou movements (that are essential for all season use, including calving and post calving, and insect-relief) in the area south/southeast of Teshekpuk Lake.

Requirement/Standard: Within the Southern Caribou Calving Area, no permanent oil and gas facilities, except pipelines or other infrastructure associated with offshore oil and gas exploration and production, will be allowed. Prior to the permitting of permanent oil and gas infrastructure in the Southern Caribou Calving Area, a workshop will be convened to identify the best corridor for pipeline construction in efforts to minimize impacts to wildlife and subsistence resources. The workshop participants will include but will not be limited to federal, State, and North Slope Borough representatives.

Lease Stipulation K-12 - Colville River Special Area

Note: This measure would be applied to relevant new leases. On lands unavailable for leasing, K-12 would be a ROP.

Objective: Prevent or minimize loss of raptor foraging habitat (also see Lease Stipulation K-1).
Requirement/Standard: If necessary to construct permanent facilities within the Colville River Special Area, all reasonable and practicable efforts shall be made to locate permanent facilities as far from raptor nests as feasible. Additionally, within 15 miles of raptor nest sites, significant alteration of high quality foraging habitat shall be prohibited unless the lessee can demonstrate on a site-specific basis that impacts would be minimal. Of particular concern are ponds, lakes, wetlands, and riparian habitats. Note: *On a case-by-case basis, and in consultation with appropriate federal and State regulatory and resource agencies, essential pipeline and road crossings will be permitted through the Colville River Special Area where no other feasible or prudent options are available.*

Lease Stipulation K-13 - Pik Dunes

- No leasing
- ROP for new infrastructure
- Sand and gravel mining authorized on a case-by-case basis

Note: None of the area is available for oil and gas leasing or exploratory drilling. Therefore, K-13 will apply as a ROP.
Objective: Retain unique qualities of the Pik Dunes, including geologic and scenic uniqueness, insect-relief habitat for caribou, and habitat for several uncommon plant species.
Requirement/Standard: Surface structures, except approximately perpendicular pipeline crossings and ice pads, are prohibited within the Pik Dunes.

Lease Stipulation K-14 – Utukok River Uplands Special Area

- No leasing, except the northernmost portion of the Special Area
- No new infrastructure, except the northernmost portion of the Special Area
- Sand and gravel mining authorized on a case-by-case basis

Note: This measure would be applied to relevant new leases. On lands unavailable for leasing, K-14 would be a ROP. Portions of K-14 that apply to permanent infrastructure are only relevant to the northern portion of the Utukok River Uplands Special Area available to application for such infrastructure.
Objective: Minimize disturbance and hindrance of caribou, or alteration of caribou movements through the Utukok River Uplands Special Area that are essential for all season use, including calving and rearing, insect-relief, and migration.
Requirement/Standard: In the Utukok River Uplands Special Area the following standards will

be applied to permitted activities:

