

Chapter Five Natural Environment





This page is intentionally left blank





CHAPTER 5: NATURAL ENVIRONMENT

GEOGRAPHY

The North Slope Borough is situated on the Arctic Coastal Plain of Alaska, bound by the Brooks Mountain Range to the south and the Chukchi and Beaufort Seas to the west and north. The Arctic Coastal Plain is a gently rolling, treeless landscape characterized by a wide expanse of flat tundra with thaw lakes, drained lake basins, polygonal pattered ground, pingos, and tussock-laden tundra overlaying permafrost.^{77, 78}

The NSB encompasses an area of nearly 95,000 square miles, across which eight rural communities are dispersed. The majority of these communities are coastal on the Beaufort or Chukchi seas, with only one community being more than 30 miles from a coastline, Anaktuvuk Pass.⁷⁹ Freshwater lakes, streams, and rivers are abundant in the region and support a variety of wildlife.

Some rivers within the NSB have been designated by the U.S. Congress to be Wild and Scenic Rivers, including the Sheenjek, Ivishak, and Wind rivers. The intent of the designation is to safeguard rivers with outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations.⁸⁰

VEGETATION AND WETLANDS

Low shrubs, mosses, sedges and lichens cover the North Slope of Alaska.⁸¹ Arctic Tundra receives little precipitation, but wetlands are abundant due to the impermeable layer of permafrost under the thin tundra soil.⁸² Wetlands in the NSB are primarily freshwater emergent wetlands, a grouping which includes wet meadows, marshes, swamps, or bogs, where standing surface water and ice provide habitat for plants that reach through the water to reach air.⁸³

Arctic wetlands provide many useful functions and values. The various ponds, lakes, and drainages of the North Slope regulate runoff through storage in the active layer, slowly releasing water to streams over extended periods. These wetlands retain or distribute sediments, nutrients, and toxicants. When planning future development, careful siting can minimize impacts to higher value wetland areas, where disruptions may adversely affect the habitat of sensitive and important wildlife species, or functions benefitting the community.

⁷⁷ U.S. Department of the Interior. U.S. Geological Survey. 2012. *Changing Arctic Ecosystems: Research to Understand and Project Changes in Marine and Terrestrial Ecosystems of the Arctic*. <https://pubs.usgs.gov/fs/2011/3136/>.

⁷⁸ CAVM Team. 2003. *Circumpolar Arctic Vegetation Map*. (1:7,500,000 scale), Conservation of Arctic Flora and Fauna (CAFF) Map No. 1. U.S. Fish and Wildlife Service, Anchorage, Alaska. ISBN: 0-9767525-0-6, ISBN-13: 978-0-9767525-0-9. www.geobotany.uaf.edu/cavm.

⁷⁹ Google. (n.d.) [Google Earth Pro ruler, Alaska North Slope]. Retrieved June 7, 2018 from Google Earth Pro software.

⁸⁰ National Wild and Scenic Rivers System. 2014. *About the WSR Act*. www.rivers.gov/wsr-act.php.

⁸¹ CAVM Team. 2003. *Circumpolar Arctic Vegetation Map*. (1:7,500,000 scale), Conservation of Arctic Flora and Fauna (CAFF) Map No. 1. U.S. Fish and Wildlife Service, Anchorage, Alaska. ISBN: 0-9767525-0-6, ISBN-13: 978-0-9767525-0-9. www.geobotany.uaf.edu/cavm.

⁸² North Slope Borough. 2017. *Point Hope Comprehensive Plan 2017 - 2037*. Prepared for the North Slope Borough by ASRC Energy Services and UMIAQ Environmental. www.north-slope.org/assets/images/uploads/PHO_Adopted_Comprehensive_Plan.pdf.

⁸³ U.S. Department of the Interior. U.S. Geological Survey. 1997. *Wetland Definitions and Classifications in the United States*.





SOILS/GEOLOGY

Soils in the North Slope Borough are typical of the Arctic Coastal Plain and include fine-grained, organic-rich silt and some sand which has been deposited by rivers.⁸⁴ These soils are topped by a thin, peaty tundra mat which supports a variety of vegetation. Surficial geological deposits of coal, marine sand, and bedrock also dot the landscape. Outcroppings of coal have been found in or near the communities of Atkasuk, Point Lay, Nuiqsut, Point Hope, and Anaktuvuk Pass.⁸⁵ The NSB's distinctive rolling tundra is formed over a continuous region of deep permafrost.

Permafrost

Permafrost is defined as ground (soil or rock and included ice or organic material) that remains at or below 0°C for at least two consecutive years.⁸⁶ Thick, continuous permafrost generally exists north of Kotzebue Sound.⁸⁷ In permafrost regions, the uppermost layer of soil that freezes and thaws seasonally is the active layer. The highest moisture content can be found in the active layer. Below the active layer lies the permafrost table; the highest moisture content in the permafrost tends to be found in this layer.⁸⁸

Freeze-thaw cycles of permafrost create polygonal ground patterns which are separated by ice wedges.⁸⁹ Also present among soils on the North Slope of Alaska are ice lenses, localized ice formations that often melt at a different rate than the surrounding soil. Coastal bluffs experiencing erosion expose permafrost soils and ice wedges, which are vulnerable to thermal degradation (melting). Climate change accelerates erosion and melting, increasing water movement.