a. Before authorization of construction of permanent facilities, the lessee shall design and implement and report a study of caribou movement unless an acceptable study(s) specific to the Western Arctic Herd has been completed within the last 10 years. The study shall include a minimum of four years of current data on the Western Arctic Herd's movements and the study design shall be approved by the authorized officer in consultation with the appropriate federal, State, and North Slope Borough wildlife and resource agencies and the Western Arctic Caribou Herd Working Group. The study should provide information necessary to determine facility (including pipeline) design and location. Lessees may submit individual study proposals or they may combine with other lessees in the area to do a single, joint study for the entire Utukok River Uplands Special Area. Study data may be gathered concurrently with other activities as approved by the authorized officer and in consultation with the appropriate federal, State, and North Slope Borough wildlife and resource agencies. A final report of the study results will be prepared and submitted. Prior to the permitting of a pipeline in the Utukok River Uplands Special Area, a workshop will be convened to identify the best corridor for pipeline construction in efforts to minimize impacts to wildlife (specifically the Western Arctic Herd) and subsistence resources. The workshop participants will include but will not be limited to federal, State, and North Slope Borough representatives. All of these modifications will increase protection for caribou and other wildlife that utilize the Utukok River Uplands Special Area during all seasons.
b. Within the Utukok River Uplands Special Area, lessees shall orient linear corridors when laying out oil and gas field developments to address migration and corralling effects and to avoid loops of road and/or pipeline that connect facilities.
c. Ramps over pipelines, buried pipelines, or pipelines buried under the road may be required by the authorized officer, after consultation with appropriate federal, State, and North Slope Borough regulatory and resource agencies, in the Utukok River Uplands Special Area where pipelines potentially impede caribou movement.
d. Major construction activities using heavy equipment (e.g., sand/gravel extraction and transport, pipeline and pad construction, but not drilling from existing production pads) shall be suspended within Utukok River Uplands Special Area from May 20 through August 20, unless approved by the authorized officer in consultation with the appropriate federal, State, and North Slope Borough regulatory and resource agencies. The intent of this requirement is to restrict activities that will disturb caribou during calving and insect-relief periods. If caribou arrive on the calving grounds prior to May 20, major construction activities will be suspended. The lessee shall submit with the development proposal a "stop work" plan that considers this and any other mitigation related to caribou early arrival. The intent of this latter requirement is to provide flexibility to adapt to changing climate conditions that may occur during the life of fields in the region.
e. The following ground and air traffic restrictions shall apply to permanent oil and gas-related roads in the areas and time periods indicated:
    i. Within the Utukok River Uplands Special Area, from May 20 through August 20, traffic speed shall not exceed 15 miles per hour when caribou are within ½ mile of the road. Additional strategies may include limiting trips, using convoys, using different vehicle types, etc., to the extent practicable. The lessee shall submit with the development proposal a vehicle use plan that considers these and any other mitigation. The vehicle use

plan shall also include a vehicle-use monitoring plan. Adjustments will be required by the authorized officer if resulting disturbance is determined to be unacceptable.

ii. The lessee or a contractor shall observe caribou movement from May 20 through August 20, or earlier if caribou are present prior to May 20. Based on these observations, traffic will be stopped:

a) Temporarily to allow a crossing by 10 or more caribou. Sections of road will be evacuated whenever an attempted crossing by a large number of caribou appears to be imminent. The lessee shall submit with the development proposal a vehicle use plan that considers these and any other mitigation.

b) By direction of the authorized officer throughout a defined area for up to four weeks to prevent displacement of calving caribou.

The vehicle use plan shall also include a vehicle-use monitoring plan. Adjustments will be required by the authorized officer if resulting disturbance is determined to be unacceptable.

iii. Major equipment, materials, and supplies to be used at oil and gas work sites in the Utukok River Uplands Special Area shall be stockpiled prior to or after the period of May 20 through August 20 to minimize road traffic during that period.

iv. Within the Utukok River Uplands Special Area aircraft use (including fixed wing and helicopter) shall be restricted from May 20 through August 20 unless doing so endangers human life or violates safe flying practices. Authorized users of the NPR-A may be restricted from using aircraft larger than a Twin Otter, and limited to an average of one fixed-wing aircraft takeoff and landing per day per airstrip, except for emergency purposes. Restrictions may include prohibiting the use of aircraft larger than a Twin Otter by authorized users of the NPR-A, including oil and gas lessees, from May 20 through August 20 within the Utukok River Uplands Special Area, except for emergency purposes. The lessee shall submit with the development proposal an aircraft use plan that considers these and other mitigation. The aircraft use plan shall also include an aircraft monitoring plan. Adjustments, including perhaps suspension of all aircraft use, will be required by the authorized officer if resulting disturbance is determined to be unacceptable. This lease stipulation is not intended to restrict flights necessary to survey wildlife to gain information necessary to meet the stated objective of the stipulations and ROPs. However, flights necessary to gain this information will be restricted to the minimum necessary to collect such data.

v. Aircraft shall maintain a minimum height of 1,000 feet above ground level (except for takeoffs and landings) over caribou winter ranges from December 1 through May 1, and 2,000 feet above ground level over the Utukok River Uplands Special Area from May 20 through August 20, unless doing so endangers human life or violates safe flying practices. Caribou wintering ranges will be defined annually by the authorized officer in consultation with the Alaska Department of Fish and Game. This lease stipulation is not intended to restrict flights necessary to survey wildlife to gain information necessary to meet the stated objective of the stipulations and ROPs. However, flights necessary to gain this information will be restricted to the minimum necessary to collect such data.