Climate

The climate in the Alaskan Arctic is affected by many factors including atmospheric pressure, temperature, geography, wind, humidity, clouds, and precipitation. A tundra climate prevails on the North Slope, with cool and cloudy summers and long cold winters.⁹⁰

Temperatures are moderated by surrounding topography and proximity to marine waters. Flat and treeless tundra means no natural wind barriers or protected valleys where dense cold air can settle as commonly happens in interior Alaska.⁹¹ The average temperature for the year on the North Slope is 25.0°F (-3.9°C). The warmest month, on average, is July with an average temperature of 60.5°F (15.8°C). Freezing temperatures can occur at any time of year, but the coolest month on average is January, with an

⁸⁴ North Slope Borough. 2017. *Point Hope Comprehensive Plan 2017 - 2037*. Prepared for the North Slope Borough by ASRC Energy Services and UMIQA Environmental. www.north-slope.org/assets/images/uploads/PHO_Adopted_Comprehensive_Plan.pdf.

⁸⁵ See Chapter 10: Energy of this plan for more information.

⁸⁶ International Permafrost Association. 2015. *Permafrost Distribution*. <https://ipa.arcticportal.org/publications/occasional-publications/what-is-permafrost>.

⁸⁷ Alaskool: Online Material about Alaska Native History, Education, Languages, and Cultures. n.d. *Alaska Native Curriculum and Teacher Development Project*. www.alaskool.org/resources/regional/nw_reg_pro/permafrost.html.

⁸⁸ Alaska Native Tribal Health Consortium (ANTHC) Center for Climate and Health. 2010. *Climate Change in Point Hope, Alaska: Strategies for Community Health*. www.cidrap.umn.edu/sites/default/files/public/php/26952/Climate%20Change%20HIA%20Report_Point%20Hope_0.pdf.

⁸⁹ U.S. Department of Agriculture. 1979. *Exploratory Soil Survey of Alaska*. www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/alaska/AK_exploratory1979/alaska.pdf.

⁹⁰ National Snow & Ice Data Center. 2018. *Arctic Weather and Climate*. https://nsidc.org/cryosphere/arctic-meteorology/climate_vs_weather.html.

⁹¹ State of Alaska. Department of Fish and Game. 2001. *Alaska's Tundra and Wildlife*. www.adfg.alaska.gov/static/education/educators/curricula/alaskawildlifecurriculum/pdfs/alaskas_tundra_wildlife_curriculum.pdf.





average temperature of -8.5°F (-22.5°C). Inland communities such as Anaktuvuk Pass are influenced by the interior Arctic climate, and register warmer in the summer and cooler in the winter than other coastal communities within the NSB.

The average amount of precipitation for the year is 13.0" (330.2 mm) on Alaska's North Slope. The month with the most precipitation on average is August with 2.4" (61 mm) of precipitation. Winter precipitation generally consists of dry snow, with an average of 46.2" of snow (0 cm). The month with the most snow is October, with 9.2" of snow (23.4 cm).⁹² Many communities within the NSB experience persistent high winds, which can cause issues with snow drifting around infrastructure and melting issues during breakup.⁹³ Inversions are also common in the Arctic, when cold air settles close to the ground with warm air on top of it.

Air Quality

According to ADEC's Air Quality Advisories/Episodes List, there has been only one air quality advisory on the North Slope since 2011.⁹⁴ This was issued in July of 2017 due to migration of wildlife smoke from the northern Yukon Flats, and lasted for four days. No additional air quality warnings or episodes were issued from 2011 – 2018.

While air quality advisories on the North Slope have been minimal, rural communities do experience periods of decreased air quality. The 2012 Health Impact Assessment (HIA) notes that the Arctic has unique climate-related factors which can contribute to decreased air quality and increased levels of exposure to air pollution. For example, low temperatures increase incomplete combustion products and create temperature inversions, trapping pollution near homes and people. Residents of North Slope communities have voiced concern regarding airborne particulates from gravel roadways, particularly during strong wind events. These particulates can have negative effects on health, particularly to children and the elderly.⁹⁵

Additionally, the Prudhoe Bay oilfield can impact air quality by diesel combustion and natural gas processing activities. Air quality changes due to development has primarily been voiced as a concern in Nuiqsut, the community closest to the Prudhoe Bay oilfield.⁹⁶ A recent study published in Atmospheric Environment used air quality data collected in Utqiagvik to find that Prudhoe Bay is a significant component of the tiny chemical particles suspended in the air.⁹⁷ Additional air quality monitoring stations have been added as recently as 2016.^{98, 99}

⁹² Weatherbase. 2018. *North Slope, Alaska Weather*. www.weatherbase.com/weather/weather-summary.php3?s=12305&cityname=North+Slope%2C+Alaska%2C+United+States+of+America&units=&set=metric.

⁹³ North Slope Borough. 2015. *Kaktovik Comprehensive Plan*. www.north-slope.org/assets/images/uploads/APRIL_2015_KAK_Comp_Plan_adopted.pdf.