Lease Stipulation K-17: Federal Mineral Estate under Native Lands

- Available for leasing
- Sand and gravel mining authorized on a case-by-case basis

APPENDIX 2 – BLM's SUMMARY OF THE REASONABLY FORSEEABLE DEVELOPMENT SCENARIO

Oil and Gas Exploration and Development
The proposed action would make available specific areas of the NPR-A for lease sales and subsequent oil and gas exploration, development, and production activities. Issuance of an oil and gas lease would not authorize ground disturbing activities; however, a lease would grant the lessee certain rights to drill and extract oil and/or gas subject to applicable regulations and lease stipulations. The focus of this analysis of effects, therefore, is on the potential impacts to listed species from those ground disturbing activities that may follow leasing or infrastructure authorization for on-lease oil and gas activity.

The Proposed Action offers specific areas of the NPR-A as available for lease sales and infrastructure development, rather than project-level oil and gas exploration and development plans or proposed infrastructure construction. In addition to on-lease oil and gas activities, impacts to listed species could occur from construction of off-lease infrastructure, seismic exploration, and non-oil and gas activities that are permissible under this plan. The BLM would not issue a permit for any activities until: 1) the permittee applies for appropriate BLM authorizations (e.g., application for permit to drill); 2) the permittee files a plan with site-specific details, and demonstrates compliance with the BLM stipulations and ROPs; 3) the BLM completes subsequent National Environmental Policy Act (NEPA) Analysis and ESA section 7 consultation for the proposed on-lease activity; and 4) the permittee demonstrates compliance with the MMPA, Clean Water Act, and/or other applicable requirements.

General Assumptions and Timeline
A generalized timeline for a typical project in a remote area of the North Slope is presented below. Discoveries of a commercially viable quantities of oil could be announced at any time within a 10-year period following a lease sale.

• Year of lease sale; begin exploration and may discover commercially viable quantities of oil.

• 3–6 years from discovery: delineation and development activities; unitization and establishment of the initial Participating Area (i.e., hydrocarbon reservoir, field, or pool).

• 7–8 years from discovery: development of surface facilities, initial oil production.

• 10–70 years from discovery: production.

• 2–5 years after end of production: abandonment, including well plugging and site restoration.

Potential Future Development and Infrastructure
The estimated location and amount of activity related to oil and gas exploration and production presented in the RFDS are based on the locations of formations of interest, known discoveries, distance to existing infrastructure, and leasing interest from operators. Oil resources concentrated in the eastern and northeastern areas of the NPR-A are expected to be the primary target for development over the next 20 years and are identified as the area of high development potential (Houseknecht et al. 2017). Several discoveries have been identified within those areas, and seismic data suggest that unexplored geological trapping mechanisms are present that may yield future discoveries there.
Under the Proposed Action, new development would be expected around Umiat, as well as additional satellite developments using the Alpine or the proposed Willow central processing facility (CPF) for processing of recovered oil and gas resources. Previous information from exploration wells suggest that an estimated one-billon barrels of oil exist in the Umiat area (Oil and Gas Journal 2010). In September 2019, the BLM received an application for an exploratory unit at Umiat that encompasses two federal leases. Approximately 60 mi from the nearest infrastructure and 92 mi from the Trans Alaska Pipeline (TAPS), initial development in this area would require a substantial investment for infrastructure connection.

The possibility exists that a discovery and development could occur in other areas of the NPR-A. However, developments near Smith Bay (the site of one of world's largest recent oil discoveries [Lidji 2018]) and near Teshekpuk Lake (attractive to potential operators due to the ability to tie into infrastructure at nearby Alpine or future Willow developments) would not be possible due to prohibitions on leasing and the construction of new infrastructure under the Proposed Action.

Two gas pipelines to connect the North Slope to southern Alaska and export terminals, the Alaska Liquid Natural Gas Pipeline and the Alaska Stand Alone Pipeline, recently completed their NEPA analyses and were approved. This may lead to future development of gas fields in the NPR-A. The Gubik Field is a gas field that likely extends into the NPR-A in the Umiat area. If gas infrastructure were extended to the North Slope, this field could become viable for development; otherwise, no development of gas resources is expected. U.S. Geological Survey studies have estimated most gas reserves to exist in the southern and central parts of NPR-A (Collett et al. 2019), though recoverable gas has also been found in the Nanushuk and Torok Formations across the northern portion of the NPR-A (Houseknecht et al. 2017).