⁹⁴ State of Alaska. Department of Environmental Conservation. 2018. *Complete Air Quality Advisories/Episodes List*. <http://dec.alaska.gov/Applications/Air/airtoolsweb/Advisories>.

⁹⁵ North Slope Borough. Department of Health and Social Services. 2012. *Baseline Community Health Analysis Report*. Prepared for the North Slope Borough by Jana McAninch, MD, MPH. www.north-slope.org/assets/images/uploads/BaselineCommunityHealthAnalysisReport.pdf.

⁹⁶ Ibid

⁹⁷ Kolesar, K.R., Cellini, J., Peterson, P.K., Jefferson, A., Tuch, T., Birmili, W., Wiedensohler, A. Pratt, K.A. 2017. *Effect of Prudhoe Bay emissions on atmospheric aerosol growth events observed in Utqiabvik (Barrow), Alaska*. *Atmospheric Environment*, 152, 146-155. www.sciencedirect.com/science/article/pii/S1352231016309785.

⁹⁸ Pratt, K.A, Gunsch, M, Kirpes, R.M., Kolesar, K.R., Moffett, C.E., Barrett, T.E., Sheesley, R.J. 2016. *Prudhoe Bay Oilfield Influences on Atmospheric Particulate Matter (PM) on the North Slope of Alaska*. www.boem.gov/D1-Environmental-Pratt.

⁹⁹ Dobson, Jennifer, Ritter, Troy L., Driscoll, David. 2010. *Impact of Oil Development on Air Quality in an Alaska Native Village*. www.researchgate.net/publication/266791836_Impact_of_Oil_Development_on_Air_Quality_in_an_Alaska_Native_Village.





Water Quality

The ADEC Alaska Monitoring and Assessment Program conducts aquatic resource surveys across Alaska to measure water quality based on a variety of indicators, including chemical contaminants, macroinvertebrate community structure, and water chemistry. A list of impaired waters is maintained by the ADEC. There are not any impaired water bodies within the NSB included in the ADEC Catalog. However, the Catalog has not been updated since 2010. Across the Northern Region, surveys have been completed on Arctic Wetlands (2011) and Arctic Lakes (2013), among other more targeted location surveys. Both surveys showed overall water quality as good.¹⁰⁰ Waterbodies near human activity, contaminated sites, or other potential pollution sources may experience long-term or seasonal contamination, and need to be tested on an individual basis. Water quality testing is required for any drinking water source, and the ADEC Drinking Water Program ensures drinking water sources are compliant with state and federal drinking water regulations.¹⁰¹ More advanced testing techniques may identify newly recognized contaminants, which may be present in village water sources.

WILDLIFE

The North Slope Borough is abundant with wildlife. Migratory birds, land mammals, marine mammals, invertebrates, and fish find habitat in the lands and waters of northern Alaska, and provide subsistence resources to residents.

Migratory birds travel to coastal breeding areas in late March through early May where feeding, breeding, and nesting takes place in arctic bays, lagoons, and river outlets. For the duration of the brief summer, the North Slope is home to millions of birds, including seabirds, waterfowl, shorebirds, songbirds, and upland birds and raptors.^{102, 103}

Wetland and upland habitats support land mammals including caribou, muskox, arctic and red fox, wolf, wolverine, arctic and ground squirrel, among many others. Land mammals are adapted to their arctic environments and have unique ways of dealing with the cold environment, such as migrating out of the arctic, conservation of energy or hibernation, and circulatory system adaptations.¹⁰⁴

There are four major caribou herds on the North Slope, including the Teshekpuk Lake Herd, Central Arctic Herd, Western Arctic Herd, and Porcupine Herd. These herds migrate between their southern winter grounds to northern

¹⁰⁰ State of Alaska. Department of Environmental Conservation. 2018. *Water Quality Reports*. <https://dec.alaska.gov/water/water-quality/reports>.

¹⁰¹ State of Alaska. Department of Environmental Conservation. 2018. *Drinking Water Program Overview*. <https://dec.alaska.gov/eh/dw/overview/>.

¹⁰² Chance, Norman. 2009. *Arctic National Wildlife Refuge Special Report – Birds in the Refuge*. <http://arcticcircle.uconn.edu/ANWR/anwrbirds.html>.

¹⁰³ North Slope Borough. 2018. *Common Birds on the North Slope*. www.north-slope.org/departments/wildlife-management/studies-and-research-projects/migratory-birds/birds-on-north-slope.

¹⁰⁴ Mowry, Tim. 2010. Fairbanks News Miner. *Animals do different things to survive winter in Alaska*. www.newsminer.com/features/outdoors/animals-do-different-things-to-survive-winter-in-alaska/article_866180aa-465b-5c0c-94e2-0f89e5c3f41b.html.





coastal summer grounds to forage, calve, and for insect relief.¹⁰⁵

Marine mammals including the bowhead, beluga, and gray whale, ringed, bearded, and spotted seal, walrus, and polar bear are found in the waters and coastal environments of the Beaufort and Chukchi Seas. Marine mammals are highly important to the marine ecosystem and are valued for their vast subsistence resources. Food resources for marine mammals are varied and include fish, benthic invertebrates, and other marine mammals.¹⁰⁶

Fish, both marine and freshwater, inhabit Alaska's North Slope. Fish commonly found in the Beaufort and Chukchi Seas include multiple species of cod, flounder, cisco, and whitefish, as well as sculpin, herring, and smelt.¹⁰⁷ Additionally, many rivers which drain into the Chukchi or Beaufort Seas and their tributaries provide spawning and rearing habitat for anadromous fish species. Anadromous fish are fish which spend portions of their life cycle in both fresh and salt waters.¹⁰⁸

Protected Species

Wildlife species can be protected by many different agencies and regulations. Key regulations affecting NSB wildlife and use thereof are outlined in this section, however this is not an exhaustive list. Traditional Knowledge of wildlife populations growing or declining can

influence protections taken by subsistence users. Hunting, trapping, and fishing regulations, as well as land ownership and special designation of lands may also apply.

All thirteen great whales, including bowhead, are protected by the International Whaling Commission. Bowhead hunts are regulated by a catch limit imposed by the IWC. The Commission estimates that subsistence hunts take less than one percent of the stock of bowhead whales per year.¹⁰⁹ The Alaska Eskimo Whaling Commission (AEWC) advocates for subsistence whaling rights of Alaska Eskimos and the protection of habitat of the bowhead whale.

At the federal level, the Migratory Bird Treaty Act (MBTA) (1918), the Marine Mammal Protection Act (MMPA) (1972), and the Endangered Species Act (ESA) (1973) apply to certain and specific wildlife species found within the NSB. Species may experience protection under more than one federal regulation.

All native birds in Alaska except grouse and ptarmigan are federally protected under the MBTA, which prohibits the "take" of migratory birds, their feathers, or their nests. The exception is the Willow ptarmigan, which is protected as a species of least concern. "Take" means to harass, harm, pursue, hunt, shoot, wound, kill, capture, or collect, or to attempt to engage in any such conduct.¹¹⁰ In 1997, the U.S. Congress ratified treaty amendments that made

¹⁰⁵ State of Alaska. Department of Fish and Game. 2014. *Alaska Fish and Wildlife News August 2014*. www.adfg.alaska.gov/index.cfm?adfg=wildlifeneews.view_article&articles_id=678.

¹⁰⁶ U.S. Department of Commerce. National Oceanic and Atmospheric Administration. 2018. *Marine Mammal Laboratory*. www.afsc.noaa.gov/nmml/education/science/studymm4eat.php.

¹⁰⁷ North Slope Borough. 2018. *Common Fish on the North Slope*. www.north-slope.org/departments/wildlife-management/studies-and-research-projects/fish/common-fish-north-slope.

¹⁰⁸ State of Alaska. Department of Fish and Game. 2018. *Anadromous Waters Catalog*. <http://extra.sf.adfg.state.ak.us/FishResourceMonitor/?mode=awc>.

¹⁰⁹ International Whaling Commission. 2015. *Aboriginal Subsistence Whaling*. <https://iwc.int/aboriginal>.

¹¹⁰ U.S. Department of the Interior. U.S. Fish and Wildlife Service. 2018. *Endangered Species Glossary*. www.fws.gov/midwest/endangered/glossary/index.html.





it legal for residents of villages within subsistence harvest areas to take migratory waterfowl for subsistence during the traditional spring season. The amendments also required that a meaningful role be provided to Alaska Natives in the development and implementation of regulations affecting the non-wasteful taking of migratory birds, leading to the formation of the Alaska Migratory Bird Co-Management Council. Subsistence migratory bird regulations are now developed annually by the USFWS based on recommendations of the Alaska Migratory Bird Co-Management Council.¹¹¹

The MMPA protects all marine mammals, with jurisdiction shared between NOAA Fisheries (also known as the National Marine Fisheries Service or NMFS) for seals, sea lions, whales, dolphins, and porpoises, and the USFWS for sea otter, polar bear, and walrus.¹¹² Like the MBTA, the MMPA makes it illegal to “take” marine mammals without a permit.¹¹³ The MMPA includes an exemption for Alaska Natives living on the coast of the North Pacific an exemption, which allows for the non-wasteful harvest of marine mammals for subsistence and for creating and selling handicrafts and clothing.¹¹⁴

The ESA also prohibits “take” of listed species, but additionally restricts transportation and selling of listed species and their parts, prohibits federal activities which jeopardize their continued existence or adversely modifying their habitat, and mandates development and implementation of recovery plans.¹¹⁵ A species is

considered endangered if in danger of extinction throughout all or a significant portion of its range, and considered threatened if likely to become endangered within the foreseeable future.¹¹⁶ The ESA includes an exemption for Alaska Natives which allows taking of listed species when the taking is primarily for subsistence purposes and it doesn’t negatively affect the listed species. Specific information regarding ESA-listed species within the NSB is included in the following section.

At the state level, the Alaska Department of Fish and Game (ADF&G) is the main entity involved with in wildlife protections. ADF&G maintains hunting, trapping, and fishing regulations for the entire State of Alaska. Additionally, ADF&G maintains the Catalog of Waters Important for the Spawning, Rearing, or Migration of Anadromous Fishes for the State of Alaska (the Catalog). Under Alaska Statute 16.05.871, listing in the Catalog requires ADFG approval should any agency or person wish to construct a hydraulic project or use, divert, obstruct, pollute, or change the natural flow or bed of listed rivers, or to use wheeled, tracked, or excavating equipment or log-dragging equipment in the bed of listed rivers.