Leasing
Approximately 4.1 million acres of the NPR-A planning area have been classified as having high petroleum development potential (BLM 2020b, Appendix B). The BLM assumes that only high-potential areas are considered to be reasonable targets for development at this time, but exploration is not limited to those locations. Petroleum development potential was modeled on factors including known discoveries, the locations of formations of interest, distance to infrastructure, and leasing interest from operators. Exploration drilling locations will be dictated by geologic information and may change as new information is received.

In 2018, the U.S. Geological Survey estimated that the total volume of non-associated gas (i.e., gas not associated with oil) within the NPR-A project area was approximately 53.8 trillion cubic feet (TCF). It is expected that most gas reserves exist in the southern and central parts of NPR-A

(Collett et al. 2019). Another U.S. Geological Survey study of the six assessment units in the Nanushuk and Torok Formations across the northern portion of the NPR-A estimatedapproximately 6.9 TCF of associated recoverable gas and 17.5 TCF of non-associated recoverable gas in those units (Houseknecht et al. 2017).

Under the Proposed Action, new oil development is most likely to occur around Umiat, or additional development near Willow. Total lifetime production from new developments under the Proposed Action could reach 1.35 billion barrels of oil.
Possible new development is described in terms of projected oil production (low, medium, and high), construction surface disturbance, water use, and gravel use (Table Appendix 2.1). The combination of the projected type and amount of future activities, hereafter referred to as the development scenario, provides a basis for estimating effects of the Proposed Action on listed species.

Table Appendix 2.1 - Production, surface disturbance, gravel needs, and infrastructure

	Oil Production Case		
	LOW	**MEDIUM**	**HIGH**
Peak production (barrels oil per day)	61,529	107,675	256,369
Surface disturbance (acres)	183	749	1,269
Gravel needs (cubic yards)	1,466,433	6,440,000	11,639,172
Peak water use (gallons per day)	2,584,204	4,522,357	10,767,516
Central Processing Facility, airstrips	0	1	2
Satellite pads	1	5	10
Gravel roads (miles)	20	82	128
Ice roads (miles)	50	50	50
Vertical support members (miles)	15	77	122
Seawater treatment plant	1	1	1
Barge landing	1	1	1

Developments at CD5, Willow, GMT1 and GMT2 are not included in the surface disturbance calculations presented above in Table 3.1, as they have been or are being, separately consulted on and are included in the cumulative effects analysis.

Logistics Common to All Stages of Potential Future Development and Infrastructure

Staging areas

The development scenario for the Proposed Action predicts that three 50-acre staging areas would be constructed inland of the coast to support oil and gas activities. Other existing gravel pads could also be used for staging, such as Point Lonely, Cape Simpson, Ikpikpuk Well site, 16 Inigok, or Umiat. It is not foreseen that any new staging areas would be built along the coast, as existing gravel pads are already present at Point Lonely, Cape Simpson, Utqiaġvik, and Wainwright. Staging areas are used to store equipment and materials from the time they are brought into the NPR-A until further transportation is feasible. Staging areas can be established for year-round use, and typically comprise fuel storage tanks, warehouses, housing units, and some include permanent gravel airstrips capable of handling large capacity aircraft. In winter months, staged materials are moved by temporary roads (ice or packed snow) or by aircraft to their final destination.

Aircraft

Helicopters and fixed-wing aircraft capable of landing on unimproved airstrips, tundra, lakes and rivers, and gravel bars are the primary mode of transport of people and equipment during summer in undeveloped portions of NPR-A. These aircraft would provide access for or means to conduct a large number of activities including research projects by the State of Alaska, federal government, and research institutions as well as activities necessary for oil and gas exploration and development. Exclusive of the oil and gas industry, these activities could include air support or provide a platform for compliance of BLM stipulations by permittees; research and monitoring of plants, fish, birds and mammals; and for community infrastructure projects by various federal, state and local governmental agencies and research institutions. Within the oil and gas industry, activities could include air support for seismic surveys and exploratory drilling; aerial wildlife surveys; support for ground surveys of fish, wildlife, archaeological, and other resources; road and pipeline route surveys; pipeline inspections; and support for other development, operations, and abandonment activities.