Threatened and Endangered Species

The North Slope Borough Department of Wildlife Management facilitates sustainable harvests and monitors populations of fish and wildlife species through research, leadership, and advocacy from local to international levels. Additionally, the

¹¹¹ U.S. Department of the Interior. 2018. *Federal Subsistence Management Program*. www.doi.gov/subsistence.

¹¹² Ibid

¹¹³ Marine Mammal Center. 2018. *Marine Mammal Protection Act*. www.marinemammalcenter.org/what-we-do/rescue/marine-mammal-protection-act.html.

¹¹⁴ U.S. Department of the Interior. 2018. *Federal Subsistence Management Program*. www.doi.gov/subsistence.

¹¹⁵ U.S. Department of the Interior. 2018. U.S. Fish and Wildlife Service. 2018. *Endangered Species Listing*. www.fws.gov/alaska/fisheries/endangered/listing.htm.

¹¹⁶ U.S. Department of the Interior. U.S. Fish and Wildlife Service. 2017. *Endangered Species Act: An Overview*. www.fws.gov/endangered/laws-policies/.





Department of Wildlife Management encourages borough resident participation in the management of wildlife resources by keeping the resources at healthy population levels, essential to successful subsistence harvests.¹¹⁷

The Endangered Species Act (1973) requires federal agencies work to conserve threatened and endangered species and the habitats on which they depend. The goal is to protect and recover imperiled species and their habitats. The NSB and surrounding waters provide habitat to

eight species which are listed as threatened or endangered. The Pacific Walrus is currently a candidate for listing under the ESA, which means that the USFWS has sufficient information to propose them as threatened or endangered but development of the proposed listing is precluded due to higher priority actions.¹¹⁸ Table 12 shows the ESA status of the eight listed species. The Eastern North Pacific Distinct Population Segment (DPS) of Gray Whales were previously listed as endangered but were delisted in 1994 due to recovery.¹¹⁹

Table 12: NSB Endangered Species Status

Species Common Name	ESA Status	Jurisdiction	Additional Protections
Bearded Seal (Beringia DPS)	Threatened	NOAA	MMPA Depleted ADF&G
Bowhead Whale	Endangered	NOAA	MMPA Depleted IWC Protected ADF&G
Eskimo Curlew	Endangered – may be extinct	USFWS	MBTA ADF&G
Polar Bear	Threatened	USFWS	MMPA Protected ADF&G
Ringed Seal (Arctic DPS)	Threatened	NOAA	MMPA Depleted ADF&G
Spectacled Eider	Threatened	USFWS	MBTA ADF&G
Steller’s Eider	Threatened	USFWS	MBTA ADF&G

The ESA requires the designation of critical habitat for a listed species when it is “prudent and determinable.”¹²⁰ Critical habitat areas are essential to the conservation of a species, and

designation of critical habitat affects federal agency actions or federally funded or permitted actions within the designated area. Of the ESA-listed species with range in the NSB, two have

¹¹⁷ North Slope Borough. 2018. *Department of Wildlife Management*. www.north-slope.org/departments/wildlife-management.

¹¹⁸ U.S. Department of the Interior. U.S. Fish and Wildlife Service. 2017. *Candidate Species: Section 4 of the Endangered Species Act*. www.fws.gov/endangered/esa-library/pdf/candidate_species.pdf.

¹¹⁹ U.S. Department of the Interior. U.S. Fish and Wildlife Service. 1994. *50 CFR Part 17: Final Rule to Remove the Eastern North Pacific Population of the Gray Whale From the List of Endangered Wildlife*. https://ecos.fws.gov/docs/federal_register/fr2597.pdf.

¹²⁰ U.S. Department of the Interior. U.S. Fish and Wildlife Service. 2013. *ESA Basics*. www.fws.gov/endangered/esa-library/pdf/ESA_basics.pdf.





designated critical habitat within the NSB: Steller’s eider and polar bear, shown in Map 4. Critical habitat for the Arctic Ringed Seal is currently proposed.

Three distinct types of critical habitat currently exist for polar bear: sea ice habitat, terrestrial denning habitat, and barrier island habitat. Sea ice critical habitat provides for bear feeding, breeding, denning, and movement. Barrier island critical habitat encompasses offshore islands offset from the mainland coast of Alaska. Areas within one mile of the barrier islands is known as the no-disturbance zone. According to the USFWS, a one mile distance was chosen because female polar bears were shown to react to snow machine traffic within this distance, and adult females are the most important age and sex class in the population.¹²¹ The barrier island habitat and no-disturbance zone exclude the coastal townsites of Kaktovik and Utqiagvik.

Both the spectacled eider and Steller’s eider are listed as threatened under the ESA. After departure from their nesting and breeding grounds in the late summer and fall, both Steller’s and spectacled eiders migrate south through the Chukchi Sea to southwest Alaska to molt and winter. Spectacled eiders gather along the Chukchi and Bering Sea coasts to molt in very large flocks of over 80,000 individuals. Critical habitat has been designated by USFWS in areas where eiders congregate during breeding, molting, wintering, and spring staging. One of the areas designated as critical habitat is Ledyard Bay, one of the primary molting grounds for female spectacled eiders breeding on the North Slope.

Point Lay Walrus Haulout
Photos courtesy of Bill Tracey, Sr.



The Arctic DPS of ringed seal (arctic ringed seal) offer important subsistence resources and are prey for other protected species including the polar bear. In 2014, NOAA Fisheries proposed the Alaska coastline and Exclusive Economic Zone (EEZ) from the Beaufort Sea south to Cape Avinof be designated as critical habitat for the arctic ringed seal. The proposed critical habitat provides sea ice conditions that are essential for the survival of arctic ringed seals. This critical habitat has not yet been adopted and finalized into regulation.¹²²

¹²¹ U.S. Department of the Interior. U.S. Fish and Wildlife Service. 2010. *50 CFR Part 17: Designation of Critical Habitat for the Polar Bear in the United States*. www.fws.gov/home/feature/2010/pdf/Polar_Bear_Critical_Habitat_Designation_11-22-2010OFR.pdf.

¹²² U.S. Department of Commerce. National Oceanic and Atmospheric Administration. 2018. *Proposed Critical Habitat for the Arctic Ringed Seal under the Endangered Species Act*. <https://alaskafisheries.noaa.gov/pr/ice-seals>.