The location, timing, and frequency of such flights and the type of aircraft used will be influenced by many variables and will likely be different depending on whether or not the activity is associated with the oil and gas industry. However, the vast majority of flights will take place between May and October and the majority will take place over land using helicopters. The restrictions that the BLM and other regulators might place on the permittee will affect aircraft-dependent activities.

Beginning in 2006, the BLM requires that all aircraft take-off and landing locations occurring within and associated with authorized activities within the NPR-A be predicted pre-season and then collected and reported post-season in order to comply with the Terms and Conditions of the yearly ESA section 7 consultation for summer activities in the NPR-A. Since 2006, the number of aircraft take-offs and landings in the NPR-A have varied widely. Take-off and landing (TOL) numbers reported in the next paragraph are from data collected between 2008–2016 (excluding 2014). Data collected more recently have not been analyzed; therefore, the pre-season predicted numbers for 2017–2020 are reported here.

For the period 2009–2016 (excluding 2014), TOLs ranged from 1,600 in 2009 to 6,966 in 2015, with the majority of the count coming from federal government and industrial activities. Beginning in 2017, TOL predictions have been consistently higher than during 2008–2016, with estimates of 7,789 TOL for 2017; 10,363 TOL for 2018; 10,204 TOL for 2019; and 8,542 TOL for 2020. The majority of this increase is due to greater numbers being predicted by permittees conducting industrial activities.

Winter ground transportation
During exploration, most overland transportation in the NPR-A would occur on temporary ice roads or snow-packed trails approximately 3.6 m (12 ft) wide. Ice roads/snow packed trails would also be used to support construction, maintenance, and monitoring of pipelines transporting oil and gas from the respective development complexes in the NPR-A to transmission pipelines east of the NPR-A border. Seasonal ice roads would be constructed annually and used for four to five months each winter (December to April). The development scenario estimates that 50 miles of ice roads/snow packed trails would be constructed in the NPR-A annually, for an estimated total of 59,342 miles over the life of the IAP – estimated to be approximately 70 years (BLM 2020a: Appendix F, p. F-3) (Table 3.1).

Vehicles allowed for use in winter overland moves would exert low ground pressure. In winter, vehicles would be permitted to travel only over snow-covered ground frozen to a sufficient depth to minimize soil and vegetation impacts. Typically, overland moves would originate in Prudhoe Bay or Utqiaġvik and would use overland travel routes or sea ice. Streams are commonly crossed at dry streambeds, on grounded ice, or ice thick enough to support the crossing vehicles. Overland moves would typically begin in December when there is adequate snow cover and the ground is frozen and end in early May. On a yearly basis, 4 - 60 trains of 4 -15 vehicles and attached sleds could engage in overland travel. Should oil and gas exploratory drilling and development increase the amount of general activity on the North Slope, the number of overland moves would likely be closer to the high end of this range.

Summer ground activity
Although travel off gravel pads is easiest in winter and generally environmentally preferable, some vehicle travel off pads does occur in North Slope oil fields during the summer to accomplish specific tasks. Any off-pad travel would be conducted in accordance with ROP L-1, which would, among other things, limit such travel to low ground pressure vehicles in attempt to minimize effects on tundra.

Summer vehicle tundra travel is commonly associated with spill prevention and preparedness measures required in spill prevention plans. Each summer season, low-ground-pressure vehicles might be used to transport and place floating booms across streams downstream from pipelines. These booms are left in place through the summer to capture any oil that might spill from a pipeline and then would be retrieved with low-ground-pressure vehicles before freeze-up. Pipeline inspections may also entail summer vehicle travel on the tundra.

Periodically, spill response training may occur along and downstream from pipelines in summer.

Seismic exploration
Two types of seismic surveys could be used in the Action Area: two-dimensional (2-D seismic) and three-dimensional (3-D seismic). 2-D seismic surveys involve widely spaced survey lines

(i.e., several miles apart) for broad reconnaissance that is cost effective for initial data collection but is unlikely to be used in the NPR-A as much of the NPR-A has already been covered by 2D seismic surveying. 3-D seismic requires a dense grid of seismic lines (approximately 200 ft apart) to provide a more detailed image of the subsurface under the survey area. Each survey can cover 400 to 900 square miles. Future 3D seismic surveys are expected to be conducted at the lease block level as companies look to gain information on promising areas. In contrast to historical practices, modern seismic surveying uses fewer heavy vibroseis vehicles and occurs on and near snow trails when the tundra is frozen in order to minimize any impacts to the surface resources.
It is foreseeable under the Proposed Action that up to twelve 3-D surveys would be conducted through the life of the IAP. Surveys would occur approximately every other year after the signing of the ROD. It is assumed that none of these would be in areas unavailable for leasing because no drilling would be allowed there. It is also assumed that exploration-focused seismic surveys would not be repeated where good data gathered with modern technology are already available.