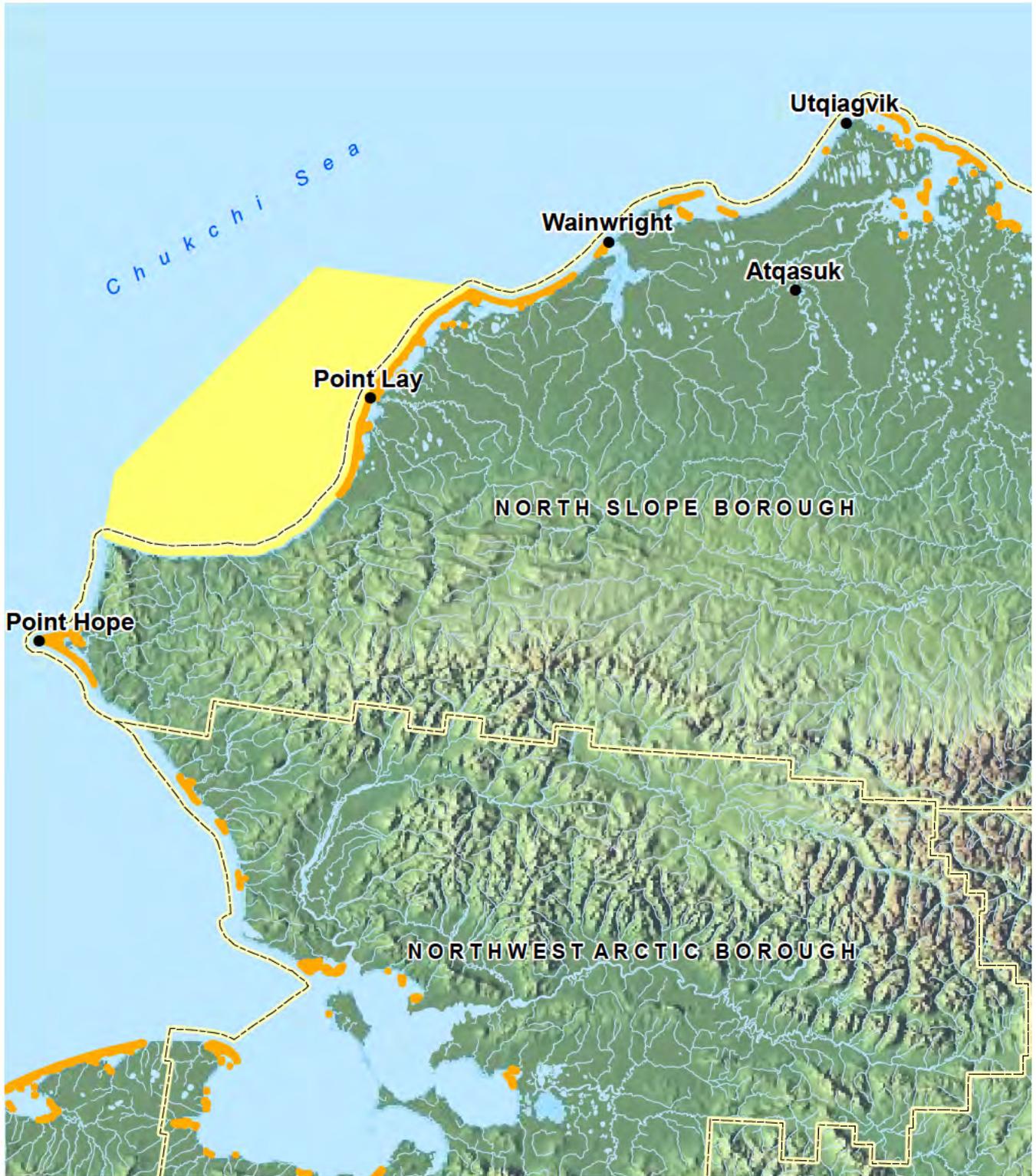


Pacific walrus use Chukchi Sea waters for foraging and transiting, and are currently a candidate for listing under the ESA. Walrus are known to haulout in large numbers to rest in many locations along the Chukchi Sea coastline, including near Point Lay. Large herds of walrus at a haulout can panic and stampede if disturbed. Due to receding sea ice, walrus spend more time at terrestrial haulouts where calves and young can suffer increased mortality due to stampeding.¹²³ During times when walrus are hauled out on ice near Point Lay, the Native Village of Point Lay, in partnership with the USFWS and other federal organizations, have requested that the media and tourists refrain from visiting the community to view the walrus. The Native Village of Point Lay has redirected subsistence hunters from haulouts, and even rerouted local airline flights to avoid causing mortality due to stampede.¹²⁴

¹²³ Udevitz, Mark S., Taylor, R.L., Garlich-Miller, J.L., Quakenbush, L.T., Snyder, J.A. 2013. *Potential Population-Level Effects of Increased Haulout-Related Mortality of Pacific Walrus Calves*. www.fws.gov/alaska/fisheries/mmm/walrus/pdf/Effects%20of%20increased%20haulout%20mortality%20of%20calves%20%20Polar%20Biol%202012.pdf.

¹²⁴ U.S. Department of the Interior. U.S. Fish and Wildlife Service. 2017. *Pacific Walrus Haul Out Near Point Lay Earlier Than in Previous Years*. www.fws.gov/news/ShowNews.cfm?ref=pacific-walrus-haul-out-near-point-lay-earlier-than-in-previous-years-& ID=36121.





**North Slope Borough
Protected Species – Map 4**





- | | |
|---|-------------------|
| Borough Boundaries | NSB Communities |
| Polar Bear Barrier Island Critical Habitat | Industrial Center |
| Spectacled Eider Ledyard Bay Critical Habitat | |
| Polar Bear Critical Habitat and Arctic Ringed Seal Critical Habitat | |





CLIMATE CHANGE AND SUSTAINABILITY

The cold and frozen Arctic environment is extremely susceptible to warming temperatures. Climate change is faster and more severe in the Arctic than in other parts of the world, and the Arctic is warming at a rate of almost twice the global average.¹²⁵ Changes in sea ice coverage are one of the most drastic ways to see the impact of warming global temperatures. September is historically when sea ice is at a minimum, and satellite observations taken since 1979 show that September Arctic sea ice is now declining at a rate of 13.2 percent per decade.¹²⁶ Diminishing sea ice can further exacerbate climate change as areas of open water are exposed which can absorb more heat from the sun.

Several decades ago shore-fast ice absorbed energy of the waves along the Chukchi and Beaufort Sea coastlines. Summer sea ice retreat has led to longer open water seasons, making the Alaskan Arctic coastline more vulnerable to erosion.¹²⁷ During fall, the prime storm season, the coastline is exposed and warm waves reaching the NSB coastline erode cliffs of once-frozen soil into the sea.¹²⁸ Roads, homes, and infrastructure along the coastline is at risk during each storm, and damages do to eroding coastline

can be costly to the NSB and dangerous to residents. In 2018, the U.S. Army Corps of Engineers (USACE) published a Draft Coastal Erosion Feasibility Study for Utqiagvik, noting that frequent and severe coastal storms threaten public health and safety, the economy, over \$1 billion of critical infrastructure, access to subsistence areas, and cultural and historical resources.¹²⁹

The rolling tundra of the NSB, a complex of lakes, streams and wetlands, is underlain by permafrost. A warming climate contributes to the thawing of this permafrost which can have many detrimental effects. Melting permafrost under NSB communities results in land subsidence, which can create sink holes and damage infrastructure. Underground ice cellars have been damaged or have failed entirely. Ice cellars are used traditionally to store harvested subsistence foods and are passed down in families for generations. Damaged and failing ice cellars threaten both food security and safety.¹³⁰ Melting permafrost also carries sediment into fresh water, where increased sediment load can make rivers and lakes wider and shallower. Riverine erosion occurs mostly in the spring when ice scouring, snow melt off, and bank slumping following thaw occurs.¹³¹ Additionally, melting permafrost releases additional carbon

¹²⁵ Khachatourian, Travis. 2017. KTUU Anchorage. *Alaska Warming Twice as Fast as Global Average*. www.ktuu.com/content/news/Leaked-climate-change-report-outlines--439353963.html.

¹²⁶ NASA Global Climate Change. 2017. *Arctic Sea Ice Minimum*. <https://climate.nasa.gov/vital-signs/arctic-sea-ice/>.

¹²⁷ Khachatourian, Travis. 2017. KTUU Anchorage. *Alaska Warming Twice as Fast as Global Average*. www.ktuu.com/content/news/Leaked-climate-change-report-outlines--439353963.html.

¹²⁸ Thompson, Andrea. 2017. Alaska's Coast Is Vanishing, 1 Storm at a Time. www.scientificamerican.com/article/alaskas-coast-is-vanishing-1-storm-at-a-time/.

¹²⁹ U.S. Army Corps of Engineers. Alaska District. 2018. *Barrow, Alaska Coastal Erosion Draft Feasibility Report*. Sept. 6, 2018. www.poa.usace.army.mil/Portals/34/docs/civilworks/publicreview/BarrowDraftFeasibilityReportwithAppendices.pdf?ver=2018-09-06-175056-500.

¹³⁰ Alaska Native Tribal Health Consortium (ANTHC) Center for Climate and Health. 2010. *Climate Change in Point Hope, Alaska: Strategies for Community Health*. www.cidrap.umn.edu/sites/default/files/public/php/26952/Climate%20Change%20HIA%20Report_Point%20Hope_0.pdf.

¹³¹ North Slope Borough. 2017. *Atqasuk Comprehensive Plan 2017 - 2037*. Prepared for the North Slope Borough by ASRC Energy Services and UMIAC Environmental. www.north-slope.org/assets/images/uploads/ATQ_Adopted_Comprehensive_Plan.pdf.





dioxide and methane into the atmosphere, resulting in additional warming.¹³²

Warming trends have spurred responses by plant and animal life as they accommodate earlier snowmelt, lake ice thaw, and plant growth. Many migratory species arrive to their Arctic summer grounds several days earlier in spring than recorded in the 1970s. Scientists expect these trends to continue.¹³³

A warming climate allows shrubs and woody vegetation to expand into the tundra,

sometimes replacing lichens and other established tundra vegetation. Loss of lichens can be detrimental to caribou populations, and caribou may change migration patterns or decline in abundance due to changing vegetation. Caribou are a critical subsistence food source on the North Slope, and also provide food to predators such as bears and wolves.¹³⁴ Vegetation changes caused by climate change such as introduction of invasive or other non-native species can have ecosystem-wide impacts.

COMMUNITY INPUT, FINDINGS, NEEDS, AND CHALLENGES

Residents of all villages have continually expressed the natural beauty of the North Slope. It not only provides abundantly for subsistence lifestyle but also is a planning of exorbitant beauty. Outreach for the comprehensive plans have indicated that protecting the natural environmental from climate change and to protect subsistence resources – both land and sea.

Environmental and concerns identified by workshop participants are provided in Chapter 2 and listed below:

- Climate change effects on subsistence and food security
- Climate change increasing extreme weather events/conditions
- Coastal erosion

¹³² National Snow and Ice Data Center. 2018. *Methane and Frozen Ground*. <https://nsidc.org/cryosphere/frozensground/methane.html>.

¹³³ U.S. Department of the Interior. U.S. Geological Survey. 2016. *Measuring and Forecasting the Response of Alaska's Terrestrial Ecosystem to a Warming Climate*. https://alaska.usgs.gov/science/interdisciplinary_science/cae/arctic_coastal_plain.php.

¹³⁴ U.S. Environmental Protection Agency. 2017. *Climate Impacts in Alaska*. <https://19january2017snapshot.epa.gov/climate-impacts/climate-impacts-alaska.html>.





Additional issues

- Failing ice cellars
- Subsidence
- Potential damage to high value wetlands
- Accelerated permafrost melt from exposed bluffs
- Air quality, particularly near Prudhoe Bay oilfields
- Protection of endangered and threatened species and their habitats
- Diminished near shore sea ice
- Invasive species resulting from climate change
- Infrastructure at risk due to climate change and environmental factors
- Migratory changes

Findings

Air quality and water quality is generally good throughout the borough.

Quality of life, which includes environmental quality, is an increasingly important criterion in private sector economic investment decisions.

Climate change is affecting in the arctic dramatically.

Needs & Challenges

Ice cellars are failing, creating food security concerns.

Potential air pollution may not be well monitored or within the control of the local government or the North Slope Borough.

Climate change poses a significant challenge to the region – from increased marine traffic, changes in weather patterns, diminishing sea ice, and changing migration routes.

More advanced testing techniques may identify newly recognized contaminants, which may be present in village water sources. Subsidence poses a significant issue to infrastructure in several villages.





PRIMARY NATURAL ENVIRONMENT GOAL

Goal Ten: Protect our environment.

Objective 1: Seek a healthy arctic environment through leadership in land use and wildlife management.

- 10.1.1. Coordinate with resource agencies to identify and map watersheds, wetlands, and traditional trails in the North Slope Borough that are important for subsistence.
- 10.1.2. Evaluate existing zoning and land use regulations for effectiveness in protecting sensitive areas, including establishing a zoning district(s) specifically for subsistence and/or special habitats.
- 10.1.3. Develop a wetlands mitigation bank that compensates for expected adverse impacts to the environment.

Objective 2: Identify, remediate, and remove contamination and hazardous waste.

- 10.2.1. Identify existing and abandoned sites with garbage, hazardous waste, and toxic substances and seek funds for demolition and clean-up.
- 10.2.2. Educate village residents about proper disposal of garbage, hazardous waste, and toxic substances.
- 10.2.3. Enforce existing laws and policies to prevent future contamination.
- 10.2.4. Develop a system for the export of hazardous and other non-disposable material.