Exploratory drilling
It is expected that lease-level winter exploration would continue to occur outside of the existing lease units within the NPR-A. The exploration drilling would likely be informed by new or existing seismic survey data. Exploration drilling would typically occur during the winter months (January to mid-April) when conditions facilitate tundra travel and the construction of ice pads, ice roads, snow trails, and ice airstrips. Drilling would be conducted from ice pads. Ice roads and snow trails would provide seasonal routes for moving drill rigs and other equipment, materials, supplies, and personnel accommodations.

Field Development
A production operation complex would, at a minimum, contain a production pad that could potentially support dozens of wells and a large central processing facility (CPF) for each oil field. An airstrip usually is located near the CPF to allow transport of supplies and personnel to the field site. A typical pad for a CPF and associated facilities (e.g., airstrip, worker's camp, and production well pad) is approximately 80 acres (BLM 2012). Components of the CPF may be constructed as transportable modules in offsite locations, perhaps outside Alaska, barged to the North Slope, then moved over gravel roads or winter ice roads to the project location and assembled. All buildings would be supported above the ground on pilings to accommodate ground settling or frost heaving.

The development scenario estimates that 0–2 CPFs could be developed for oil production in the NPR-A under the Proposed Action. A total of 2–20 oil satellite production pads are anticipated as well, with each of these typically requiring 15 acres and a 10–15-mile gravel road to connect to a CPF. These estimates include development of discovered oil in the Bear Tooth unit (northeastern NPR-A) and developments near Teshekpuk Lake, Smith Bay, and Umiat.

Road and pad construction
Gravel is the preferred material for pad construction. Gravel pad construction would be needed for wellheads, production and support facilities, roads, and airstrips. Pads would be constructed

to a thickness sufficient to maintain a stable thermal regime. This development scenario assumes an average 7-foot thickness, based on data from the Willow Master Development Plan (BLM 2020a). An estimated 20–128 miles of in-field gravel roads will be needed in the NPR-A under the Proposed Action. Total gravel needs range from 1,466,433 – 11,639,172 cubic yards, depending on the level of development.

Gravel resources in the planning area are generally scarce and may be a major factor in the viability of future developments. Companies may need to transport gravel from outside the planning area to facilitate development.

Pipelines

The development scenario assumes that all oil produced in the NPR-A would ultimately be moved east to Pump Station 1 of TAPS. Typically, oil pipeline routes are laid out in straight-line segments (or alignments) and are installed aboveground on vertical support members (VSMs). On the North Slope, this is preferred over buried pipelines, because above-ground pipelines take less time to construct, cause less disruption to the land during installation, are easier to monitor and repair, and provide more flexibility for later modification (e.g., adding new pipelines) than buried pipelines. The development scenario estimates that 15–122 miles of VSMs would be required for oil production.

Pipeline construction is expected to occur during the winter concurrent with the construction of the development and production facilities. Pipelines would be installed above ground on VSMs spaced 35 to 70 ft apart. Pipelines would be placed a minimum of 7 ft above the tundra.

Clearance is generally higher (up to 20 ft) over topographic lows (stream valleys), because engineering requirements call for a nearly level pipeline route. Pipelines crossing large rivers, such as the Colville River, could be on bridges or buried using horizontal directional drilling techniques. Elevated pipelines would likely cross narrow streams on suspension spans to minimize impacts to stream banks and riparian vegetation and to avoid potential problems associated with corrosion, maintenance, and abandonment of buried pipelines. Power lines would be placed in cable trays on or suspended from VSMS. Routine pipeline maintenance would occur during the winter months when ice roads or hardened snow trails provide ready access; summer activities would occur on an emergency basis only. Pipelines would be monitored both electronically (remotely) and visually (e.g., with aircraft over flights) to determine pipeline integrity.

Marine development

Under the Proposed Action, oil and gas leasing would not be allowed in marine waters or associated barrier islands of the NPR-A (Lease Stipulation K-4). This includes Kasegaluk Lagoon, Wainwright Inlet/Kuk River, Peard Bay, Elson Lagoon, Dease Inlet, Admiralty Bay, and other unnamed marine features. Lease Stipulation K-5 further ensures offshore protections by prohibiting oil and gas exploratory well drill pads, production well drill pads, and central processing facilities in coastal waters, on islands between the northern boundary of the Reserve and the mainland, and inland areas within one mile of the coast. Other facilities necessary for oil and gas production within NPR-A that must be within these marine areas (e.g., barge landing, seawater treatment plant, or spill response staging and storage areas) would not be precluded.

Also, some coastal areas and marine waterbodies would not be precluded from receiving a pipeline originating from offshore leases that are not administered by the BLM.

Vessel activity
Sealifts would likely be used to deliver large processing and drill site modules, as well as bulk construction materials during the summer months (mid-July to late September). Each sealift would include multiple barges and tugboats. A large development project could use approximately 30-50 sealift barges and 50-100 tugboats to transfer all necessary construction materials.
There are currently no docks in the NPR-A, and the development scenario does not predict that any will be built, although dock infrastructure proposed in the Willow Master Development Plan to be built at Oliktok Point (outside of the NPR-A) could be reused. The first development operations in the NPR-A were mobilized from existing marine loading sites (West Dock and Oliktok Point) that were used to transition barged materials to on-shore locations for eventual ice road transport to the NPR-A.

A barge landing and storage pad could be required to transport large equipment such as CPF modules and drill rigs into the development area. This type of pad would cover approximately 10 acres and require approximately 100,000 cubic yards of gravel. Alternatively, a module transfer island, covering approximately 12 acres, could be constructed and would allow for the transfer of larger modules, which would require fewer trips (BLM 2019b). Modules and equipment would be offloaded from barges in 3 to 5 days and stored on the staging pad until winter, when transportation could resume via ice road or snow-packed trail. Possible locations for the barge landing include Atigaru Point, Smith Bay, and Utqiaġvik; however, additional study would be needed to confirm site suitability. Barges with supplies would be transported from Dutch Harbor in Unalaska (Appendix A, Map A-2).

Non-recreational airboat use would be allowed on streams, lakes, and estuaries that are seasonally accessible. For this analysis, it is assumed that no facilities would be constructed adjacent to waterways that could support non-recreational use of watercraft because of the setbacks required by stipulations K-1, K-2, and K-5 and ROP E-2 (Appendix B).

Abandonment and restoration
Wells are plugged and abandoned as the field matures. Abandonment activities would likely begin stepwise through the life of the field and could last 2 to 5 years after the end of production. Abandonment operations generally include removing all equipment, plugging all wells, restoring the site, cutting well casing at least 3 ft below the surface, and conducting final environmental studies.

The goal of restoration for the NPR-A after oil and gas production ceases is to reestablish the previous ecosystem function. Abandonment and reclamation activities within the NPR-A are governed by 43 CFR Part 3160, subpart 3162, which requires permittees to reclaim the land in accordance with plans approved by the BLM (43 CFR §§ 3162.3-4 and 3162.5-1).

Activities not associated with oil and gas exploration and development

Aircraft Use

Aircraft activities include point-to-point transport of personnel or supplies, surveys, or monitoring activities. Most aircraft activity would take place during spring, summer, and fall. It is likely that aircraft would fly over nearly all of the NPR-A. Use of aircraft to complete cultural and paleontological surveys would most likely occur along river drainages and coastal areas. Aerial wildlife surveys would be most common during June and July over caribou and waterfowl habitat areas.

Watercraft Use

Watercraft would be allowed for summer transportation. Watercraft would likely be used by researchers during study efforts if facilities or areas of concern were located near large water bodies such as the sea, rivers, or large, deep-water lakes. These activities would occur during the summer months, but the type of activities and their frequency and locations remain speculative because data quantifying these activities have not been collected for the NPR-A.

Excavation and Collection

Excavating and collecting archaeological, paleontological, geologic, and soil resources may occur throughout the NPR-A. Excavation usually is done using a trowel or hand shovel; is usually limited to areas of several square ft; and rarely extends more than three ft below the surface. Some excavations, however, require heavy machinery and blasting (Alaska Report 2007). If an archaeological site is studied in detail or if a geologic section is mapped, then larger areas might be excavated. Most excavation would probably occur within the primary drainages and along coastal areas of the NPR-A.

Land-Based Travel and Camping

Ground activities include small groups of scientists, or recreationists (including guided hunting parties) hiking across tundra or floating down a river. Ground camps range from those supplied by aircraft to those with only a backpack's worth of supplies. Because of the fragile nature of thawed tundra during the summer, large camps are normally restricted to durable areas such as gravel bars, beaches, or existing gravel pads. Large camps could include a fuel tank or bladder of up to 5,000 gallons, or fuel in drums, and could have 20 or more people. Smaller parties use "fly" camps that are set up and moved every few days by boat, raft, or aircraft, and have nothing more than stove fuel. Backpack camps have even fewer supplies than fly camps and tend to move every day. The BLM would issue land-use authorizations that allow activities such as research and monitoring.

Community Overland Moves

Current management policy for the NPR-A allows only those activities that would have a negligible impact on the environment. Permafrost underlies the entire NPR-A, and wetlands cover the majority of the NPR-A. Due to the types of soils that exist in the NPR-A, the BLM does not issue permits for summer inter-village overland travel in the NPR-A. Instead, the BLM issues Rights-of-Way for winter overland moves to bring supplies to villages and other places through its Community Winter Access Trails (CWAT) program (BLM 2019a). Under the CWAT program, vehicles with wide tracks or low-pressure tires are used to pre-pack and maintain snow trails. Pilot vehicles including Rolligons or Steigers lead scheduled caravans of up to 15 regular highway vehicles between villages. In 2019, the CWAT program created 300 miles of trails connecting Utqiaġvik, Atqasuk, Wainwright, and Nuiqsut from February to late April. On a yearly basis, 10–15 trains of 4–15 vehicles and attached sleds could engage in overland travel (BLM 2019a).

Solid and Hazardous Waste Removal

Wastes, including those considered hazardous, are associated with human activity. A phased approach would be used to address hazardous and solid wastes in the NPR-A. The process for hazardous waste removal is consistent with guidance and regulations from the Comprehensive Environmental Response, Compensation, and Liability Act and National Contingency Plan. It includes verification, site evaluation, and site cleanup. If the initial examination were to suspect or verify a release, a risk assessment would be completed to determine whether the situation posed an imminent threat to either public health or sensitive environments. If the situation warranted immediate action, an emergency response or removal action could be initiated.

If the initial examination verified that the release of a reportable quantity of a hazardous substance (as defined in 40 CFR § 302.4) occurred, a threat existed, or a release was suspected but the situation did not warrant an emergency response, a site evaluation would be conducted. The site evaluation process would be concurrent with identifying potentially responsible parties. The responsible party, once identified, would complete, under federal and State oversight, all remaining evaluative and remedial actions.

Areas that support relatively high levels of human contact and biologically sensitive areas would have the highest priority for contaminant removal actions. At lower priority sites, alternatives to removal could include in-situ treatments such as fencing the site to secure it and prevent contact by humans or wildlife or capping the contaminated area with clean soil or gravel.

Recreation and Film Permits

The BLM issues special recreation permits to commercial recreation operators, such as hunting and float-trip guides, who focus their activity along the Colville River and other larger rivers in the NPR-A, such as the Utukok and Kokolik. Guided hunting or float trips would consist, on average, of 10 people, and commonly occur from March through September. Some special recreation permits could also be associated with other types of use, such as filming of natural resources and wildlife. Float-equipped aircraft could be used to take hunters or sightseers to lakes or rivers. These flights could result in camping within the NPR-A at a level similar to that of fly-in camps or backpack camps.

Boating parties along the rivers would carry enough fuel for a small stove and their boat engines. They would typically camp for no more than one night in any one place, and their camping practices and impacts would generally be consistent with those of fly camps or backpack camps described earlier in this section under "Land-based activities and camping."

In addition, small parties use the rivers for non-commercial recreational hunting and fishing or float trips, and there is a limited amount of backpacking in the NPR-A. The frequency and locations of these activities are not quantified, and permits are not required.